SALMON FISHING BOATS OF THE NORTH AMERICAN PACIFIC COAST

IN THE ERA OF OAR AND SAIL

A Thesis

by

CHARLES DAVID MOORE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

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Major Subject: Anthropology
SALMON FISHING BOATS OF THE NORTH AMERICAN PACIFIC COAST
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NAUTICAL ARCHAEOLOGY A Thesis
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ABSTRACT

Salmon Fishing Boats of the North American Pacific Coast in the Era of Oar and Sail. (December 1993)

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The Pacific Salmon exhibits habits for which specific methods of capture were developed for use in clearly defined environmental settings. The isolation of many of these settings and the mechanized nature of the canning process led to heavy capitalization of the fishery, concentration of power and influence into the hands of a few industrialists, and a standardization of the modes of production. Boat-builders responded with a "stock" boat, the Columbia River Sailing Gillnetter. As this type dispersed throughout the salmon fishery, local variants emerged. Other types of boats also propelled by oar and sail both preceded its introduction and continued in use until the introduction of motors. Salmon were sought with dugouts, sampans, feluccas, small double-enders, and various flat-bottomed craft. Four distinct sailing rigs were employed. By cataloguing historical documentation of these craft and their variants, along with data taken from surviving boats and models, a taxonomy is developed for small craft identification by archaeologists working on the Pacific Coast. The information gained from studying various salmon fishing boats and their distribution reflects changing hull shape due to local sea conditions, competition amid diminishing fish stocks, and access to exotic building materials. Also examined are the way in which old traditions in boat-building survive and new ones begin in an ethnic potpourri where the ancient relationship between boat-builder and boat-user is sometimes transformed. Conclusions show that flat-bottomed boats were chosen where conditions allowed and where, or when, exotic building material was not available. Round-bottomed boats were required as competition pressed fishermen into more treacherous waters. While cannery owners greatly expanded the range of some types they followed the lead of independent fishermen for innovation. Local sea conditions influenced hull shape, but boats built in emergent boat-building centers and exported often retained characteristics more suited for the builder's home waters than the user's, reflecting new distance between builder and fisherman. West Coast evidence relating to cultural traditions surviving transplantation is complex and often contradictory, but leads to interesting questions pertinent to more than a purely regional analysis.
To the memory of

Grant Carder
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CHAPTER I

Introduction

From central California to Bristol Bay, Alaska, commercial salmon fishing played a significant role in opening and settling the Pacific littoral of North America. The industrial development of this fishery has been well recorded since at least the 1880s, its social history less so, and its technological evolution in terms of the fishermen's boats, hardly at all. These variously shaped and constructed artifacts from the era of oar and sail are the subjects of this study.¹

Commercial fishing for salmon intended for export began, with fish supplied by aboriginal fishermen, as early as 1831 on the lower Fraser and Columbia Rivers. By the 1850's, immigrant fishermen appeared in rapidly increasing numbers with their own gear and boats. These boats, propelled by oars and sails, supplied the hungry multitude of salmon canneries with their largest catches. Though the use of non-engined craft continued as late as 1951 in Bristol Bay, the period of principal concern for this thesis spans the 1860s to the decade preceding 1915, from the appearance of two recognizable West Coast boat types (the felucca and Columbia River sailing gillnetter) and the first salmon canning enterprise, to the dominance of the gasoline engine on fishing grounds near urban centres.

By focusing on boats used specifically in the commercial salmon fishery, analysis is facilitated by the given need for these craft, or artifacts, to function within a relatively constant set of operational parameters. Recognized also is the trend "at least within the arena of historic archaeology, [that] the questions that count in underwater archaeology are going to be based increasingly on historic contexts and decreasingly on boat-building typologies or shipbuilding technologies. Seen in this light cotton barges have more in common with cotton barns than they have in common with coal barges" (Potter, 1990:36). To study West Coast fishing boats without providing the industrial context within which they functioned would obscure this fundamental relationship.

This thesis has four specific objectives. The first is to outline regional contexts, historic, geographic and demographic, which gave rise to the boats under study. The second, worked into Chapter III, is to catalogue relevant resources, particularly surviving boats. The third is to develop and apply analysis to the currently available data, and the fourth is to demonstrate how the archaeology of boats on the West Coast

¹This thesis follows the style and format of The International Journal of Nautical Archaeology.
can enhance our knowledge in both a regional and more broadly based context.

Archaeological contributions to the study of the world's small craft have just begun. From the West Coast, these contributions exist only in potential. The unifying theme behind the outlined objectives is to serve future archaeological investigations in this region. The lead is followed by East Coast archaeologists who recognize that (Peterson, 1989:59-60):

The direction of small craft research in North America is toward the understanding of locally conceived, designed and used vernacular craft. As artifacts and as participants in a tradition of vernacular boats constructed within a craft tradition by craft specialists, they are legitimate bearers of valuable historical and cultural information. Yet, the study of small craft in North America is currently in its infancy and lacks well developed literature, a widespread understanding of the nature and value of the resource, and taxonomic and theoretical systems for describing and explaining the phenomena.

Data useful to archaeologists encountering West Coast small craft have never been presented in a cohesive fashion; it is critical for a study at this phase to develop a simple methodological frame of reference. The development of a typology is necessary not only as the first step in translating small craft data into archaeological and anthropological parlance, and hence relating it to the rest of the science of man, but also it is a vital tool for the identification of boat finds in the field. This identification is prerequisite for any archaeological assessment regarding site/artifact significance. Government agencies operate under the federal guidelines of the Canada Shipping Act or Section 106 of the National Preservation Act in the United States, and follow regional government legislation, such as the Heritage Conservation Act in British Columbia, or California Environmental Quality Act. Particulars of assessment might mean the difference between the careful preservation and/or recording of a boat, or its destruction. Drawing on typologies already established will facilitate future inter-regional, or even inter-continental, comparisons in boat-building technology; the fledgling "Origins-Project", initiated by Carl Olaf Cederlund (Swedish National Maritime Museums), with its aims of tracing the emigration and evolution of European boat types to and across North America (Cederlund, 1992), illustrates the nature of this research potential.

Michael Alford (1989:63) has developed a typology based on structural elements for classification of North Carolina indigenous boat types for the period 1790-1920. He stresses that the system is valid "only when applied to the vernacular boat types native to North Carolina and, specifically, to those generally not more than 40 ft. (12.2 m) in
length" (Alford, 1989:62). Systems more broadly based in terms of
geography are possible, and one taking features of shape and structure
into consideration, which may be applied to all the boats studied herein1
has been developed (see page 301).

Vernacular boats may be particularly useful at the provincial,
state, or regional level because they "reflect regional trends in maritime
economics through their use and preference" (Wilde-Ramsing, 1989:73).
Data collected to date speak to regional questions such as how access to
exotic building materials, local sea conditions, and changing fishing
strategies affected boat construction on the West Coast. More light can
also be shed on Canada/U.S. industrial relations in the region during the
nineteenth century. Some interpretations apply to broader contexts.
Comparing West Coast boat types with those used elsewhere is valid beyond
the pursuit of boat type origins and bears on broader questions of ethnic
influences and how these are transferred and survive in new lands. The
mechanisms of transfer are considered, and how they are influenced by
varied relationships among fishermen, boat builders, and the captains of
an industrialized fishery.

Some surprising parallels may be drawn with the development and
settlement surrounding the East Coast cod fishery two centuries earlier.
In their infancy, both the West Coast salmon fishery and the East Coast
cod fishery played vital roles in the European or American settlement of
their respective coasts. Both catches were intended primarily for export,
which, coupled with remote fishing and processing areas, necessitated
heavy capital investment to support the transportation infrastructure.
Initially, manpower, equipment, and supplies all had to be imported for
the duration of short fishing seasons. In both fisheries, the fishermen
had very little influence during the initial development of the respective
fisheries: in the East, the first fishermen were formally indentured;
while in the West they were little better off as they had to rent their
boats and nets from the company, were often paid in company tokens good
only for supplies offered at the company store at inflated prices, and
would sometimes finish a season's work in debt to the company. With
increased settlement, resident fishermen exerted more influence as they
began to own their own boats, and hence, developed direct relationships
with local boatbuilders. On both coasts this trend was synchronous with:
a move away from a strictly inshore fishery, placing a greater demand on

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1 All vernacular craft studied in this thesis qualify as "boats"
according to the U.S. Maritime Heritage Task Force, which defines them
as any craft under an arbitrarily chosen 40-foot (12.2 m) length, and
the U.S. National Park Service definition of boats as craft measuring
less than five gross tons.
boat performance; the emergence of a domestic market, or market fishery; and a fishing season of increased length (Albion, Baker, & Labaree, 1972:25; Samson, 1984:25; Faulkner, 1985:57). By studying the emergence and evolution of boat types on the West Coast we may, by inference, gain some insight to how the first boat types, derived from European traditions, acquired their North American forms and identities, a process for which data is almost entirely lacking.

Data relating to small craft are difficult to acquire under the best of circumstances. Unlike ships, the pedestrian origins and functions of small fishing craft attracted little attention in contemporary records. However, the recent and compact period of evolution for Pacific Coast boat types offers some advantage to researchers.

Review of Sources

There were over a hundred types of American sailing craft employed in the fisheries and in commerce between 1800 and 1900. A few scattered pictures, half models and plans are all that remain of many of these types -- some have left only their names. A few types now 'alive' are gradually disappearing. It seems important, therefore, that records be made of every type possible before it is too late (Chapelle, 1935:xii).

Chapelle's exhortation is now nearly sixty years old, and his numeric estimate of types is very conservative. His sources were "abandoned boats, boats stored in barns, [and] pieces of boats lying in the marshes or behind fish houses..." (Alford, 1989:61). Chapelle or his colleagues furnished lines and/or construction drawings of four hulls of West Coast fishing boats, and these are examined here. Expectations of finding more boats today in similar abandoned circumstances were have passed largely unfulfilled. The considerable geographic scope of this study, extreme remoteness of many fishing grounds in the north, extensive urbanization of many southern shorelines, and the inability of the author to spend a great deal of time in any one place, has contributed to the paucity of data from these sources. Nevertheless, "some idea of the attrition rate for historic vessels may be gained from the fact that of the 426 vessels included in the 1936-1937 Historic American Merchant Marine Survey documentation project, precisely one is still extant fifty-five years later" (Summers, 1992:20). For small, ephemeral fishing craft, time has clearly taken its toll, and most of the physical remains accessible in Chapelle's time have disappeared.

However, current researchers have one advantage in that recovery and/or study of small craft remains found underwater is now possible. Indeed, "submerged boats form the largest category of unstudied craft and
research" (Peterson, 1989:59). Most of the Pacific Coast salmon fishing boats were used in estuarine environments which bode well for preservation. Areas of historic boat use and abandonment are often areas now impacted by landfill or foreshore development so that, given archaeological assessments sensitive to small craft remains, the potential for future boat recovery seems high. Large vessels such as the Niantic and the Levi's Plaza ship have recently been recorded in the landfill of San Francisco harbour, while projects including the excavation of the Hoff Store site (Pastron & Hattori, 1990), a ship-breaking yard (Archeo-Tec, 1985), Californian whaling stations (May, 1990), and the survey of cannery sites in northern British Columbia (Newell, 1987), exemplify the recent trend in West Coast archaeology towards the study of maritime industrial sites of the nineteenth century, which will inevitably uncover small craft remains in the future. To date, however, only one boat pertinent to this study has been recovered from the field, while two other fishing boat remains have been briefly surveyed.

At this time, the best sources for physical boat remains on the West Coast are museums. The number and location of craft surviving in these collections are listed. These craft had not been measured prior to this study. A few boatbuilder's plans and a model were also found in Museum collections, and these too are presented here.

Methodology and techniques of presentation followed for this study's data owe a debt to some excellent published studies of small craft on the North American Atlantic Coast, Scandinavia, and in Great Britain: Chapelle (1951); Hasslof, Henningsen and Christensen (1972); Nielsen (1980); and particularly, McKee (1983).

Documents covering the earliest efforts of Europeans or Americans to establish a fishery on the Pacific Coast are spotty. The records for the Russian and Spanish forays into fishing are poor. Many Russian documents are not available or remain untranslated, while those published lack details. Many Spanish/Californian documents, not yet mined for their boat-building and fishing minutia, were tragically destroyed with the Archives of San Francisco during the fire of 1906. Log books from the vanguard of American trading packets into the region are accessible and refer to early attempts to put by stores of salt-salmon. But after this first blush of discovery had worn off, fishing tends to disappear from the records. The Hudson's Bay Company records are thoroughly represented in published works for the full span of that company's involvement in the fishery. The American trading companies' records have not benefitted to the same degree from publication, but the Peabody Museum, Essex Institute, and the Massachusetts Historical Society have pertinent archival holdings.
bound to have much of interest for the researcher with access (Beasley, 1992:84).

Monographs and magazine articles written in the travelogue format or as treatises promoting immigration are sometimes useful for their boat descriptions, particularly for the early periods of settlement when they may be the only source. Unfortunately, the authors concerned tend toward romantic descriptions, and never demonstrate expertise in their observations of small fishing craft.

Fish packing company archives, with respect to the boats bought and used, have proven disappointing, while documentation from boatbuilding yards is almost non-existent. Boat builders' records were probably poor in the first place, and their establishments extremely vulnerable to fire. What little has survived is now to be found in museums rather than with the boat building families. Only one builder's model has been found.

The recording of boat lines is a relatively recent phenomenon. Even as lines were being regularly produced for ships, boats were passed over almost completely. In the nineteenth century, most builders continued with traditional methods, creating boats by eye, with the aid of molds, or, occasionally, with the assistance of models. Few nineteenth century observers took sufficient interest to take lines from completed boats. In England, Dixon Kemp was a notable exception, while the first North American book in which boat lines are printed is the Annual Illustrated Catalogue and Oarsman’s Manual published in 1871 (Gardner, 1979:44). In 1884, Forest and Stream Publishing Co. brought out the first edition of Stephens’ Canoe and Boatbuilding, a Complete Manual for Amateurs, which was followed a year later by Charles P. Kunhardt’s Small Yachts, Their Design and Construction. All these studies concentrate on pleasure craft, but the latter two include a working sharpie, a fisherman’s dory and a couple of skiffs or bateaux.

Henry Hall, in his Tenth Census Report on the Ship-Building Industry of the United States (1884) offers little detail, but describes working boats "with some attention to derivation and historical background.... [which was] something new and a foretaste of what was to come, but not for some considerable time" (Gardner, 1979:45). George Brown Goode’s The Fisheries and Fishery Industries of the United States (1887) is a work of great scope and detail which surveys the nation’s fisheries in the years 1879-1880, mentioning various working small craft, but the details are meagre.
Figure 1. Sheer, half-breadth, and half-deck plans of a San Francisco fishing felucca (Collins, 1892b:Pl.XIII).

In the vanguard of this new-found interest in working small craft was J.W. Collins. Though his contributions are often overlooked, his model collecting on behalf of the National Museum (Smithsonian Institution) beginning in 1876 laid the foundations for studies brought to fruition by Howard Chapelle. Between 1888 and 1890 he was responsible for reporting to the U.S. Fish Commission on the state of the Pacific Fisheries. The attention given to the West was long overdue. As far back as 1852, fisheries inspectors' reports and recommendations are useful to researchers of East Coast fisheries (Samson, 1984:8), but not until the 1880s is such data available for the West Coast. The selection of Collins for this duty was fortuitous; unlike many fisheries inspectors with an academic background in ichthyology, he was a former Gloucester fisherman who had already championed safer designs for East Coast fishing boats, and his reports place an unusual emphasis on boats and the men who used them (Fig. 1). These reports, particularly his Fishing Vessels and Boats of the Pacific Coast, published 100 years ago, are well placed chronologically a decade before power plants started to make inroads and after several types were well established, and are key sources for this paper. The habit of Government agencies managing fisheries in both Canada
and the United States of carefully listing the race or nationality of each fisherman, despite its racist motivation, provides data useful in the interpretation of ethnic influences on boat design.

One excellent manuscript source for boats used around San Francisco is an undated letter by J. Porter Shaw. Shaw, after whom the National Maritime Museum Library in San Francisco is named, wrote this letter in response to Howard Chapelle's request for information for his American Small Sailing Craft (1951). The letter may then be roughly dated to the 1940s. Shaw was born in 1884, and grew up on the Bay waters an avid sailor and amateur boat-builder. Several of his keen observations were not included in Chapelle's work. Regrettably, the letter copy held in the J. Porter Shaw Library is incomplete.

In Canada, there is no analogous figure to Shaw, or Collins. However, the Department of Marine and Fisheries, Fisheries Branch, Annual Reports series begin in 1868, with useful background information for the developing West Coast fisheries appearing after 1888.

Lines drawings and descriptions of working craft began to appear in popular yachting magazines around the turn of the century. The descriptions tend towards the romantic, but some of the authors writing for Rudder and Yachting magazine make valid contributions through their knowledge of the details necessary to usefully describe a boat.

This study was conducted too late to draw heavily on oral testimony. Few fishermen are left who reached fishing grounds with oars and sails, besides those who worked the most northerly waters where conversion to power was delayed. Of the boat-builders, no one who actually built sailboats prior to World War I has been located, though their sons and grandsons in some cases have childhood memories of sailboats being built. Fortunately, the 1970s and 1980s saw oral history programs initiated in British Columbia, Washington, Alaska, and on a limited scale, California. Though pertinent interviews aim at recording the life of the fisherman, some valuable information on boat building has been gleaned from these.

Fortunately, the period of flourishing fishing activity which followed the introduction of canning techniques in the last half of the nineteenth century is represented photographically. There are several historic photo collections held in various museums and local historic societies which document the salmon fisheries. A few of these photos are of diagnostic value, and, in some cases, they are the only record surviving of boat types in some localities.

Of less direct utility, but providing considerable insight to the atmosphere of the early West Coast fisheries are a small handful of popular books set against the colourful but accurately portrayed backdrop of the early West Coast fisheries. John Steinbeck's classics, Cannery Row
(1954) and *Sweet Thursday* (1954), were preceded by Martha Ferguson McKeown's *Alaska Silver* (1951) and *The Trail Led North* (1948), Zane Grey's *Tales of Fishes* (1919) and *Rogue River Feud* (1948), Bertrand W. Sinclair's *Poor Man's Rock* (1920), Rex E. Beach's *The Silver Horde* (1909), and Jack London's *Tales of the Fish Patrol* (1905).
CHAPTER II

The Pacific Salmon: its Habitat and Exploitation

Specialization: Species, Geography, Processing and Fishermen

The tasks various small craft had to fulfill in the salmon fisheries were dictated by the habits of various salmon species, techniques used in capture, and processing methods for which the catch was intended. Specialization was further defined by geography and the ethnic traditions of fishermen.

The five principal species of Pacific salmon (genus *Oncorhynchus*) are all anadromous. That is, they begin their lives in rivers or lakes, descend to spend the middle span of years in the sea, and return upriver in schools to spawn precisely at their place of their birth. Unlike the Atlantic salmon, the Pacific salmon spawns only once and then dies. Groups returning to the same spawning grounds have distinct times for entering the rivers. The times of these "races" as they are known to scientists, or "runs" in the fisherman's parlance, vary from species to species and even within a single species depending on the specific spawning ground location (Ralston, 1969:39). In general, the runs are confined to the warmer months following the spring breakup in the northern interior streams to mid-autumn, with the heaviest concentration of fish entering most rivers in the month of August. In smaller streams the runs may be very brief. In larger rivers, such as the Sacramento, Columbia, and Fraser, the fishing season for salmon could be relatively long owing to a succession of runs as distinct groups made their way upstream at different times to the spawning beds of many tributaries (Fig. 2).

The southernmost salmon rivers of significance are the Sacramento and San Joaquin; the northernmost are the rivers and streams flowing into Bristol Bay. Salmon feeding at sea are found everywhere in what may be defined as temperate or subarctic waters. The southern limit is Point Conception, which marks a rather rapid transition between the fish fauna of southern California "with its large representation of subtropical types, and that of central California, with many subarctic forms" (Hubbs, 1948:460).

*Oncorhynchus nerka* is the most numerous species in northern streams (north of the Columbia River) while *Oncorhynchus tschawytscha* most numerous in southern streams. Both of these species found particular favour with canners. But each species showed distinct traits and often was known by different popular names in different locations. This information is summarized in Table 1.
Figure 2. Map of the North American Pacific Coast showing major salmon rivers, and prevailing capture techniques in 1889 (see Appendix A).
Table 1. Genus Onchorhynchus: nomenclature and characteristics of the five species (Pacific Fisherman Yearbook, 1915:55; Harris & Kess, 1975:61-63; Tomasevich, 1943:221-222).

<table>
<thead>
<tr>
<th>Species</th>
<th>O. tshawytscha</th>
<th>O. nerka</th>
<th>O. kisutch</th>
<th>O. gorbuscha</th>
<th>O. keta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Names in Alaska</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot; B.C.</td>
<td>king</td>
<td>red</td>
<td>coho,</td>
<td>pink</td>
<td>chum</td>
</tr>
<tr>
<td></td>
<td>spring</td>
<td>sockeye</td>
<td>medium red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot; Puget Snd.</td>
<td></td>
<td></td>
<td>coho</td>
<td>humpback,</td>
<td>keta,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pink</td>
<td>chum,</td>
</tr>
<tr>
<td>&quot; Columbia R.</td>
<td>chinook</td>
<td></td>
<td>blueback</td>
<td></td>
<td>chum,</td>
</tr>
<tr>
<td></td>
<td>quinnat</td>
<td></td>
<td>silverside</td>
<td>humpback</td>
<td>dog</td>
</tr>
<tr>
<td>&quot; outside rvs.</td>
<td>chinook,</td>
<td>quinnant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>king</td>
<td>silverside</td>
<td></td>
<td></td>
<td>dog</td>
</tr>
<tr>
<td>&quot; California</td>
<td>chinook</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>quinnant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average weight</td>
<td>22 lbs. (10kg)</td>
<td>5 lbs. (2.3kg)</td>
<td>6 lbs. (2.7kg)</td>
<td>4 lbs. (1.8kg)</td>
<td>8 lbs. (3.6kg)</td>
</tr>
<tr>
<td>Habits</td>
<td>takes hook readily</td>
<td>forms lg schools outside streams</td>
<td>takes hook readily</td>
<td>won't take hook</td>
<td></td>
</tr>
<tr>
<td>Flesh colour</td>
<td>pale to deep pink</td>
<td>intense red</td>
<td>deep pink</td>
<td>pale pink</td>
<td>pinkish white</td>
</tr>
<tr>
<td>Flesh quality</td>
<td>firm</td>
<td>firm</td>
<td>firm</td>
<td>soft</td>
<td>soft</td>
</tr>
<tr>
<td>Process to market, c. 1910, in order of pref.</td>
<td>mild-cured, canned, fresh</td>
<td>canned, mild-cured, fresh</td>
<td>fresh, mild-cured, canned</td>
<td>fresh, canned</td>
<td>canned</td>
</tr>
<tr>
<td>Markets, c.1910</td>
<td>domestic, Britain</td>
<td>worldwide</td>
<td>domestic, Britain</td>
<td>domestic, Pacific Rim</td>
<td>domestic</td>
</tr>
</tbody>
</table>

Salmon are most easily caught along the lower reaches of large rivers, estuaries, and proximate coastal waters while the fish are migrating in schools to their spawning grounds. This is fortunate, for the North Pacific Ocean where it approaches the American continent is not a forgiving environment for small craft (McCurdy, 1977:xii):

The Pacific Coast from California to British Columbia can almost be said to be entirely rocky and precipitous. There are very few harbours and these are widely scattered.
The Pacific Coast of the United States is in general rugged and mountainous, the high land in many places rising abruptly from the sea. The shore is generally bold and rocky, with occasional short stretches of narrow sand beach... but the entire coast is backed by the coast range, which frequently terminates at the shore in high cliffs and jagged off-lying rocks.

From San Francisco northward the winter gales increase in severity, frequency, and duration.... In winter the heaviest weather is from the southeast to southwest, with an occasional northerly gale of short duration. The southeast gales occur at any time, generally accompanied by rain and thick weather and increasing in severity northward. These gales, with the heavy southwest swell prevailing during the winter months, cause a confused irregular sea....

[The] problem with currents on the Pacific Coast is one of the most difficult with which mariners anywhere are compelled to contend. The movements of these waters have neither the comparatively uniform direction and velocity of the Gulf Stream nor the constant ebb and flow of tidal currents.

From the Strait of Juan de Fuca to the Aleutian Islands, the shore grows increasingly rugged, but is penetrated frequently by deep fjords, the consequence of glacial action. Islands are frequent, as are harbours, but tidal currents, occasionally exceeding 10 knots (17 km/h) in velocity, sweep among them and over ubiquitous reefs and rock pinnacles. The weather worsens with each degree of latitude. In Bristol Bay, storms are frequent and nasty even in summer, while tides ranging up to thirty feet between low and high water sweep over an exposed shoreline suddenly composed of sandy beaches and expansive mudflats.

First Nations people of the Pacific Coast skillfully plied these waters in their skin boats, dugouts, and reed boats. Sometimes far offshore they pursued whales, and with hook and line they caught halibut and other species of fish, including salmon. Most of their salmon, however, were caught in the relatively protected waters of the rivers and estuaries. Though salmon on their way to spawn do not feed, and therefore will not take a hook, the Native\(^\text{2}\) employment of nets, weirs, traps, dipnets and spears was sufficient to reap a rich harvest from the rivers. The salmon were dried, following the earliest and most universally used method of food preservation (Yonge, 1975:333), and provided year-round nourishment. The favoured fish for drying was the keta, as the other species generally had too high a content of fat to dry whole (Collins, 1892a:247).

The first white men on the coast sometimes used the Native methods of preservation when putting by a store of salmon for their own use. But

\(^{2}\) "Native" will be capitalized throughout this study when used as a noun referring to Native-American peoples, or a possessive adjective referring to artifacts or aspects of Native-American culture.
in searching for a process suitable for exportation they turned to "pickling" the salmon "green," that is packing fish directly into barrels with brine. It is uncertain which species of salmon were first salt-cured this way, but the first casks did not travel well. Attempts to market early salmon packs to the eastern United States and Europe were largely unsuccessful. However, through the last three quarters of the nineteenth century salteries continued in operation providing a product which was marketed to the Sandwich Islands, the Orient, and Australia, in addition to that which was used locally by trading companies for winter consumption by employees and for trade with Natives.

At first, most of the salt-cured fish were caught by Native fishermen using their traditional means of capture. Works which detail Native craft and their function, and traditional fishing methods include Collins (1892b), Waterman and Coffin (1920), Olson (1927), Stern (1934), Durham (1960), Stewart (1977), Jobson and Hildebrandt (1980), Hudson (1981), Lincoln (1990), and Holm (1991). Native fishing gear and canoes of pre-contact form are best examined in the context of the society which spawned their development, but the continued, though decreasing, use of Native methods of capture in the service of the commercial fishery, in some areas well into the twentieth century, begs some additional attention be paid here as Native craft so employed fall within the scope of this paper. The two methods of capture which came to dominate the commercial salmon fishery, the seine and gill nets, were successfully introduced and/or adopted by caucasian fishermen in West Coast rivers before the establishment of canneries. Of these two methods of capture the gill net found the most universal acceptance, and was used in every major salmon fishery. Set gill nets proved too vulnerable to damage by drifting debris in most western rivers, but drifting gill nets rapidly found favour among fishermen of diverse ethnic backgrounds.

To set a drifting gill net, a boat was required to carry the net to the head of a reach. Usually a sail was used to facilitate upstream travel, but sometimes oars alone were used. Two men were required to shoot and recover the net. The "puller" manned the oars while the fisherman handled the net. The boat was pulled away from the free end of the net as it was set across the stream. With two-thirds of the net out the boat turned down-stream creating an "L" shape. The net was left out until the net was full or the boat and net drifted to the end of the reach. The net was suspended from its "corkline" by a series of floats; its bottom end kept down by a weighted "leadline." The mesh of the net was so designed to catch the fish swimming upstream by the gills, being small enough to permit the passage of the head but not the body. Mesh size would vary according to the species sought: for example, a typical
gill net used on the Columbia River for chinook salmon would have a mesh size of 8 1/2 inches (216 mm), while one used on the Fraser for sockeye would have a mesh size of 5 1/4 inches (134 mm). When recovering the net the boat would have to be backed by the puller so that the net would not be stretched, thereby possibly freeing the entangled fish.

Lengths of the gillnets varied from 100 to 300 or more fathoms (182-547+ m), and from 22 meshes (2 fathoms, or 3.6 m) to 45 meshes (4 fathoms, or 7.3 m) deep. The boats would have to be of sufficient burden to carry the net, a crew of two, in most cases a rig for sail, and the quantity of fish caught in one or two days. The number of sets which could be made within a specific period was dictated by local conditions. Nets were usually put out about an hour before high water slack and taken in about an hour after the turn of the tide. In Alaska, fishermen usually fished high and low slack (Cobb, 1916:19). In rivers with a heavy sediment load, the nets could be shot night or day, but in rivers where, or when, the water was relatively clear, the nets could be used only at night when the nets would be invisible to the fish.

Little in the way of seaworthiness was demanded of boats working gill nets on the protected river reaches. It is generally recognized that "river and estuarial fishing require less elaborate boats and gear" (Ralston, 1969:39). They had only to meet the requisite load capacity, and row and sail with relative ease. However, the best fish were caught near river mouths; as spawning fish go upstream without taking in any food the exertion of their trek depletes the fat content and softens their flesh. As more and more boats crowded the river they jockeyed ever further downstream to have first chance at the best fish. Lower estuary areas, ragged interfaces between riverine and oceanic environments, presented far more hostile sea conditions to boats and demanded very seaworthy designs and construction. The extreme example of this hostile interface is the infamous Columbia River Bar, where ponderous Pacific swells, their progress unfettered by any obstacles closer than Japan, crash into strong opposing river currents in shallow water. Similarly dramatic bar environments may be found at the mouths of salmon rivers from northern California to Gray's Harbor. But, even the more protected river mouths exhibit localized environments noticeably more demanding than the upstream river reaches or even the open sea beyond.

Throughout the era of oar and sail the gill net remained the most popular form of apparatus in use, and more salmon were taken in this form than in any other (Cobb, 1916:19). The seine net, however, was also employed extensively where local conditions and legislation permitted its use. Two forms of seine net were used: the "drag" seine, also known as the haul or beach seine, was set in circular fashion by boat, but was
dragged up a beach with its catch by a large crew of men, or men in
combination with horses; the "purse" seine was set and hauled entirely by
boat, the bottom of the net being first pursed shut. Though purse seines
had been in use for years in the mackerel fishery of New England, the
Pacific Coast type, first used in Puget Sound, is said to have been
introduced by Chinese fishermen in 1882 (Spurlock, 1940:49). The skiffs
used by caucasian fishermen to set seines of either form were similar;
mobility and seaworthiness were not a priority, but they were required to
provide a stable platform for heavy nets which ranged up to 250 fathoms
(456 m) in length and 25 fathoms (46 m) deep, and carry a rowing crew
typically comprising four oarsmen to eight plus net handlers. The purse
seine catch was normally loaded into an accompanying scow. Sails were not
commonly used as skiffs and scows were normally towed by a tug to fishing
areas when these were located any distance from their shore base. The
full potential of the purse seine would be realized only with mobility
provided by relatively large power boats which combined in a single unit
the functions of crew camp, scow, and tug.

Other mobile methods of net capture were used in different locales,
but these will be treated under regional headings in this study. Fixed
apparatus used on the coast included pound nets, weirs, traps, and fish-
wheels (Collins, 1892a:10). These capture methods were banned or limited
by law in many areas. Boats were required to tend such apparatus, but
these were generally a motley assortment of craft, not standardized in
noticeable fashion, nor properly classed as fishing boats, and so will be
ignored for the purposes of this study.

The proliferation of non-native methods of capture may be directly
linked to the introduction of the canning industry. The canning process
had been invented by Nicolas Appert as a way to feed Napoleon's troops in
1809 (McKervill, 1967:29). The canning of salmon also began in Europe
(Ralston, 1969:37-40):

Atlantic salmon were native to most rivers of northwest
Europe but by the nineteenth century had either been fished
out or shut out of their spawning grounds by man-made
alterations to the river environment. They survived only at
the edge of their former habitat in countries removed from the
main population densities, such as Norway, Scotland, and
Ireland. Canning as a means of transporting the fish to
market seems to have begun on a very small scale in Scotland
in the 1820s. By the 1840s it had moved to take advantage of
the larger opportunities across the Atlantic in New Brunswick
and Maine, which were also distant from the centres of
population, and which had larger, relatively unexploited
stocks of salmon.

The development of canning was decisive in the growth of
commercial fisheries in far-away western North America, the
very outward edge of European expansion. The distance of this
coast form large population centres ensured that canning would
be the dominant method of processing. Prior to its
introduction fishing was almost exclusively for the local fresh market, and attempts to export salted salmon in barrels had met with only limited success.

Before the series of gold rushes which began with the California rush of 1849, the Euro-American population base for fresh fish markets on the West Coast was insignificant. With the limited success of traditional salting methods, a parallel pioneering role to that of commercial fisherman in the northwestern Atlantic was not achieved by West Coast fishermen until the introduction of canning. Otters, seals, and whales had provided the first marketable ocean products taken off the Pacific Coast, but these had been procured by ships' crews based on distant shores. The people brought to the West Coast by the lure of gold provided the manpower needed to fill new positions as fishermen, cannery workers, and boat-builders.

Canning was a vital component in a new era of industrialized food processing and has generated much interest on the part of students of technology (Fig. 3). Oliver Evan's eighteenth-century flour mill and the "disassembly" lines of 19th-century midwestern meat packers are perhaps the most familiar subjects of this interest. But these latter processes developed more efficient systemic approaches by combining existing technologies. "Canning, however, broke with the past, introducing new food-processing technologies and entirely new food products to society" (O'Bannon, 1987:558).

It was a by-product of new industrial process which permitted the rolling out of very thin, uniform sheets of metal.

Canning is in many ways a particularly North American industry, having its greatest growth on this continent, perfecting its techniques here, and diffusing them to other countries. In yet another sense it is a particularly United States industry. Long before the first Tin Lizzie was ever conceived by Henry Ford, tins in their hundreds of millions were rolling out of canneries, using those methods of mechanization -- minute division of labour, repetitive operation, and line assembly -- that are usually considered the hallmark of United States industry (Ralston, 1969:38).

The chief market for salmon was also the product of industrialization; England was not only the largest consumer of canned salmon, but was also the leading industrial state least able to feed its large population. "Canning was only part of a general process by which such industrial states extended the area of the world from which they drew their food and raw materials" (Ralston, 1969:40).

In some places, the annual spawning runs lasted "as few as fifteen days, strictly limiting the length of both the fishing and canning seasons and forcing packers to produce their entire annual output within, at best, a period of three or four months. The shortness of the season placed a heavy emphasis on speed and efficiency in cannery operations, an emphasis
Figure 3. Salmon cannery near Astoria, Oregon (from Goode, 1887:Pl.169).

Further stressed by the unpredictability of the spawning runs" (O'Bannon, 1987:559). The distance of many canneries from major population centres with the consequent financial demands of plant setup and transportation further emphasized the premium placed on centralization of capital, a company structure oriented towards self-containment, and standardization of methods and equipment in the salmon canning industry.

It would be naturally expected that the standardized and assembly-line nature of salmon canning would spill over into the associated boat building industry. Indeed, "stock boats" were produced, and orders for large numbers of boats were filled with remarkable speed by small boat shops. Stock boats were built on both coasts, however, in the second half of the nineteenth century and the boat-builders’ customers were not always buyers from large fishing outfits. Furthermore, the gill-net boats built on the West Coast were of less standardized form than, for instance, the stock dories built for the Grand Banks fishery. The results will be explored further.

The first canneries had used only red spring salmon, relegating the pale, or white, springs to the salting barrels. Then, sockeyes joined the red springs as the only acceptable species for canning (Forester & Forester, 1975:30). Sockeye salmon, because of color and firmness of the
meat, fat content, and flavor, gradually came to be considered the species best suited for canning, and was particularly popular with British consumers. Almost the entire sockeye catch was canned (Tomasevich, 1943:228). The specialization of the canneries clearly affected species selection. Undesired species were not sought by the fishermen and if caught incidentally were either discarded, or used for fertilizer or dog food (hence the name "dog salmon"). In the early years of this century a combination of rising demand for canned salmon and a decrease in stocks gradually led to the increased utilization of other species in addition to sockeye and spring.

Other branches of the salmon fishery, those not involved in canning, paralleled or preceded this trend towards the capture of other species. In British Columbia, for example, the old method of salting salmon was continued. The market, however, was limited to the Orient, the fishermen were usually Japanese, and the target species were those such as the humpback and keta salmon which had been ignored by the big packers (Forester & Forester, 1975:19). Coho had also become a favorite of the developing fresh market fishery. But the most significant process to parallel canning was mild-curing.

Mild-curing was the process which created a product marketed most frequently as "lox." It demanded premium prices from primarily Jewish clientele in the eastern United States and Europe. The arrival of the railroad to the several fishing centres on the West Coast and the advent of refrigeration made production and shipment of mild-cure salmon practical. For a brief time prior to 1900 the fish for this mild-cure process were provided by gillnet, trap, and seine fishermen on the Columbia and Sacramento rivers (Pacific Fisherman Yearbook, 1915:82). However, the fish best suited for the mild-cure process were ocean-caught "feeder" salmon which possessed firmer flesh than those caught in rivers (Damron, 1975:34).

Feeder fish are best caught with a hook and line "trolled" behind a boat. There are several claimants to the first "invention" or "introduction" of trolling to the West Coast. However, the method was a traditional part of the Native fishing repertoire. Scandinavian fishermen had used spoon lures in the Atlantic, and Italian and Portuguese had trolled with baited hooks for tuna in the Mediterranean (Damron, 1975:43, 48). Chinese fishermen in southern California trolled for barracuda with abalone lures (Armentrout-Ma, 1981:148), though there is no evidence they sought salmon this way. Both bait and lures were used to troll for Pacific salmon in various locals. With the method becoming commercially viable, new fishing areas opened up and salmon were no longer sought only in the river reaches (Fig. 2). As trolling caught on around the turn of
the century in Monterey Bay and Fort Bragg in California, the Willamette River in Oregon, Puget Sound, British Columbia, and Southeast Alaska (Cobb, 1916:27), the mild-cure buyers "gradually became willing to pay a premium price for the high-quality troll-caught chinook" (Damron, 1975:35). The chinook or spring salmon, along with the silverside or coho, readily took the troller's hook; those fish not used by the mild-curers found their way to the fresh market where fish unscarred by net or gaff were welcome.

Fishing gear used by the early trollers was extremely simple, comprising only a single line with a weight and hook (sometimes two hooks) or lure attached to a leader. Rods and reels were not used, the line simply being secured to the fisherman's leg, or his oar, and hauled in hand over hand when a fish struck. This primitive way of trolling was often called "hand-lining", but should not be confused with hand-line fishing with multi-hooked trawl lines for ground fish.

Boats used for trolling were small, generally carrying only one man. Their catches were relatively light and landed daily. Easy rowing was an essential quality as the fisherman had to keep his boat moving constantly while his line was out so that his bait or lure exhibited the appropriate life-like characteristics. Seaworthiness was also very important as these little boats often traversed exposed shores working their lines close along treacherous reefs and bluff headlands.

The arrival of transcontinental railroads not only facilitated the emergence of the mild-curing process in the salmon fishery, it affected the nature of the canning industry. With rail lines offering an alternative to ships transporting the pack to market, canneries tended to centralize around railheads. The trend away from independently owned canneries was magnified as large companies based in transportation centres further benefitted from their concentration of capital. A reciprocal trend was greater reliance for outlying canneries on major centres for the supply of manpower and equipment, including boats. At the same time, rail lines made eastern materials more readily available on the West Coast. For example, eastern varieties of oak were now accessible to boatbuilders. Furthermore, complete boats manufactured in eastern shops, specifically dories and some skiffs (advertisements in Pacific Fisherman Yearbook, 1914-1917) were imported. The railroads also brought new waves of immigrants, who in their increasing numbers enhanced the need for local fresh fish markets and expanded the ranks of fishermen and shore workers.

The fishing industry, however, was by no means a melting pot for the diverse ethnic groups which entered it. Legislation often limited or banned the participation of some fishermen based on their race or nationality. As well as special laws for aboriginal peoples, restrictive
immigration laws were exercised in both Canada and the United States, but targeted different groups and varied in the timing of implementation and effects on fisheries. Cannery operators emphasized the industry's inherent divisions of labour by contracting work crews through "bosses" who hired workers from a common ethnic community to fulfill specific job requirements. Racially segregated unions only entrenched ethnic disparity. However, immigrant groups tended to select their own fishing techniques or other specializations as a group, even when their choices were not governed by external influences.

The ethnic divisions among fishermen were most apparent in larger population centres where substantial communities reinforced cultural traditions and developed a dependency of economic interests which were isolated from, and often rivals with, those of other ethnic groups. At sea, these inter-ethnic rivalries occasionally led to bloodshed. Distinctions in fishing methods and style of boat construction joined manner of dress and language as markers of cultural affiliation. These differences among fishermen were considerably lessened, but did not totally disappear, where fishermen from many ethnic backgrounds and regions of the West Coast travelled seasonally to fish distant grounds. Seasonal fishermen in the Bristol Bay fishery, for instance, all used gill nets set from near-identical company boats, yet it was still possible by observing boat-handling techniques and rigging details to tell an "Italian boat" from a "Swede boat" (see pages 250-251).

Ethnic homogeneity was not found on the cannery floor either. In Alaska, as elsewhere on the coast, most of the cannery work, cleaning, gutting and packing of the fish, was carried out by a Chinese crew. The Chinese were gradually replaced in this century with Mexican, South-east Asian, and local Native women labourers. The Native men of Alaska tended not enter the gill net fishery, but continued in the local tradition of fishing with traps. Eventually, Alaskan legislation reserved the trap fishery exclusively for Natives.

Drag seine use in British Columbia was largely limited to use by Natives based on their aboriginal rights up to the 1930s (Forester & Forester, 1975:11). In south-eastern Alaska and northern British Columbia First Nations fishermen were heavily involved in all branches of the inshore fisheries, though the majority seems to have become involved in inshore hand-line fishing both for salmon and groundfish. The Puget Sound reef net fishery became the one uniquely Native fishing method to be adopted by white fishermen (see page 179).

Maritimers from Nova Scotia and Maine first came to the North Pacific to pursue sealing and whaling, while pioneers of the halibut fishery came from New England. These three pursuits came to be dominated,
early in the twentieth century, by the Norwegians, who were barred in
British Columbia from entering the salmon gill net fishery. Even given
the choice, Scandinavians tended to lean towards the hook and line
fishing, i.e. trolling for salmon, in preference to working inshore with
nets. In southern British Columbia Natives and Japanese, for a time, were
among the principal groups of gill net fishermen, though Americans, the
English, Irish, Scandinavians and other Europeans eventually made
substantial inroads as gillnetters. Most Yugoslav fishermen were purse
seiners operating out of ports in southern B.C. or Puget Sound (Forester
& Forester, 1975:11).

Down the outside coast of Washington, and the coasts of Oregon and
northern California fishermen had ethnic roots in both northern and
southern Europe. As seasonal fishermen were replaced by residents the
dominant group became those fishermen hailing from northern Europe, most
notably Finns and Swedes, as the Greek-, Portuguese-, and particularly
Italian-speaking fishermen preferred to establish homes in central
California. Chinese and Japanese fishermen were kept out of the salmon
fisheries by legislation or by the intimidation of white fishermen, though
Japanese fishermen in the United States congregated farther south where
the abalone and tuna fisheries became their specialties. Native fishermen
were marginalized once the industry was established, though they continued
to fish for their own consumption on the rivers running through Reserve
land. Deepwater fisheries between San Francisco and the Strait of Juan de
Fuca were non-existent, and salmon completely dominated the inshore
fishery, along with relatively small oyster and sturgeon fisheries.

The San Francisco fresh fish market, the largest on the West Coast, came
to be entirely dominated by Italians, particularly the Genovese. Fish
species caught both in- and off-shore were presented for sale, of
which salmon represented only one of many species. In order to supply the
range of fish sought, the distinctive Italian boats carried a variety of
fishing gear types including traditional Italian nets, the lampara and the
paranzella, trawl lines, and gill nets. Sicilians gradually came to
squeeze Greek and Portuguese fishermen out of the Sacramento River fishery
where most of the salmon was caught in gill nets for canneries and mild-
curing plants. Sicilian and Genovese fisherman also became collectively
the dominant group fishing out of Monterey.

The largest rival fishing group to the Italians in San Francisco Bay
and Monterey was the Chinese. They fished from craft and with nets of the
Chinese tradition. Among the first non-Native fishermen to work on the
West Coast, the Chinese initially fished for all species. But under
pressure from white fishermen and legislation they were gradually limited
to fishing those species which were not then marketable domestically. These, notably shrimp, they exported to the Orient.

The first salt-curing establishments were run by traders, "Boston men", in territory open to New England trade, or the factors of Hudson's Bay Company outposts, who were usually of Scottish descent. The majority of their permanent employees were Native and French-Canadian. Early canny operators in the United States were most frequently from Maine. In British Columbia, they were usually from New Brunswick, or Scotland. These men brought with them fishing techniques as well as methods of processing.

Though boats were built almost everywhere, most came from shops near the four major fishing centres: San Francisco, Astoria, Seattle, and Vancouver. Boat-builders working within the Italian and Chinese traditions are invisible in the historic records. In many cases the fishermen built their own boats, or purchased their boats from other fishermen who had shown a knack for building. In the United States, most owners of the major boat building shops which built stock boats for canneries all over the coast had their roots in New England, Scandinavia, or Italy. It is uncertain how diverse the ethnic backgrounds of their employees were. In British Columbia, the first boat-builders were from Eastern Canada, or the Great Lakes region, but by 1914 most builders of fishboats were Japanese. Far from the major boat-building centres, in northern British Columbia and southeastern Alaska, Native craftsmen were prominent, not only building traditional canoes, but also boats built entirely in the Euro-American tradition.

The Chronology of a Frontier Fishery

Thirty percent of the pre-contact native population living north of Mexico were located along the Pacific Coast on less than six percent of the corresponding land area (Duff, 1969:39). Salmon provided the primary food-source for a series of complex pre-contact cultures with populations of great density. Native methods of capture were sophisticated; the explorer Dixon (1789) "observed that seven of his crew in a whaleboat fishing with handlines could not equal the catch made by two Indians with their native gear" (Bell, 1981:17). Yet, the Europeans and Americans who reconnoitered the coast, while impressed with the abundance of fish which they favourably compared to the Grand Banks, were slower to exploit the resource than they had been in the Atlantic.

The first Europeans to settle on the Pacific Coast of North America were the Spanish. Spain had claimed the Northwest Coast in the Treaty of Tordesillas in 1494, but only established themselves in what is the modern
state of California in 1769 with the founding of the San Diego Presidio. A year later the San Carlos Borromeo mission and Monterey Presidio mission were established. San Francisco Bay was not discovered until 1775. Of the established Spanish inhabitants in Alta California, Beechey observed that they "seem little regardful of the exhaustless stores of food contained in the waters of their shores," further suggesting that "fish are not much sought after in consequence of the productions of the land being so very abundant" (cited in Forbes, 1839:109). The missionaries actively opposed exploitation of the sea through their "Mission Routine" which sought to "civilize" First Nations people by suppressing traditional food gathering lifeways, including fishing and shellfish gathering, replacing them with European-style agriculture which bound the Natives to land and Mission (Engelhardt, 1934:65; Forbes, 1839:34). Secular Spanish and Mexican land-holders measured their wealth in terms of heads of European livestock; little interest was expressed in native wild species on land or in the water (Tibesar, 1977:153).

The Spanish attitudes are ironic because, before agriculture was fully established in newly settled areas, the Missions remained highly dependant on tenuous supply links with San Blas in New Spain. For example, in 1773, when a supply packet from San Blas bound for the mission at Monterey lost its rudder and was driven up the gulf, "the missions were nearly all starved, and the whole fathers, soldiers, and converts, were obliged to subsist chiefly on milk for eight months" (Forbes, 1839:69). In 1774 provisions became so scarce at San Carlos that a visiting Captain complained "that there had not been left even a small cake of chocolate to offer him for breakfast; and that all the food remaining consisted of milk and herbs without bread or anything else. On this account the neophytes were permitted to rove around the country for seeds or on the beach digging for shellfish or by fishing. The Arrival of the Santiago... relieved the distress, whereupon the Indians rejoined their Mission" (Engelhardt, 1934:42).

The irony of the Californios' attitudes deepens when one considers that Spain, more than any other colonizing nation in Europe, save Portugal, was a nation of fish-eaters; Spanish fishermen manned the explorers' ships and made the early trans-atlantic crossings possible; and fishermen even directed their own expeditions across the Atlantic in search of fish and whales (Tuck & Grenier, 1981). James Hornell, in his classic global survey of fishing methods, states that "wherever the Portuguese have gone, they have left a record of improvements made in the fishing methods of the coast people who came under their influence...." (Hornell, 1950:61). However, there is very little in the archaeological or ethnographic record indicating any Iberian influence on West Coast
fishing. Based on archaeological evidence of aboriginal fishing activity from the Santa Barbara and Monterey regions of California, the record reveals diversified native technology including hook and line, large baskets for catching sardines, fishing pots, and perhaps the use of nets (Landberg, 1975:146). Yet no clear change contemporaneous with European occupation is indicated. Metal is introduced for fish-hook manufacture, but its implementation appears to be more a native adaptation of scrap material than a manufacture of a new product under active Spanish guidance.

The pursuit of gold which had driven the Spanish in the southern parts of the continent would not be discovered in California until after their exit from the Pacific Coast stage. Its influence on immigration was dramatic but fitful. North of California, it was the two living resources, fish and fur, which had opened northern parts of the continent to exploration and settlement from the east, which opened it again from the west (Forester & Forester, 1975:16).

The Russians, who entered the Alaska region following Vitus Bering’s exploratory voyage of 1741, brought with them to North America an attitude quite different from that of the Spaniards. It was George Wilhelm Steller, the German botanist accompanying Bering, who properly classified the Pacific salmon species. Completely uninterested in agriculture, the Russian-American Company, under its aggressive field manager Alexander Baranov, was keenly interested in the native species on land and in the water, particularly if they were fur-bearing. For the collection of otter and seal pelts, Natives in the Russians’ employ were encouraged to continue their traditional hunting techniques. Their bidarks or kayaks became an integral part of the Russian fur-gathering system, and were carried by ship for use as far south as central California.

The Russian traders also fished for quantities of salmon at two locations at least, but little is known of their methods. They were dependent on salmon processed the Native way, which they called iukola (dried red salmon). They stored this fish in their warehouses as a winter source for food and trade. Almost none was exported (Golovin, 1862: 1979:82). The fisheries were mentioned in the Convention of 1825 settling the British/Russian border although neither party was actually fishing in the boundary area (Forester & Forester, 1975:16).

The salmon fishery in the first part of the nineteenth century is bound closely to the history of rival territorial expansion policies on the part of two new entrants on to the Pacific Coast, the United States

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3 Pacific salmon spawning in Siberian streams and rivers would not be fished commercially until 1910 (Pacific Fisherman Yearbook 1916:55-57).
and England. British trade in sea otter pelts beginning in 1785 and
continuing largely under the auspices of the Hudson’s Bay Company after
1821, benefitted from the navigations at sea by Cook and Vancouver, and
the overland expeditions by Mackenzie, Thompson and Fraser.

Lewis and Clark would blaze the Oregon Trail followed by many of the
first American settlers, but private Yankee traders pioneered American
trade by sea. Owing to embargoes and other difficulties in the European
market during the troubled years of the late eighteenth century, American
traders embarked on commercial ventures into the Pacific Ocean in search
of new markets. A few, such as Captain Edmund Fanning (1838), wrote
tracts encouraging the American government to offer more support for
Pacific ventures. These authors argued that an important facet of trade
with the Orient was exploitation of the North and South American
"Fisheries," which included the taking of seal and sea otter pelts, the
pearl fishery, and even exotic foodstuffs such as the pickled "seaworm,"
items which were among the few assured to fetch a good price in Canton and
other open Chinese ports. Well spiced with adventure as well as economic
argument, these books proved very popular in the early nineteenth century
and were read not only in the United States, but also in England and
France where some were also published. Though its potential market was
not always accurately appreciated, the abundance of fish in the Pacific
was consistently noted by the American authors.

By the early part of the nineteenth century, except for the war
years of 1812-14, the maritime fur trade in the region was dominated by
American ships sailing out of Boston. Doubtless, a number of the Yankee
shipmasters who visited the Coast in the late eighteenth century had
barrels of salmon salted down for the use of their crews on the return
voyage (Morison, 1927b:111). John Jacob Astor’s Pacific Fur Company
established a fishing station at Oak Point on the Columbia River in 1812,
but no fish were exported.

The North West Trading Company enjoyed a monopoly on the interior
fur trade of the New Caledonia and Columbia Districts until its
amalgamation with the Hudson’s Bay Company in 1821. Credited with putting
up cured salmon "soon after 1800" (Rathbun, 1899:253), the Montreal-based
company used the fish to fill trading post larders over the winters, as
British and American trading companies had done before in the East and
Mid-West (University of Wisconsin Sea Grant Institute, 1986:2):

Lake whitefish and lake trout were a regular part of the
diet of those manning the forts and trading posts. In its
heyday, [1784 to 1821] the North West Company...annually
harvested and packed 500 to 1,000 barrels of Lake Superior
fish to supply its far-flung outposts.

The first true commercial fishing on the Great Lakes
probably began in the early 1800s with [the]... American Fur
Company, which established fishing stations on Lake Superior. Most of the men fishing for the company were French or French-Indians, who, using gill nets and small boats, mainly harvested lake trout, whitefish and lake herring.

Until 1846, the United States and Britain shared jurisdiction over what is now the states of Washington and Oregon, though the Hudson's Bay Company enjoyed an effective monopoly over the Columbia River Valley from Fort George (Astoria), and, in 1827, established itself on the Fraser River at Fort Langley. Even more than its rival trading companies the Hudson's Bay Company "expected its posts to be as self-sufficient as possible, and it encouraged each responsible trader to develop the natural resources around his trading post or fort to accomplish this end" (Murray, 1986:29). Salmon were sought to feed Company employees, but they were also traded to the Natives, thereby encouraging them to spend more time trapping. George Simpson, governor of the company's Northern Department, recognized that the fish might be profitably be exported and made overtures to England, offering to provide barrels of salmon to a ship-captain in the employ of the Company, if a market could be found. Two years later his instructions to McLoughlin at Fort Vancouver on the Columbia contained a similar proposal with an offer to "...provide the necessary means in coopers, fishermen, nets, etc., to prosecute that branch of the business" (cited in Morison, 1927b:111-112). Doubtless, Archibald McDonald at Fort Langley on the Fraser River received identical instructions about the same time, for he reported in a letter dated in 1831 that he was "preparing 2 to 300 barrels to be at the salmon [fishing grounds] immediately at the commencement of the season." He further mentioned that a cooper was supposed to be on the way and that "in consequence of my Casks of last season losing all the pickle, the Dr. [McLoughlin] sent none of them to market but sent his own and kept ours for home consumption" (McDonald, 1831) 1907:258).

The problem of poor "pickles" plagued the early shipments. Attempts to establish a foothold in the sophisticated markets of New England and Europe, were largely unsuccessful as a consequence. It seems that, in addition to a shortage of barrels and coopers, and some inexperience on the part of the company employees, the chief difficulty was the scarcity and expense of salt. Short brining times, and insufficient salt contributed to early poor quality. Inexpensive salt would later come from southern California, but as late as 1852 it was still scarce, as it was said an ounce of salt brought an ounce of gold at the mining camp at Jacksonville, Oregon (Spurlock, 1940:111).

Despite the spoilage, 180-pound (82 kg) barrels of salmon packed by the Hudson's Bay Company became a regular trade item throughout the Pacific Basin, with destinations including California, Russian America,
China, Australia, and, most importantly, the Sandwich Islands, where they retailed at ten to twelve dollars each. By 1846, furs had declined to less than half the value of exports from the Pacific posts of the Hudson's Bay Company, with fish along with lumber making up the remainder (Spurlock, 1940:104). The bellicose "54-40 or fight" slogan of the new American settlers on the Columbia was put to rest by the treaty 1846, as the Hudson Bay Company was forced to retire to the Fraser River. There, fish would keep Fort Langley, the first real settlement west of the Canadian Rockies, alive after its usefulness as a fur trading station had declined. The export market for cured salmon in the Pacific remained stable, if not highly lucrative, while the daily rations at the fort were four fish per man, and the annual consumption about 25,000 fish (McKervill, 1967:21).

Salmon for export by the Hudson's Bay Company and the other short-lived endeavours of rival trading organizations was supplied almost entirely by Natives fishing with their traditional methods and equipment. Only when the Native population had virtually disappeared under the onslaught of disease did non-Natives regularly begin to catch fish for themselves. The curing of salmon on the Columbia continued after the departure of the Hudson's Bay Company in the form of small-scale operations run by American settlers, supplied in part by Native fishermen. However, most details of these operations, statistics of export and local consumption, etc., of this important transitional phase in the fishery have eluded documentation.

Great changes were in store for the West Coast, the result of a series of gold rushes, beginning most dramatically with the discovery of gold at Sutter's Fort, on the Sacramento River in 1849. The California gold rush cost Oregon the leadership of the American West (Spurlock, 1940:112):

Until then the center of interest, population, and enterprise had been in the Willamette and Columbia River valleys. Though more than half its men were lured to the California gold fields in the initial rush, Oregon was again on the increase as to population and industry almost immediately. Farm produce brought fabulous prices in California. Lumber mills hummed along the Columbia and the profits induced expansion to Puget Sound where coal deposits also supplied the California demand. From sound and river ships sped southward deeply laden and then made the long, hard beat back against the nor'wester. Shortly after a decade had passed a railroad crept across the prairies. While men in high places talked of destiny, Americans, out of pain and bloodshed, in pioneering, conquest, and Civil War had brought an utter change in the economy of the Pacific coast.

San Francisco had become a city overnight, and with that status came the capability of sustaining a fresh fish market. The need for fishermen was filled by those disillusioned with, or barred from the gold fields.
Among the first groups to replace the shovel and pan with the oar and net were the Chinese and Italians. But other fishermen from the East Coast of North America and Europe also tried their hands, whether they had had experience in their homeland or not.

In 1858, gold fever struck again, this time on the Fraser River. On April 25, of that year, 450 Californian miners arrived in Victoria on the Commodore, and before year end 25,000 men from around the globe had sailed into the last preserve of the Hudson’s Bay Company on the West Coast (McKervill, 1967:26). Again, gold changed the character of the country. The Company’s charter was revoked and two Crown Colonies established in 1858. While the flood of humanity soon eased, the population pools on the Fraser River, Vancouver Island, and Puget Sound remained, farming expanded, and trade "bristled" (McKervill, 1967:27).

Through brief interruptions and changes of ownership, salteries on the Sacramento, Columbia and Fraser Rivers, Puget Sound, and later, points farther north, continued their humble, poorly documented operations. Salt had become much cheaper and more readily available, and the packs of better quality, but profits were apparently still marginal. A different technique of preserving salmon would be required to market the fish abroad in the last half of the nineteenth century. Canning was a process already used for packing fish on the East Coast. The 1860s saw its introduction in California to preserve fruit. It is a little surprising it was not used for Pacific Salmon sooner than it was.

As early as 1861, salmon was canned experimentally on Vancouver Island (Forbes, 1862:55). More experiments followed after 1867 on the Fraser River, but canning would only become definitely established on that river in 1870, after William Hume, often identified as the "father" of Pacific salmon canning, established his first canning operation on the Sacramento River.

Hume had a strong pedigree as a salmon fisherman. In the spring of 1852, he had arrived in California with "the net he had made back in his home town of Augusta, Maine, where he and his father had fished the Kennebec River" (McKervill, 1967:28). His family had lived there since 1780, and for generations before that his Scot ancestors had fished for salmon on the Tweed and Tay. The waters of the Sacramento, teeming with 10 to 40 pound (4.5 - 18 kg) chinook, were a source of amazement to Hume: Salmon sold for over one dollar a pound in Maine, where "at this time, ...the catching of a salmon...on the Kennebec River was of rare occurrence, usually the catch for a season being three or four, and a half dozen being a large take for the year" (Hume, 1893) 1975:15). Hume returned home with his stories and persuaded his brother, George, and Andrew Hapgood, a childhood friend who had trained as a tinsmith and
worked briefly canning salmon in New Brunswick, to join him in California. In 1864, the three men packed 2,000 cases of Sacramento River salmon. The Humes fished and cleaned their catch while Hapgood put the catch in tins cut and soldered entirely by hand. Half of their tins burst. Their product sold poorly and they were ready to quit when a San Francisco merchant advanced them money for their next year's catch. With less spoilage, they repeated their first season's pack on the Sacramento, but for the 1866 season, Hapgood, Hume and Company moved to Eagle Cliff, Washington Territory, on the Columbia River 40 miles above Astoria, where they doubled their pack. Though the Humes tried to keep the success of the operation quiet, a new rush had begun. By 1880, over half a million cases were packed on the Columbia by 29 canneries, and the product was finding eager buyers in the eastern United States, England, and Europe. "Salmon canneries spread in about twenty years from the southern limit of salmon habitat... to the northern limits in Alaska, leapfrogging in a frenzy of development from the Sacramento to the Columbia, from the Fraser to the Skeena, and finally to the rich salmon streams in Bristol Bay, Alaska" (Ralston, 1969:40). In twenty years the Columbia River fishery had already begun its decline from over-fishing.

A northward march was necessary for the voracious canneries to maintain their raw material supply. An awareness seemed to flicker of among the canners in 1877 that the resources of the big salmon rivers of the south were finite. That year marked opening of the first canneries along the Oregon Coast, and on Puget Sound, while the Canadian industry leapt to the Skeena River (Cobb, 1917:471; Spurlock, 1940:127). It was also the year that coho were first canned (Cobb, 1917:424). A cannery was built on the outer coast of Washington in 1878, while Alaskan salmon were canned in the southeastern region of that territory for the first time. Within ten years the industry had been pushed as far as the Aleutians and the sixteen canneries operating in 1888 in Alaska produced a pack approximating that of the coastal states combined (Spurlock, 1940:114). The industry's greatest period of growth in both the United States and in British Columbia began after 1883, but after 1888, the upward trend in the Alaska pack was in direct contrast to the downward trend on the Columbia River and the Oregon and Washington coastal streams. Somewhat more restrictive regulations for conservation in British Columbia slowed the impact of over-fishing, but the Fraser River pack sharply declined after 1913 for a variety of reasons.

Spoilage marked by "exploding" cans remained a worry for early canneries. "One man lost a pack of ten thousand cases by spoilage and he built a big fire and burned the whole lot to recover the solder he had put into it. On the other hand certain cans of salmon were kept for fifty
years and found to be in good condition" (Crandall, 1946:28-29). Giant steam retorts and increasingly mechanized canning lines improved quality control, but the principles employed by the early canners are still used with the help of modern equipment.

With the application of technology in fishing and transportation, as well as in cannery operations, "the industry soon became characterized as a mass-production industry displaying a great degree of organizational and financial concentration" (Tomasevich, 1943:226). Considerable financial depth was required just to get the product to market; before the Panama Canal opened in 1914, square-rigged ships took up to five months to deliver the pack to England, while another two months or more might pass before the lot was sold and the packing company received its payment (McKervill, 1967:37). In addition to the pressure of working remote fishing grounds with short seasons, confrontation with organized fishermen further propelled the trend towards the concentration of capital.

The Italian Fishermen's Benevolent Society of San Francisco, formed in 1852, was the first labour organization of any sort on the West Coast. But the fisherman's earnings through the 1850s and 1860s seem to have been relatively good. The depression years of the 1870s struck the frontier economy of the West Coast with particular severity. Adding to the crisis in California were dwindling returns from the gold mines, drought in the countryside, and burdensome public debt in the urban centres. The completion of the first transcontinental railroads, instead of bringing the expected prosperity worsened the situation; laid off construction crews numbered 10,000 counting the Chinese alone, while the trains brought hordes of new immigrants, along with cheap goods from the east which led to oversupplied markets, falling prices, and the bankruptcy of many West Coast merchants and manufacturers. The unemployment and reduced wages which followed led to a great deal of unrest, too often expressed in race riots against the Chinese, but it also signalled the beginning of organization among workers in industries such as salmon canning which flourished through Atherton's "Terrible Seventies" (Staniford, 1975:249). Prosperity seemed to return in the 1880s, but the "good times,... were deceptive. The plutocrats fared well, but merchant, farmer, and labor groups continued to struggle with limited success for a fair stake in the industrial order" (Staniford, 1975:253). As labour organization among fishermen became more effective the Canners followed the leads of Rockefeller in oil and Carnegie in steel, where corporations were consolidated into monolithic trusts which contributed to immense industrial production, expanded markets, and a controlled labour force.
The grim depression of the mid nineties did not upset the continued trend towards industrial concentration, although labour's position was weakened by increased unemployment and poverty (Staniford, 1975:254-255).

Salmon canning companies formed a series of associations beginning with the Alaska Packers Association in 1892, followed by the Columbia River Packers Association (1897), and the British Columbia Packers Association (1902), which "gave the processors greater control over the demands of the gillnetters" (Smith, 1976:58). Although the associations would later fracture under the pressures of anti-trust legislation, and a desire for more independence among association members, they represent the trend though the last days of oar and sail in southern areas where canneries became fewer, larger, and more efficient. With the disappearance of independent operators the buying practices of the associations led to larger bulk orders of supplies and equipment from fewer suppliers, whether they offered canning machinery, sheet tin, solder, nets, or boats.

Few gill-net fishermen owned their own boats prior to the introduction of boats powered by gas engines in the first decade of the twentieth century. What followed was a profound change in labour relations in the canning industry as fishermen no longer rented their boats and nets from the canneries but became semi-independent operators of boats they purchased directly from the boat-builder. Away from the urban centres of the south, this change was slow in coming, as the lack of resident fishermen, the canneries' desire not to replace cheap labour with expensive motors, and government regulations apparently aimed at conservation, combined to keep sailboats in use. They served the canneries on some northern rivers of British Columbia through the 1930s, and on Bristol Bay until 1951.

By 1914, the 200 plants scattered along the Pacific rim produced over 6.6 million cases from canning lines which were almost wholly mechanized (O'Bannon, 1987;560). Salmon was one of the most important products of American canneries, the nation's fifth most valuable canned foodstuff. Two thirds of the production came from the territory of Alaska where "...the fisheries...exceed in value its gold production, while in the state of Washington the fisheries are exceeded in importance only by the lumber industry" (Cobb, 1916:19). By 1930, the Pacific salmon fishery would exceed in value all others on the globe except herring and oysters (Freeman, 1935:109). The total pack for the West Coast would peak in 1936, owing to the tremendous Alaskan pack that year (Smith, 1976;56) which alone accounted for over eight million cases, taken in large part by sailing gillnetters.
The production figures from the mild-cure fishery, which developed following the general introduction of refrigerator rail cars in the 1890s, were not nearly so high as those of the canners. Though mild-curing plants were often operated as adjuncts to major canneries, many independent companies were able to resist the trends of amalgamation. Even more independent than the mild-curers were the troller fishermen who supplied them. They fished alone in boats built by, or for, them. It was with powerboats that the trolls became as numerous as the gillnetters in many areas of the Pacific Coast, but their rowboats continued in use through the depression years of the 1930s in southern British Columbia, and longer farther north.
CHAPTER III

Salmon Fishing Boats and Fishermen by Region

California

Mexican rule over thinly-populated Alta California was effectively challenged through the 1840s by the ever-increasing immigration of American and British settlers inspired by the literature produced by those who had come earlier by ship in search of whales, otters, and hides. With the near-simultaneous Gold Rush and the end of Mexican rule halfway through the nineteenth century, California's economy was transformed from a quiet, marginal one based on cattle, to a vibrant resource-oriented one which relied heavily on maritime ventures. Lumber schooners braved the Mendocino Coast, while sealers ranged the coast to Alaska. Within fifteen years San Francisco had replaced New England as the centre for the American whaling fleet. Almost overnight, San Francisco became a major port city, boasting a fresh fish market which would remain throughout the century larger than all the other fish markets of the Pacific Coast combined. The varied craft supplying the market impressed eastern observers: "They are of divers patterns, and the predominating types come from the central seats of antipodal civilizations" (Jordan, 1887:592). "...Chinese junks mingled with lateen-rigged Italian boats and New England whaleboats. Nowhere else in the United States, and possibly the world, has a fishing industry ever been so ethnically diverse" (McEvoy, 1986:68).

The disparity of fishing boat types reflected real divisions among the fishermen as each ethnic group operated "in near isolation from others, each with its own economic organization, methods and markets" (McEvoy, 1986:66).

Along with the fishermen came immigrant boat builders. Trained in New England, the British Isles, Scandinavia, the Mediterranean, or China, they had to temper their traditional skills and techniques to the species of wood they found available to them (Shaw, n.d.:2-3):

California produced very little good ship-building timber, except in the extreme northern portion around Eureka and Crescent City. All of our timber came from there, or from Oregon and Washington, where the Douglas Fir grows. Now Douglas Fir (Oregon Pine) is a splendid timber for planking. It is tough, it seasons very quickly (the old shipbuilders used to claim that they could frame a vessel, and before she was planked, the frame was seasoned), the torpedo does not particularly care for it -- he will leave a pine vessel every time for an oak one -- and it comes in very long lengths. We have no compass timber. Our Oak is not even good firewood, and the eucalyptus is the same. Redwood is too soft. It does not hold fastenings well, but it does not rot easily, and is somewhat fire resistant. Like Douglas Fir it also comes in very long lengths, and used to be cut in very great widths....
Our spruces and cedars were also very straight. Consequently we had no framing timber.

Most fishing boats built in California were not purpose-built to catch salmon as this species, relative to other commercially viable fish, has always been much less significant in the California fishery than in regions to the north. But the first salmon cannery on the Pacific Coast was built on the Sacramento River, the prototype for the type of salmon boat most extensively used on the West Coast originated on the same river, and San Francisco remained a financial, transhipment, and boat-building centre for early cannery operations in Oregon, and then in Alaska. One of the world’s last fleets of sailing ships was the "Star" line of the Alaska Packers, and every spring until 1929 the tall-masted ships of this fleet passed through the Golden Gate as they carried to Arctic waters cannery equipment, supplies, fishermen, and boats made in San Francisco (MacMullen, 1961). The last survivors of the "Stars," the Star of India (Euterpe), and the Star of Alaska (now renamed Balclutha) are currently centre-pieces at the Maritime Museum of San Diego, and the National Maritime Museum at San Francisco, respectively.

Despite California’s burgeoning population, a frontier environment remained a salient characteristic of the state’s market economy, and this pattern of capital management became a blueprint for the salmon canning industry throughout the coast and well into the next century (Staniford, 1975:179):

The mainstay was the large class of entrepreneurs, a heterogeneous lot of small and big operators who spear-headed the state’s economic development. If they could not carry on individually or with partners, they formed cooperatives and corporations to pool their money and efforts. If they could not afford Caucasian labor, they sought cheap alien labor, devised improved processes and invented machines to do the work, they organized into various types of associations to coordinate their efforts, to regulate operations..., to promote the production and distribution of their goods (trade associations), or to protect their group interests.... The merchant financiers, joined by rising manufacturers,... made greater use of the corporate device which enabled them to conduct large-scale operations for greater profits -- bigger size meant lower costs, and lower costs meant bigger profits. All of them pressed for public policies and for government assistance which would benefit their enterprises. Although they often professed sentiments of rugged individualism and free enterprise, they did not hesitate to impose group control and seek government aid.

In the face of an industrial assault consisting of urban pollution in the Bay area, destruction of spawning grounds due to hydraulic mining in the interior, and over-fishing in the estuary, the fish stocks of the Sacramento River, the largest salmon river in California, were already in decline by the time the first cannery was built. The river made a brief recovery, probably due to reduced mining activity by the 1880s, and
200,000 cases were produced in 1882. However, after 1900, only a few thousand cases per year were packed (Freeman, 1935:112), and, in 1920, the canning of Sacramento salmon was permanently abandoned (Gregory & Barnes, 1939:70). The coastal rivers of Northern California provided small catches of spawning salmon, and, with the turn of the century, a trolling fishery was being established from various sites on the California coast, most notably Monterey.

Spanish Colonial and Mexican Republican Periods

Throughout the Spanish Colonial and Mexican Republican periods in California there was nothing resembling an over-exploitation of maritime resources, or even more than a passing interest in localized maritime endeavour. While the navy continued its logistical role, supplying the missions by sea, the vessels were built in New Spain, or Mexico, and the ship's boats seemed to restrict their duties to lightering from the ships. A glance at the personnel of the modern Mexican Navy reveals that no less than 90 percent of the names are Castillian (Del Castillo, 1974:xvii); by all accounts this ancestral bias among naval officers and men continues a tradition established in the colonial period, and is significant in that sailors with ancestral roots in the Spanish provinces where fishing and small boat building and handling were important to significant portions of the population (ie Asturias, Galicia, or Catalonia) are conspicuous by their absence. When sailors settled in Alta California, their ambitions were shared with other Hispanic settlers of the region in that owning large herds of cattle was far more desirable than harvesting the sea. References to boat-building in Alta California are almost non-existent. It is known that in 1771 at Mission San Carlos soldiers built a "canoe." But this craft was probably a flat boat, intended to carry salt from the salt pits and poles for corrals (Engelhardt, 1922:36).

The first Spaniard to explore the habitat of the Pacific salmon, Sebastian Vizcaino, anchored in and named Monterey Bay in 1602. Don Gaspar de Portola, travelled north by land 167 years later, but, with a landsman's eye, marched past without recognizing Vizcaino's bay. The best harbour on the Pacific Coast, San Francisco Bay, would also be missed by land expeditions following easily traversed interior valleys, and would not be reconnoitered until 1775. For this purpose, Lieutenant Juan Batista de Ayala landed first near the Carmel River where his men made a cayuco, or dugout, from the trunk of a redwood taken from the river bank. On August 2, the dugout was launched from Ayala's San Carlos, to precede the ship into the uncharted waters through the Golden Gate. Its mission accomplished, the first boat built by Europeans in northern California was abandoned a scant three days after its launch (Jernegan, 1977:1).
The next year, Juan Batista Anza "provides the earliest discovered mention of [Pacific] salmon within the territory now included in the [lower 48 states]. While leading an expedition from Sonora to San Francisco he recorded in his diary during March, 1776, that the Carmel River... abounded with salmon" (cited in Coman, 1912:130).

Evidently, little energy was expended in Spanish boat-building or fishing following Anza's observation or the short-lived voyages of the cayuca. Visitors to California consistently note the lack of small craft, or indeed any other product of initiative expended on anything but agriculture and livestock. Captain Vancouver observed that "...if we except its natural pastures, the flocks of sheep, and herds of cattle, there is not an object to indicate the most remote connection with any European or other civilized nation" (cited in Watkins & Olmsted, 1976:13). Twenty-five years later, Russian visitors did not note significant change. In 1807-8, Langsdorff, in the company of Rezanov, had been amazed that there was not even a launch at San Francisco (Langsdorff, 1814:122):

Owing to the lack of small vessels and boats in the Puerto de San Francisco, the Spaniards are entirely shut off from direct intercourse with the opposite and northern shore of the bay, though it is hardly more than an Italian mile distant. This precludes their having any intercourse [by water] with the more northerly tribes of Indians in the neighborhood of Puerto de la Bodega. Hence communication by land in the Spanish-American colonies far exceeds what any one would suppose.

Part of the problem was a lack of suitable boat-building materials. Only when the mission settlements moved north into central California were adequate stands of timber (albeit of unfamiliar species) found near the water, and metal fastenings remained expensive and difficult to acquire. Good quality rope was scarce even in long-settled areas of Mexico: "...the San Blas naval base had been forced to the expedient of using pita, a fibre of the agave plant. But cables made from pita lasted only one voyage and once discarded had no other utility; whereas hemp cables would serve from three to four years and afterwards could be used as oakum for caulking" (Huff, 1938:72). Efforts to grow hemp in California began as early as 1785, but poor quality persisted until late in the first half of the nineteenth century when good hemp was produced in Southern California (Huff, 1938:73).

Native craft, employing only locally available materials, were apparently little used by Spaniards for transportation, and not at all for fishing. The fisheries were ignored to such a degree that a special Papal dispensation had been requested by the Californian missions allowing them to eat meat on Fridays (Langsdorff, 1814:51). The lack of settlers skilled in boat building was illustrated in 1816 by the need for the Commandant at San Francisco, wishing to repair and enlarge the presidio
buildings, to hire "an Englishman build and rig a small boat or launch with which to bring the necessary timbers from across the bay. The Spanish soldiers did not care to risk their lives in the native boats...." (Wyllie, 1917:60). Mexican independence, followed by secularization of Californian mission lands in 1834, caused little change in this respect. American and British settlers, arriving in California in the 1840s, had an opportunity to observe California, its inhabitants, and resources more closely (Garner, 1846) 1970:100):

The whole coast of California abounds in most exquisite fish, of many kinds, but although a small codfish, of which there are plenty all over the coast, sells for a dollar, still a meal of fish is very rare on shore; for no other reason but because no person will take the trouble to catch them, and I have known in time of lent, a small boat to go out fishing, and one hour after its return the owner of it has sold twenty to thirty dollars worth of fish, and this after about seven hours' fishing.

By 1870, settlement patterns reveal that remaining Hispanic communities had succumbed to pressure which pushed them off the coastal plains. For instance, in the Pajaro Valley, only a few secluded spots among hills were occupied by Mexican farmers hard-pressed on poor land, none closer to Monterey than about 80 miles (128 km) (Gordon, 1979:63). The first scientific studies of ethnicity in the commercial fisheries in the 1880s show an almost complete absence of professional fishermen of Spanish or Mexican descent (Goode & Collins, 1887:34):

...the 'Californians,' men, for the most part, of mixed Spanish and Indian blood, fished and still fish only with hook and line. To the present day they compose the larger portion of those who sit on the wharves in the sun catching sculpins, but they own no boats and are not truly fishermen.

There are at present not more than twenty Spaniards on the Pacific coast who can properly be termed fishermen.

**Californian Natives**

Aboriginal groups built no less than six distinct types of water craft in the Californian portion of the salmon habitat. In San Francisco Bay, bulrushes collected from the tule marshes were bundled to make small boats, while to the south the Chumash created canoes with split planks, ingeniously sewn together. In the north, the Tolowa and Yurok groups made large ocean-going dugouts from redwood trees (*Sequoia sempervirens*), while inshore travel was undertaken by these and other groups with two variations of smaller redwood river canoes, log rafts, and large baskets (Jobson & Hildebrandt, 1980:165).

There is no evidence of any Native craftsmen adopting European techniques of boat construction in Spanish or Mexican California. However, there is an interesting case of technical adaptation with the Chumash group using their sewing expertise to imitate the skin bidarkas
used by the Aleut hunters brought to California by Russian fur hunters. Though this development is an aside to this study, it is useful as it demonstrates, given the plentiful and inexpensive availability of hides in Spanish California and a scarcity of metal fittings, the Natives’ willingness and facility for sensible maritime adaptation, which might have been applied to Spanish techniques had there been models present to imitate, materials available, or efforts made at instruction.

The 'Mission Routine' and forced agricultural labour, added to the

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4 The 'Mission Routine' was a formalized set of instructions established by the Augustinian Mother College in Mexico, which required, as a priority of the missionaries' duties, the suppression of traditional hunting and gathering lifeways on the part of the indigenous peoples (i.e. fishing for coastal groups) so that the neophytes would be bound to the missions for food (Engelhardt, 1934:65). Seemingly excepted from restraints of the Mission Routine with respect to boat building and fishing were the Chumash in the vicinity of Mission Santa Barbara (Hudson, 1976:9-10). Ironically, their sewn canoes played an important role in the
devastation of disease and rapid American settlement of the coast to effectively remove the coastal Native groups from the fisheries. The smallpox epidemic of the late 1830s, for example, just one of several to sweep through the Native villages in the nineteenth century, took one-half of the already severely reduced population. The Costanoan population, around Monterey, virtually disappeared during the first decades of American settlement (Gordon, 1979:62), while groups farther north quickly followed. A handful of Native fishermen were still fishing the Sacramento River following statehood, but there is no evidence that they used boats (Fig. 4). By the time the first salmon canneries became established in the 1860s the Californian Native population had been reduced from 275,000 at the time of Mexican Independence to a mere 35,000 (Lamar, 1983:300).

By the early 1880s, Fish Commission officials could state categorically that, "There are at present no Indian fishermen employed on the coast of California" (Goode & Collins, 1887:43). However, following the construction in 1888 of a cannery on the Klamath River, the most northern Californian salmon stream of significance, Native fishermen reappear in the records of the California commercial fishery. Into the twentieth century they remained the most numerous fishermen on this river. Small gill nets were set from canoes which worked the river where it began to narrow some distance from its mouth (Collins, 1892a:174-175; Wilcox, 1898:639). Indigenous gill-nets, once strung between two boats (Newes, 1947:84), seem to have been replaced in this commercial fishery by small, but conventional, drift gill nets (see page 104).

Americans in Mexican California

In 1880, it is also noted that, "The number of Americans engaged in fishing on the coast of California is exceedingly limited.... The fishing of Americans has been, for the most part, confined to seal hunting, shark fishing, whale fishing, trolling in the barracuda season..." (Goode & Collins, 1887:29). The relative absence of Americans in the California salmon fishery by the last quarter of the century is ironic given the importance of the Rumes' pioneer cannery work on the banks of the Sacramento, and also given that many of the Americans who first settled in a California ruled by Mexico were brought there by the promise of rich fisheries best represented by the phenomenal salmon runs.

The unexploited wealth of the sea observed by seasoned sailors from Boston, so great that "no family need fear starvation owing to the abundant fish," (Garner, (1846) 1970:135) represented an important feature

Revolt of 1824, no doubt entrenching the merits of the Mission Routine for Mexican authorities (Hudson, 1976).
in California’s portrait as a “land of opportunity.” The huge salmon runs were specifically noted by the Wilkes Expedition: “The salmon fishery, if attended to, would be a source of considerable profit yet I was told that the Californians never seemed disposed to attempt to take them” (Wilkes, 1845, 4:159).

Non-Hispanic settlers began to cluster in the 1840s around pioneering characters of entrepreneurial bent such as Captain Sutter at New Helvetia, or Sutter’s Fort, on the Sacramento, Jacob Lease and Nathan Spear at Yerba Buena (San Francisco) (Watkins & Olmsted, 1976:9), and Philip Larkin at Monterey. These were commercially astute gentlemen who had set up trading operations, stores, and mills; it is natural they would turn also to commercial fishing possibilities (Davis, 1967:123):

When Captain Sutter had settled at Fort New Helvetia he was in the habit, at times, of sending fresh salmon to Yerba Buena. The fish were fresh, salted or smoked. Nathan Spear, who was an epicure, and lover of good things, appreciated these fish very highly. The idea suggested itself to his mind that something profitable might be done in salmon fishing on the Sacramento River. Not wishing to trespass upon Captain Sutter’s ground, although, of course, Sutter had no exclusive right to fish in the river, Spear wrote to mention the subject and received encouragement to go up and engage in fishing there for salmon. He made several trips in 1840 and 1841 in the schooner Isabella, camping on the bank of the Sacramento in a comfortable tent, and superintended the catching of the fish by the crew of his schooner and by Indians experienced in fishing, furnished by Captain Sutter. He took large quantities of salmon, filling the hold of the Isabella with fish packed in bulk, transported them to Yerba Buena, and disposed of them at satisfactory prices, packed in barrels and kegs of different sizes, to visiting vessels and to residents, making a good profit.

To Nathan Spear, therefore, is due the credit of having inaugurated the salmon fishery on this coast as a business, and of developing, to a considerable extent, an enterprise which has since grown to large proportions.

Mr. Davis may be forgiven his enthusiasm, the American and British trading companies in New Caledonia were the first to commercially enter the Pacific salmon fishery, but Spear was the first in California. He appears to have gone no further afield with his product, however, for in his twenty-nine extant letters addressed to the principal American trader and future first governor of California, Philip Larkin, there is no mention of his salmon enterprise (Hammond, 1951). Of his method of fishing, we know nothing. The Isabella appears to have been a conventional small trading sloop or schooner, but whether smaller boats accompanied it to handle nets, or what nets or other apparatus were used by the Natives is uncertain.

Over the winter of 1848/49, a company had been organized to more vigorously prosecute the Sacramento fishery with seine nets, but with the
discovery of gold that spring at Sutter’s Fort the fishermen disappeared (McEvoy, 1986:70).

It is an obvious understatement to say that the Gold Rush transformed California. In addition to contributing to a change in government and converting San Francisco from a 400 person hamlet to a booming port city with a population of 36,000 according to the 1852 census (Pastorn, 1990:8), the economy was turned upside down. The thousands of cattle roaming around the countryside in Alta California had not been the sign of prosperity they may have seemed: "...even under the more economically enlightened Mexican regime after 1821 a cow was nothing but a two-dollar hide and maybe a dollar’s worth of tallow, and worth that only because Yankee traders could smell a dollar 18,000 sea miles from home" (Watkins & Olmsted, 1976:13). The incentive for fishing, save for variety’s sake, must have been low in the Bay area where Langsdorff calculated that, "One fat bullock was sufficient to maintain the entire crew for three days, and it cost only four Spanish dollars. It was found much cheaper to feed sailors with meat than with vegetables or pulco" (Langsdorff, 1814:132). However, in 1849, cattle would be worth in San Francisco up to $500 per head, reflecting the unreal markets of the Gold Rush. Fortunes were made as the vast herds disappeared into the slaughter-houses, but skyrocketing food prices meant that small fortunes were waiting for fishermen as well (Muscatine, 1975:224).

The Boats of Chinese fishermen

Few of the tens of thousands who descended on California in 1849 and the following few years were thinking of taking up fishing. The Chinese were no exception; they rode across the Pacific on the Kuroshio Current (Wei-Lu, or "Ultimate Drain," to Chinese geographers), in the holds of western ships, or occasionally in their own junks, to find the "Golden Mountain." But the Chinese prospectors were unable to hold quality stakes in the face of unofficial and official (eg the Foreign Miners Tax of 1854) racism. Some Asians adapted to this racially hostile environment by working secondhand claims, or by taking up positions scorned by white workers, such as cooks or laundrymen in the mining camps. Others took work building railroads or in agriculture. Jobs available for Chinese workers were always at the bottom of the pay scale, and were frequently dangerous. "They literally defined the limits of what were white men’s work and white men’s wages. When this margin blurred, white workers time and again resorted to force to redefine it" (McEvoy, 1977:151).

One area where Chinese could work, for a time, without competitive conflict with caucasians was in the fisheries. Most Chinese in California hailed from the coastal province of Kwangtung, particularly Chungsan and
Sze Yup people of the districts which form the southern banks of the Pearl River Estuary below Canton and the coast immediately southward (Chin, 1969:4). An undetermined number were Tanka, or "boat people," a people with a distinct dialect of uncertain origin who have lived on boats in South China as long as records have been kept (Lydon, 1985:30). Consequently, many Chinese immigrants had extensive exposure to boat handling, boat-building and fishing prior to their departure from China, and it is not surprising that disillusioned Chinese miners were among the first non-Native fishermen of the Pacific Coast. It is uncertain when or where the first Chinese net was hauled, but it was probably in San Francisco Bay where a fishing village was established sometime between 1850 and 1852 (Armentrout-Ma, 1981:142). In the early 1850s fishing colonies were established at Monterey (Lydon, 1985:25), a colony was set up in Humboldt Bay before 1857 (Chin, 1969:37), and at least by 1864 (Armentrout-Ma, 1981:145) Chinese fishermen were working in the Sacramento and San Joaquin rivers.

In the 1870s their ranks were swelled when completion of the transcontinental and then various California railroads released thousands more. By the 1880s, there were reported to be almost thirty Chinese fishing villages on San Francisco Bay stretching from San Jose in the south to Marin and Contra Costa counties in the north. The number of Chinese fishermen on the bay was by this time well over 1,000, and possibly as high as 3,000-4,000 during the season (Armentrout-Ma, 1981:143).

Despite increasingly restrictive legislation which followed them into the fishery, "as late as 1893, fully one third of all the fishermen in California were Chinese" (McEvoy, 1977:153). Chinese fishermen were not particularly interested in fishing salmon for their own use or for export to China, but their "bag" and fyke nets caught all species, and they specifically pursued the valuable salmon at least until peddling of their fish on San Francisco streets was restricted with the imposition of a $25 per quarter tax on Chinese peddlers in 1864 (Wynne, 1964:12; Chin, 1969:37). As white fishermen began entering the fisheries in numbers, the valuable species, salmon among the first, were reserved for them, and the Chinese fishermen were marginalized and allowed to fish only for squid, shrimp, abalone, and some groundfish, species for which there was little or no value in the local market. Local sales were limited to Chinatown and isolated Chinese agricultural communities, but a prosperous export trade to China was established. By 1870, the annual value of shrimp and abalone exports had exceeded $3,000,000 and $1,000,000, respectively (Pourade, 1964:147).

Though in 1880 there were still 25 Chinese among the 500 salmon fishermen operating out of Marin and Contra Costa Counties (Chin, 1969:37), it is clear that by the end of the decade Chinese fishermen were
no longer among those specifically seeking salmon on the Sacramento River: "There is no law regulating the matter, but public opinion is so strong in relation to it, and there is such a prejudice against the Chinamen, that any attempt on their part to engage in salmon fishing would meet with a summary and probably fatal retaliation" (Goode, 1887 II:753). What sort of boats or net types were used prior to this time in pursuit of salmon is now lost to us, though "each of the [Chinese] fisheries employed practices and equipment peculiar to its kind" (Chin, 1969:37). Caucasian observers are not of much help, and their rarely recorded observations of Chinese boats were often jaundiced. J. Porter Shaw baldly stated that, "No one paid any attention to them. They were roughly built, and generally covered with coal tar, which was plentiful and cheap. I did see one building once, and noticed how formless and rough she was" (n.d.:2). Although his observations of caucasian-built boats are valuable, Shaw’s narrow and dismissive view of the Chinese is sadly reflective of prevailing social attitudes towards them: "...many a [Chinese] shrimp camp have I assisted in raiding, both for shrimp, and for the food they put before their gods" (Shaw, n.d.:2). Little wonder that those few who attempted a more sympathetic approach found cultural differences difficult to overcome, and were often met with silent hostility by fishermen for whom interest by white men had long resulted only in theft, confiscated equipment and tax bills: The Chinese fisherman "does not readily respond to your advances, and his boat and his dwelling are alike so redolent of fish of a by-gone time that intimate acquaintance is out of the question" (Brooks, 1900:237).

The following is a collection of observations relating to Chinese craft, none of which have been specifically associated with salmon fishing, but which may give some idea to the range of fishing techniques and boats employed in general. Variations on these were certainly used in the early years to catch salmon. The largest craft were junks (Collins, 1892b:46):

The junks are the only craft large enough to be registered. [5 to 15 tons] These are not documented like ordinary vessels, but are considered alien vessels sailing under permit from the custom-house. There is quite a fleet of junks from San Diego and also one sailing from San Francisco. These junks are built in California and resemble in many particulars craft that are used on the coast of China...carvel built...rounding bilge...lorcha rigged.... Lorcha sails made of cotton duck are carried....

The junks are roughly and cheaply built; nevertheless, they have the reputation of being pretty good sailors and seem to be safe.

The junks used in the abalone fisheries tended towards the large end of the scale. Collins describes a typical one having a length 54 feet, a beam of 12 feet, a hold depth of four feet, and a net tonnage of 14.3 tons
Three junkos were noted by an observer at a fishing camp near Rio Nita on the Sacramento River in 1873: "The large boats were also strongly built, but narrow and pointed at both ends, and constructed in the Chinese fashion. Two of the three large boats had one mast, and the other one had two masts. . . . with Chinese sails" (cited in Chin, 1969:37). Craft under five tons burden were probably built more often after the Chinese Exclusion Act restricted the use of larger craft in 1882. There were still 42 "junkos" reported operating out of San Francisco Bay ten years later (Weaver, 1892:151).

Not all junkos were round-bilged like the ones described by Collins and others. A photo in the National Maritime Museum, credited to I.W. Taber and featured on the cover of California History (March, 1988), clearly shows a junk of moderate size with straight, sloping topsides, and a relatively broad, flat bottom.

At Rio Nita, in 1873, the junkos were "really only movable dwellings and storehouses, where [the fishermen] live and receive the fish that are brought in by the small boats...." (cited in Chin, 1969:37). Accompanying the three junkos were seven small boats described as "little, flat-bottomed dories, square at the stern, sharp at the bow, about 15 feet long and strongly built. . . . the small boats are to visit the sloughs and various fishing points." (cited in Chin, 1969:37). Fifteen years later Collins observed that, "Each junk is usually provided with one or more flat-bottomed skiffs, like those used in the shrimp fishery at Monterey...." (1892b:46).

There were 22 of these "skiffs or sampans" operating near Monterey in 1888 (Collins, 1892a:59). Collins further describes the boats used at Monterey which he calls "Chinese fishing skiffs" (1892b:47-48):

The Chinese fishermen on the coast of California, and particularly at Monterey, use a skiff-like boat that appears to combine many of the features of the American fishing dory and the bateau or sharpy skiff, both types of which are employed to a greater or less extent on the Pacific Coast. The Chinese boat, however, has certain distinctive features that are not found elsewhere among the small craft employed in the American fisheries. It is a flat-bottomed, sharp-bowed craft, with flaring sides and a strong sheer. The forward section has a marked resemblance to the bow of a dory. The bottom near the stern curves up sharply and there is no skag (sic). The width of the stern is intermediate between the dory and the sharpy skiff, being much wider than the former and narrower than the latter. The construction of the stern is almost exactly like the Japanese isobune. The planks on each project several inches abaft the cross-planking of the stern, and over the latter there is sometimes a piece of board laid flat, extending athwartships, its ends passing through the planks on each side just beneath the gunwales.

Ordinarily boats of this type, which are in great favor among the Chinese fishermen, are entirely open, with a short platform at the bow a few inches below the gunwale; a similar
platform at the stern, and three narrow thwarts. The mast steps about 8 feet from the stem.

These boats are built of redwood by the Chinese. The following are the dimensions of one of them of the average size:

<table>
<thead>
<tr>
<th>Feet</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length, over all</td>
<td>20</td>
</tr>
<tr>
<td>Beam, extreme</td>
<td>5</td>
</tr>
<tr>
<td>Depth</td>
<td>2</td>
</tr>
<tr>
<td>Width of stern</td>
<td>3</td>
</tr>
</tbody>
</table>

"In 1875 the 3 Chinese fishing villages near Monterey had a total of 30 boats between them, most of them made in the villages" (Lydon, 1985:41). Other observers describe the workhorse of the Chinese fishing fleet (Collins' "skiff") as a twenty-one-foot flat-bottomed, "fishing sampan" which "relied on a single lateen sail or was sculled by a single fisherman standing in the stern, facing forward, and pushing a single sweep oar" (Lydon, 1985:42). A Monterey Weekly Herald reporter in 1875, said they were "odd-shaped and lumberous-looking craft that float over the billows, when lightly loaded, the both ends in the air" (cited in Lydon, 1985:42). "Yet years of observation diminished this skepticism about Chinese boats and their sailors, especially when storms wreaked havoc with all but the Chinese boats which could be pulled safely out of harm's way. The row of sampans resting on the beach like crocodiles basking in the sun were not only picturesque but eminently practical" (Lydon, 1985:44). The Italian boats had to be moved from one side of the bay to the other in the face of strong winds from the west or south, and sometimes they were caught unawares. But the smaller Chinese boats could be easily hauled out by hand, and the larger ones were pulled up with the same windlasses they used to haul seines (Lydon, 1985:50).

Fortunately, the Chinese fishing villages of the Monterey area appealed to the aesthetic sense of many photographers visiting the area between 1875 and around the turn of the century (eg Lydon, 1985:42-43, 379; Hemp, 1986:44). From these photographs of beached boats the essential characteristics outlined above are confirmed, not only for boats which appear to fall within the range of 15 to 20 foot lengths (Fig. 5 A), but also for a group of boats which are clearly much larger, some 30 feet to 40 feet in length. An 1897 report on Chinese shrimpers probably describes the larger version of the skiff: "The... boat is of Chinese make and pattern and is 40 feet long by 10 feet on the beam, it carries a 30-foot mast, which bears a typical Chinese sail. The crew is invariably made up of five men. The fishing is done by means of bag nets made in China.... Each net is about 20 feet across its mouth, and narrows quickly into a narrow bag about 40 feet long...." (Chin, 1969:38).
Figure 5. Chinese skiffs viewed at Monterey. A: Beached flat-bottomed skiff (after photograph in Pat Hathaway Historical Photo Collection 72-08-132). B: Round-bottomed skiff variant (after a Joseph K. Oliver photograph, 71-18-3, Monterey Public Library).

The characteristics of these boats, both large and small, include straight, raking bows, a flat bottom which is well rockerred, particularly aft, and a single hard chine. There is no external keel. Plank size on the straight, flaring sides, is not apparent as the dark colour of the paint, or coal tar, masks the flush seams. A raked transom of moderate size and inset within the ends of the planks bears two open wooden gudgeons (cf. Worcester, 1971:31), the uppermost gudgeon at the transom top may have been used to pivot a sculling oar as well as the rudder. The first thwart is invariably pierced for a mast. The central portion of the hull's interior is spanned by three thwarts, over which removable planks, laid fore and aft, are often placed. A plank or beam runs athwartships piercing the hull planking just below the gunwale, at the top of the transom. Framing arrangements in the bilge are hidden from the camera lens, but futtocks are visible running to the top of the planking without cap or shelf. The frame spacing appears to be about 1.5 feet (0.5 m) on
the smaller skiffs and around two feet (0.7 m) on the larger ones. Gear visible inside the boats include masts and spars, slightly shorter than the hull lengths, wrapped in canvas sails. Presumably the rig is lateen. Sculling oars are about half hull length and sport a short, small diameter handle protruding at right angles to the loom. A rudder is also contained in one boat: it has a broad blade, which is of the "fenestrated" variety with two holes, it measures approximately two feet deep by over three feet long, and has a short stock with removable tiller.

In addition to the larger skiffs already described, another variety of skiff as well as a distinct type are visible in the Monterey photographs. One boat (Lydon, 1985:33; Hemp, 1986:30; Fig. 5 B) is almost identical to the skiff in profile, but has a round, or multi-chined bottom with at least four planks per side. A small keel, or false keel, is visible, projecting less than three inches below the bottom. As the hull has apparently been abandoned, the coal tar has worn off revealing a nailing pattern which may attest to edge-joined construction. Decking across this boat's waist stands proud with what appears to be permanent, narrow side-decks, exhibiting a high degree of crown. The other type is somewhat smaller than the skiffs, exhibits a much flatter sheer and very little rocker, and seems to be less beamy. Some of this type have small transoms, without overlapping hull planks, others are double-ended.

This last type seems to correspond with Collins' description of a fishing boat he calls a "Chinese fishing canoe" (Collins, 1892b:47):

...practically a long, narrow, flat-bottomed canoe, sharp at both ends, with the bottom pretty wide in the middle the sides flaring moderately.... [this type of boat is] used extensively on San Francisco Bay, and is in favor among the Chinese shrimp fishermen, though it is also utilized in other fisheries. It is entirely open, with two thwarts and two large platforms,... in each end of the boat, a short distance from the bow and stern.... About one-sixth of the boat's length from each end, and directly opposite the platforms mentioned, are bumpkins, which project from each side a distance of several inches. The boat has a moderate amount of sheer at the top.

This type of boat is propelled by both sails and oars. The mast, on which is set a lateen sail, is stepped about one-third the boat's length from the bow. When running before the wind the tack is loosened so that the yard lays at nearly right angles to the mast, the sheet of the sail being taken down amidships. Boats of this class vary from 15 to 20 feet in length, are managed by two or three Chinamen, and are employed in the general coast fishery, though most commonly found in San Francisco Bay. They are constructed in a rough manner, and their cost is comparatively trifling. They are convenient, however, for landing on beaches, or for working in shallow water. They sail well, running free, and are light and buoyant in a sea way. The following are the dimensions of one of them:
Length, over all.........................20 0
Beam.....................................3 11
Width of bottom amidships...........2 4
Depth, amidships......................1 7 1/4
Mast, total length.....................15 0
Yard, length............................20 10 5/7

Collins mentions that these dimensions were based upon a model obtained by the U.S. Fish Commission, and now in the fishery collection in the National Museum at Washington, D.C. Three quarters of a century later Chapelle offers his description of the National Watercraft Collection model which is presumably the same. Here it is labelled a "San Francisco Shrimp Boat" (USNM 22217), and is dated to 1876 (Chapelle, 1976:301):

Roughly and cheaply built, these boats were designed for easy beaching and were buoyant; they sailed well with the wind free but usually used oars to work to windward. The range in length was from 15 to 40 feet.

The boat represented by the model was a flat-bottom double-ended open sharpie with wedge-like ends, moderate flare amidships, strong fore-and-aft camber in the bottom near the ends but nearly straight amidships, and moderate sheer. There were platforms on the gunwale at each end and two thwarts. The craft was rigged with a lateen sail and one mast stepped about one-third the length from the bow. It was steered with a sweep and was fitted to be rowed, sailed, or sculled. Some of these boats had a small keel nailed to the bottom amidships.

Scale of the model is 1 3/8 inch to the foot; to measure about 39 feet overall, 7 feet beam, 3 feet depth, the model may be too narrow for the length.

Given by U.S. Bureau of Fisheries.

Chapelle's dimensions are approximately double those supplied by Collins, though he provides no background as to why he is assured of the model's rather unusual scale. There seems to be no evidence beyond Chapelle's comments that boats of this class were built to lengths approaching 40 feet, although clearly the skiffs were, a confusion which might explain Chapelle's dimensions. Jordan's description of Chinese boats in use at Bay View, in South San Francisco, appears to match the canoe while defining its size range on that site: "The boats are long, rather narrow and sharp, flat-bottomed, very thick sided, and heavy, being built... out of redwood lumber. They range from 12 to 25 feet in length" (1887:612).

A Chinese fishing canoe is represented in a pen and ink drawing included in Collins' report (Fig. 6). It is useful in that it shows the Chinese lateen rig in place. The boats in the background represent the proportions of the canoe better than the boat in the foreground which

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5 Several models in the Smithsonian Institution collection will be referenced in this study. Unfortunately, the author was unable to observe these models first-hand.
Figure 6. Chinese "fishing canoe," or "shrimp boat" (from Collins, 1892b:plate XVI).

seems considerably foreshortened when compared with the model and photographs.

Both skiffs and canoes have been described as "shrimp" boats; the skiffs have also been described as "squid" boats. Baskets of trawl lines used for catching bottom fish are visible near the skiffs in the Monterey photographs. Abalone was also sought with boats from Monterey. Gill nets, were set among the shallow reefs, leading to them also being called "surf nets" because of their deployment in turbulent water. That seines were set from the beaches has been mentioned. How the distinct boat types and various sizes of boat were used relative to various types of gear and species is not clear. At least one source (Spier, 1958:81) credits the Chinese fishermen of Monterey with starting the salmon fishery in the area in 1853. However, this is not supported by other documentary evidence, and the gear attributed to Chinese fishermen around Monterey would not be
effective for catching feeder salmon, although an occasional salmon may have been snared with gill nets or seines employed off the beach."

Within San Francisco Bay, another type of Chinese fishing boat was reported in the *San Francisco Weekly Bulletin* of January 27, 1871 (cited in Goode & Collins, 1887:41):

"The fisherman's boat (of China Point) is a long unwieldy, clumsily constructed craft, with heavy, ill-shaped oars. They are not shipped in double rowlocks after the American method, but work on a single pin which passes through the loom of the oar. With the nets piled up in the stern, and the crew at their places, the cockswain, using a large steering-oar guides the boat to the long flats of the Oakland and Alameda shores, the principal fishing grounds,..."

Little may be gleaned with certainty from this description, but a number of rowers is implied with the use a cockswain. This element, combined with "the nets piled on the stern", brings to mind a seine boat. It probably belongs to the same class of Chinese seine boat observed at Port Madison, in Puget Sound (cited in Collins, 1892b:48):

"Her appearance was that of a typical Chinese fishing boat; her bottom was flat, sides slightly rounded, broad, square stern high out of the water, low narrow, square bow, and strong sheer. She was open, with a broad washboard all around, and a little deck in the bows and at the stern, and was divided into four compartments by water-tight bulkheads. There was no mast, and only six thole pins with double notches to hold the grommets that are slipped over the handle of the long sweeps just above the broad blades that are nailed to them. The sweeps are handled after the fashion of the Venetian gondoliers by the oarsmen who stand on the opposite side of the boat. She was 15 feet long and four or five feet broad at the stern, the widest part.

Excavated at the Rincon Point fishing village were three model boats with a length to beam ratio a little in excess of 3:1. If these models are, as investigators have speculated, scale models, then these may well represent a variation of the broad square-bowed seine boat. The sides turn in slightly towards the bow and stern, so that the stern, unlike the Port Madison boat is not the widest part. However, there is a substantial raised platform at the stern, and a smaller, lower one at the bow. A large well is sunk between these platforms accounting for about half the model length. Exotic hardwoods were used to make these models, tiny

6 Some Chinese fishermen were familiar with trolling. Off San Diego, abalone shell was used for lures in trolling for barracuda (Armentrout-Ma, 1981:148).

7 Excavations of the Chinese fishing village at Rincon Point were undertaken concurrently with excavations of a post-Gold Rush ship-breaking yard (Archeo-Tec, 1985). The village, probably the first Chinese fishing village in California, was settled between 1850 and 1852 and abandoned before 1870 (Pastron, 1989:50-51).
wooden pegs were used for fastenings, and tortoise carapace covers exterior surfaces (Pastron, 1989:51, 53).

Yet another type of Chinese fishing boat is represented by a model in National Watercraft Collection. The rigged model is called a "Chinese dugout canoe" (USNM 72744), and is dated to 1876 (Chapelle, 1976:301-302):

This type of dugout canoe, once used by Chinese fishermen on the California and Oregon coasts in the alongshore fisheries, was intended to be poled and sculled not far from shore.

The canoes represented by this model were roughly made from a log dug out from end to end, the ends transoms being nailed on. They had strong sheer and some rocker in the bottom, the latter flat athwartships for a short distance, and were round-bilged, with slightly flaring topsides. The sides, along which washboards were fitted, were straight in plan, and the bow and stern square and raking.

Scale of model is 1 inch to the foot, for a canoe 20 feet long, 3 feet 6 inches beam, and about 2 feet depth of side. The model is fitted with two sculls, single tholes with a becket, and one pole.

Given by U.S. Bureau of Fisheries.

It is probable that these canoes were built only where stands of coast redwood (Sequoia sempervirens) were accessible, though perhaps red cedars (Thuja plicata) would have served in Washington and British Columbia. Chinese fishermen who caught ground fish in Humboldt Bay beginning in 1857 probably used these craft. With nets destroyed by white fishermen the Chinese fishery apparently ended there in 1879 (Jordan, 1887:622).

Although the first junks in California may have crossed the Pacific, it seems that most junks and all the smaller craft were built locally in Chinese fishing villages. They were built by eye (Shaw, n.d.:2) with redwood. "The redwood boards for the main part of the vessel were heated and bent, then fastened together with old-style headless iron nails. The fishermen were so skillful in their building that when they were finished, the nails were completely covered with wood and thus hardly likely liable to deteriorate by rust" (Armentrout-Ma, n.d:7). Redwood was the least expensive wood suitable for boat-building on the Californian Coast in the nineteenth century, and planks could be acquired of 20 to 24 inch widths (50 - 60 cm) (Tom Fordham, pers. comm. 1991) well suited for the Chinese flat-bottomed and slab-sided forms. Some rigging elements were imported:

' Another form of fastener found in the archaeological record is the Chinese screw. Small brass fasteners, with "threaded points and unthreaded shanks.... slightly flared, flat heads... indented with a shallow slot...." were recovered from the Hoff Store site (Hattori & Brigham, 1990:37, 39). These particular screws were probably intended for cabinet work, though larger screws of the same design could possibly have found employment on boats.

Junks in China were typically fastened with hand-wrought spikes and nails, rectangular in section, with heads flanged on one side.
for the junks at least, iron-wood was imported for the masts (Armentrout-Ma, n.d:49), and "the sails with their bamboo stays [sic] were imported... although later, canvas sails came into general use" (Armentrout-Ma, n.d:51-52). As for adopting western devices one observer at the turn of the century commented that the Chinese boatman (Brooks, 1900:237):

...no longer leads his halyards through holes in blocks of hard wood, but uses regular blocks.... instead of mooring with a wooden cage enclosing a big stone, he uses our ordinary mud hook; he no longer makes diamond shape holes through the barn door rudder and lifts it out of the water when he ties up for the night or takes to the sweeps.

One Chinese fishing boat has been recovered from the field. It is in pristine condition and offers excellent testament to the potential of future small craft discoveries in the region by way of excavation. The boat was retrieved from the beach area in front of a village site at "China Point", Marin County. The boat is now a displayed at the Chinese Historical Society of America Museum in San Francisco, where it is labelled a "14-foot California redwood sampan" for fishing activities (Fig. 7).

The sampan is made entirely of redwood. The five planks comprising the bottom and side planking are all sawn to a thickness of 1/2 inch (12 mm), as are the two small bulkheads at either end. The transoms are 1 1/2 inch (38 mm) thick, the gunwale strake 1 inch (25 mm), and the floors 1 1/4 inch (31 mm) sided by 2 inches (51 mm) molded. The futtocks are sawn,

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"Note that Collins (1892a) refers to Point San Bruno, south of San Francisco as "China Point", but this name has today become synonymous with the Marin County promontory, Point San Quentin.

"The sampan was discovered protruding from beach sands by a member of the Chinese Historical Society of America, who has since passed away. Despite extended correspondence with C.H.S.A. chapters in San Francisco and Los Angeles, no further documentation as to this vessel's in situ disposition could be located.

"The word sampan is derived from the Chinese san, meaning three, and pan, meaning planks, the whole being a symbolic definition of a small boat. This form of spelling has arisen from the fact that early foreign intercourse with China was more or less limited to Canton, where the pronunciation of 'san', for three, is 'sam.' The presence of the "m" is further explained by the Annamese name of tam (for sam), again meaning three, and the Spanish cempan and the Portuguese champan. The first recorded mention of this word in Europe dated as far back as 1620, from which time it has been recognized as the generic term for any small boat of Chinese design and as such has found its way into the Oxford English Dictionary.

Curiously enough, despite the Chinese flavour of the word, the Chinese themselves, unless dealing with foreigners, never use it, but have other names which vary in different parts of the country" (Worcester, 1971:43).
Figure 7. China Point sampan, lines and construction.
and are also of 1 1/4 inch (31 mm) molded dimension. The craft is double-ended, exhibiting nearly identical fore and aft symmetry. It has an overall length of 14 feet, 5 1/2 inches (4.407 m), a maximum beam of 3 foot 4 inches (1.015 m), and a depth amidships of 10 1/2 inches (267 mm). There are no attachments for oars, scull, mast, or rudder. The craft was apparently intended only to be poled, or perhaps paddled.

Clearly, this is a simple, utilitarian craft, yet its construction belies descriptions relying heavily on adjectives such as "lumbersome," "crude" or "rough." There is even a simple grace about its shape. The five hull planks and the gunwale strakes are joined to one another at their edges with nails driven into small V-shaped recesses about 1/4 inch (6 mm) deep, 1/4 inch (6 mm) wide and 3/4 inches (19 mm) long. The nails joining planks are spaced on average at six inches, less frequently between plank and gunwale. This edge-joining imparts considerable strength to the hull and allows for fewer frames. There are only eight frames (those at either end comprised of floors only), spaced 18 inches (254 mm) apart or farther. Besides four nails in each of the end seats, all the fastenings are driven from the outside of the hull with no nail heads visible from the interior. The nails are not headless, but are conventional wire nails. It is impossible to determine their lengths in an intact boat, but the edge-joining nails are at least 1 1/4 inch (31 mm) long, with 1/8 inch (3 mm) diameter heads. Nails joining the hull planking to the frames have heads of 3/16 inch (5 mm) diameter, while the nails passing through the gunwale strake into each futtock have a head diameter of 3/8 inch (9 mm).

One curious feature is the presence of two 3/8 inch (9 mm) diameter holes through the bottom plank on its centre-line, one located one inch forward of the third frame, and the other one inch aft of the sixth. These could easily have been plugged while the boat was afloat. Perhaps the plugs were pulled when the boats were beached or carried aboard large vessels to prevent rain water from collecting, but this precaution seems unnecessary for so light a craft.

The sampan’s transom ends may betray a relationship with the Chinese dugout canoe. Another double transom-ended craft, however, is illustrated in Collins’ fisheries report (1892a). This punt-like craft is flat-bottomed and hard-chined, and does appear to be rather rough and crude. However, the drawing demonstrates a Chinese gill net in use (Fig. 8). These nets were anchored, or set, while a small boat stood by waiting for a shoal of fish to pass, its crew frightening the fish towards the net by thrusting oars into the water and by pounding on the boat’s gunwale. This sort of active net fishing has a long history in China where tame otters have been used to the same end. Chinese gill nets, seines, and perhaps
sturgeon trawls were the methods most likely used to catch salmon by the Chinese on the Sacramento River.

Figure 8. Chinese gill-net fishing (from Collins, 1892a:Plate XIX).

In summary, six distinct types of Chinese fishing boats may be identified, excluding junks:

1) Chinese Skiff: This was a craft with a dory-like profile, a transom stern, and sharp raked bow, propelled by oar, scull and lateen sail. Flat-bottomed variants may be distinguished with respect to size; the smaller ones ranging from 15 to 21 feet (4.5 - 6.5 m), the larger variety roughly ranging from 30 to 40 feet (9 - 12 m). Length to beam ratios range between 3.6:1 to 4:1. Early versions may have been round-bottomed. The type was extensively used at Monterey and on San Francisco Bay where it has been associated with shrimp and squid fishing. As junk tenders, smaller versions may have been used in disparate roles up and down the coast. Descriptive resources include detailed observations and photographs.

2) Chinese Canoe: A flat-bottomed craft, sharp at both ends, narrow, with a length to beam over 5:1, and propelled by oar, scull, or lateen sail, the canoe probably did not much exceed 25 feet (8 m) in length, though this is disputed. It was used extensively in the San Francisco Bay shrimp fishery, but was also used elsewhere on the Californian Coast and in other fisheries. Descriptive resources include one detailed observation including a drawing, undetailed recording as distant photographic subjects, and one model.
3) Chinese Dugout: The dugout hull was closed at either end with transoms and topped with washstrakes. Sculled or poled, the dugout was used off the northern California and Oregon Coasts, where bottom fish were pursued, and perhaps salmon. The one descriptive resource is a model said to represent a 20-foot (6.1 m) boat.

4) Chinese Seine Boat: The flat-bottomed, broad-sterned, rowed seine boat is described in detail once only, and then it is placed in Puget Sound, but a less detailed observation seems to place a similar boat on the flats of San Francisco Bay. Three boat models found at Rincon Point may represent seine boats. Construction was probably heavy, as a 15-foot (5 m) boat could be propelled by up to six oars. Length to beam was around 3:1 with maximum beam carried aft to the transom. The Chinese seine was used extensively for bottom fish late in the century, but both net and boat would have been well suited for pursuing Sacramento salmon.

5) Chinese Punt: This flat-bottomed square-ended craft is represented only in one drawing of indifferent quality which associates it with a gill net.

6) Redwood Sampan: This light, double transom-ended boat was intended to be poled, or perhaps paddled. One archaeological example has been recovered in excellent condition, providing a sample of construction techniques possibly used on other types. The edge-joined, five-plank, double-chined hull is the boat's outstanding feature. At 15 feet (4.6 m) length overall, this boat has a length to beam ratio of 4.3:1. There are no observations in print linking this type to a fishery, but archaeological context puts it in a place and time where shrimp processing was the principal activity.

Feluccas

San Francisco Bay is so large that often its storms are more disastrous to ocean-going craft than the ocean itself in its most violent moments. The waters of the bay contain all manner of fish wherefore its surface is ploughed by the keels of all manner of fishing boats manned by all manner of fishermen (London, 1905:11).

Most strongly associated with San Francisco's Filbert and Vallejo Street fishermen's wharves in the nineteenth century were the boats of the Italian fishermen, with their lateen rigs, double-ended hulls with bold upright stems, distinctive bulwarks, and high-crowned decks, clearly echoing a Mediterranean heritage (Fig. 9). Commonly known as "feluccas" in documents, the boats were never called this by anyone working in the Bay. To non-Italians they were simply called "Italian fishing boats," or, less politely, "Dago boats." The Italian fishermen sometimes differentiated the smaller versions, those using mainsails only without jibs, as "silenas," to distinguish them from the larger "shalloni," a phonetic spelling of a word guessed to be a Sicilian variation of "shallop" (Douthit, 1977:30). Italian fishermen also most frequently manned the diminutive, transom-sterned crab boats with sprit rigs.

Like the Chinese, the Italians were among the first non-Native West Coast fishermen. Those fishermen described as Italian in nineteenth century documents were primarily from the Northwest coast of Italy, or
Figure 9. A Felucca runs across San Francisco Bay before a fresh breeze (from a photograph).

Sicily. Other fishermen often loosely characterized as "Italian" included "Austrians" hailing from the Illyrian shore of the Adriatic Sea, Greeks, Portuguese, as well as a few fishermen from the south of France and Spain (Collins, 1892a:127; Brooks, 1900:237). The first Italian fishermen were the Genovesi from Liguria followed by Piemontesi, Lombardi, Veneti and Marchigiani Toscani. These people were primarily urban dwellers who seemed to more readily avoid the temptation to "see the elephant," or be lured by gold fever, than many other immigrant groups (Gumina, 1978:3). What these early fishermen earned from their trade is not known, but, "The average earning of a fisherman in 1882 ranged between $4.00 and $4.50 per
day. In 1888, on a percentage basis, $700 was a top share for a season with $300 the low figure" (Gumina, 1976:12).

The first felucca took to Bay waters very early, perhaps in 1849 (Steven Canright, pers. comm. 1989), or even 1848 (Goode & Collins, 1887:30). On September 27, 1850, in celebration of the laying of the Atlantic Cable, a group of fishermen mounted one of their feluccas on wheels and had it drawn through the streets by four horses (Gumina, 1978:47); the recording of this event with a simple newspaper drawing is the first graphic representation of a non-Native fishing boat on the West Coast (Fig. 10). Most feluccas were used in the vicinity of San Francisco, but they were also used to the south as far as San Diego, wherever Italian fishermen, and sometimes fishermen hailing from other parts of the Mediterranean fished. However, north of Tomales Bay, near San Francisco, the type was not used, even by Italians who fished those waters.11 The bulk of the sailing fleet was replaced by power boats.

11 Gilkerson's claim that feluccas were used as far north as Noyo harbour (1976:46) is not supported by Fish Commission documentation, at least to the 1890s. What few feluccas may have been used north of Tomales Bay probably only arrived there with the dispersal of de-valued, second-hand sailboats to outlying areas as city-based fishermen bought powerboats.
between 1911 and 1913 (Smith, 1942:24). The last working sailboat fisherman was a Neapolitan named Artillo, who died in the 1920s at the age of eighty (Dillon, 1985:91).

San Francisco's was a market fishery. Although Collins reports two salmon-canning establishments in the city, these were also engaged in canning fruit, and seem to have packed salmon (much of it shipped in by rail) only when fresh market prices were lowest (1892b:158). The species sold on the market included almost all the varieties available from within the Bay and the coastal waters outside as far as Monterey, Drake's Bay, and the Parralone Islands. Gear used by market boats also varied, each boat often having a plethora of gear in its itinerary, including a type of Mediterranean drag-net, or trawl, set by two boats working in tandem, known as the paranzella, seines, multi-hooked handlines for bottom fish, and gill and trammel nets of varying mesh sizes (Weaver, 1892:151). Some boats were specially-built for specific fisheries; for instance, the largest feluccas trawled offshore year-round, some may have specialized in salmon gill-netting, while most of the smallest market boats sought only crab. However, the typical felucca, in today's terminology, would be called a "combination boat", performing well as a working platform in a variety of tasks, according to season and species sought. The felucca had also to perform well in all seasons and in a variety of conditions from those found inside the Bay to those outside the Golden Gate. In addition to the obvious requirements of seaworthiness, the felucca needed also to be swift as the demands of the market fishery placed a premium on fresh fish and the first boats to dock would fetch top prices for their catch. Salmon was not the primary catch of the market boats, and the felucca was clearly not developed for salmon fishing, but it did find employment in the salmon fishery, and so will be examined further here. In 1880 "about twenty or thirty" out of 100 market boats fished for salmon in season (Jordan, 1887:613). In the spring of 1888, about 150, or a little over one-third of the market boats, sailed from the docks of San Francisco and vicinity to the salmon gill-netting grounds (Collins, 1892a:166).

12 Collins lists 3,300,000 pounds of salmon in the San Francisco fresh fish market for 1888 (Collins, 1892a:141). This represents about one-third of the total market volume of all species for that year. However, unlike other species which were primarily caught locally with San Francisco-based boats, most salmon were shipped in by rail or steamer from other locations. An estimate based on Collins' figures leaves about 737,500 pounds of salmon caught by San Francisco boats for the market after the fresh salmon exports for Santa Cruz, Tomales Bay, the Sacramento River and Humboldt County are subtracted (Collins, 1892a:66-67, 147, 170, 174). Most salmon brought directly to the San Francisco market by fishing boat was probably fished from gill-netting grounds south of San Pablo Bay.
In 1852, the Californian special census listed only three Italian fishermen (Dillon, 1985:84), though this figure is probably low and represents in likelihood only three boat owners, and not their crews. By 1867, Italians numbered 86 out of San Francisco’s 353 fishermen, with most of the balance being Chinese (Dillon, 1985:84). While legislation and public antipathy removed competition from Chinese fishermen, Italian fishing expertise, the ability to adopt new techniques, the companilismo system which included buyers, and the use of the efficient and flexible felucca, had ensured an Italian monopoly of the San Francisco market fishery by 1870 (Dillon, 1985:90; Gumina, 1978:79). The Italians were providing 90 percent of all commercial fish for the entire state by 1910, a time when California’s commercial fishery was the second largest in the United States (Dondero, 1950:48).

In the Italian communities, social ties, loyalties, and business associations were guided by the spirit of companilismo which respected family ties (defined by blood links, or extended family) above all, and then birthplace by town or province (Gumina, 1976:9). Among the market fishermen, who all owned their own boats individually or in partnership, these ties would determine who was taken on as a partner or crew, as well as to whom the catch was sold, and who was contracted to build a boat. Gradually, generalized specializations in fishing emerged with certain groups dominating specific localities, techniques, or positions within the business. For example, in San Francisco, "the Genoese concentrated in deep-sea fishing, especially tuna, and were intent upon developing a state-wide market, whereas the Sicilians met the demands of the local markets and specialized in fresh and inshore fishing. The Sicilians, who arrived in large numbers to California in the 1880s, also came to dominate the salmon fishery of the Sacramento River. The remaining Italian fishermen, many from Tuscany, Calabria and Naples, aligned themselves with either group depending upon their specialty" (Gumina, 1976:9).

The boats developed by the Italians ranged in size from 16 to 40 feet (5 - 9 m), and were crewed by from one to six, or, occasionally, even eight men (Collins, 1892b:41; Brookes, 1900:238)). Clearly, the feluccas, which were paraded in later civic celebrations and are represented in photos fully dressed with pennants and Italian flags (Hemp, 1986:69), constituted elements of comarziali, or reminders of native Italian roots (Gumina, 1978:47). This was no mere sentimentality as there was a conscious community effort to maintain traditional Italian practices as part of a programma d’italianita "initiated to mold the Colony into a ‘corner of the mother country’, un angolo di madrepatria" (Gumina, 1978:43). The boat’s decorative features also reflected provincial
Table 2. Summarized data for feluccas, taken from models and lines drawings (see Appendix B).

<table>
<thead>
<tr>
<th>BOAT ID</th>
<th>LOA</th>
<th>BEAM</th>
<th>L/B</th>
<th>FLOOR</th>
<th>BILGE</th>
<th>DEPTH</th>
<th>B/D</th>
<th>FBWD</th>
<th>SEC</th>
<th>PC</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>USNM 22213</td>
<td>26.83</td>
<td>9.5</td>
<td>2.82</td>
<td>&quot;rising&quot;</td>
<td>&quot;nord&quot;</td>
<td>2.5</td>
<td>3.8 shallow</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>USNM 22214</td>
<td>26</td>
<td>9.25</td>
<td>2.81</td>
<td>&quot;rising straight&quot;</td>
<td>&quot;nord&quot;</td>
<td>2.5</td>
<td>3.7 shallow</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>USNM 22215</td>
<td>37.63</td>
<td>11.5</td>
<td>3.3</td>
<td>&quot;rising straight&quot;</td>
<td>&quot;high, easy&quot;</td>
<td>3</td>
<td>3.8 shallow</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HALL</td>
<td>24</td>
<td>7.75</td>
<td>3.1</td>
<td>1:2 step</td>
<td>1/5b round</td>
<td>2.7</td>
<td>2.87 .045</td>
<td>67% easy</td>
<td>.60</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>COLLINS</td>
<td>32</td>
<td>10.5</td>
<td>3.0</td>
<td>1:4 raised</td>
<td>1/7.5b round</td>
<td>4.75</td>
<td>2.21 .060</td>
<td>80% firm</td>
<td>.55</td>
<td>49.5%</td>
<td></td>
</tr>
<tr>
<td>ASSC 105</td>
<td>18.77</td>
<td>6.33</td>
<td>2.97</td>
<td>1:5 raised</td>
<td>1/4b round</td>
<td>2.10</td>
<td>3.01 shallow</td>
<td>.030</td>
<td>79%</td>
<td>.56</td>
<td>49.3%</td>
</tr>
<tr>
<td>ASSC 106</td>
<td>23.29</td>
<td>8.17</td>
<td>2.85</td>
<td>1:2.5 step</td>
<td>1/5b round</td>
<td>2.64</td>
<td>3.01 shallow</td>
<td>.028</td>
<td>71%</td>
<td>.57</td>
<td>47.5%</td>
</tr>
<tr>
<td>HAMMS 16-21</td>
<td>18.87</td>
<td>7</td>
<td>2.7</td>
<td>1:5 raised</td>
<td>1/4b round</td>
<td>2.58</td>
<td>2.71 .057</td>
<td>75%</td>
<td>.61</td>
<td>49.56%</td>
<td></td>
</tr>
<tr>
<td>NUOVO MONDO</td>
<td>18.5</td>
<td>6.67</td>
<td>2.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
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<td>--</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOAT ID</th>
<th>DISP.</th>
<th>DISP/LWL</th>
<th>STEM HEAD</th>
<th>THOLE</th>
<th>MIDSHIP SECTION</th>
</tr>
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<tbody>
<tr>
<td>HALL</td>
<td>5,860</td>
<td>190</td>
<td>5</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>COLLINS</td>
<td>16.515</td>
<td>225</td>
<td>5</td>
<td>11/1</td>
<td></td>
</tr>
<tr>
<td>ASSC 105</td>
<td>3,072</td>
<td>207</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ASSC 106</td>
<td>5,237</td>
<td>189</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HAMMS 16-21</td>
<td>2,853</td>
<td>189</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOAT ID</th>
<th>KEEL TYPE</th>
<th>KEEL M/I</th>
<th>KEEL PROP.</th>
<th>KLSN FRAME</th>
<th>FRAME M/I</th>
<th>PLANK THICK</th>
<th>CAULK</th>
<th>MAST SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALL</td>
<td>b/-</td>
<td>-/-</td>
<td>-</td>
<td>-</td>
<td>-/-</td>
<td>-</td>
<td>no</td>
<td>50%</td>
</tr>
<tr>
<td>COLLINS</td>
<td>b/no</td>
<td>4/14</td>
<td>13.5</td>
<td>yes</td>
<td>-/-2.5</td>
<td>157%</td>
<td>-</td>
<td>51%</td>
</tr>
<tr>
<td>ASSC 105</td>
<td>b/yes</td>
<td>2/5</td>
<td>1.25</td>
<td>no</td>
<td>-/-2.5</td>
<td>309%</td>
<td>12</td>
<td>34%</td>
</tr>
<tr>
<td>ASSC 106</td>
<td>b/yes?</td>
<td>7/7</td>
<td>1.1</td>
<td>-</td>
<td>-/-</td>
<td>-</td>
<td>-</td>
<td>42%</td>
</tr>
<tr>
<td>HAMMS 16-21</td>
<td>b/no</td>
<td>2/3</td>
<td>1.15</td>
<td>no</td>
<td>1.5/1</td>
<td>125%</td>
<td>12</td>
<td>28%</td>
</tr>
</tbody>
</table>
affiliations, with all-white feluccas belonging to northern Italian fishermen, those banded with green or blue, Sicilian, etc.

It has been plausibly argued that the felucca was introduced by early Italian fishermen who imitated craft from their native Ligurian Sea, and that the Californian version was then further modified by Sicilian immigrant fishermen (Dondero, 1950:46). The largest feluccas, those over six tons burden, appeared only with the introduction of paranzella nets in 1876, but other modifications will be difficult to perceive in the archaeological record as the boats ranged widely in form and proportion irrespective of length; the variables of the evolution are not defined and would be difficult to relate in a chronological progression with the data at hand.

The descriptions which follow are placed in rough chronological order and are summarized in Table 2. The first are based on three models given by Livingstone Stone to the United States National Museum collection which have all been dated to 1876. The models are rigging display models which must be considered with the caveat that inaccuracies in hull form and proportion might be represented such as would not be encountered in a builder's model. The author was unable to measure these models directly, so the descriptions are based entirely on text supplied by Howard Chapelle (1976:299-301):

USNM 22213 ...shows a double-ended half-decked, caravel-planked sailing hull having a straight keel with a slight drag, upright straight stern and sternpost, strong sheer, and sharp hollow entrance and run, the latter the finer. The midsection shows a rising floor, hard bilge, and slightly flaring topside.

Scale of the model is 3/4 inch to the foot representing a boat 26 feet 10 inches at the gunwale, 9 feet 6 inches beam, 2 feet 6 inches depth, bowsprit 3 feet 4 inches outboard, mast 17 feet 8 inches above deck, and yard 32 feet 4 inches.

USNM 22214 [boasts a]...sharp entrance with hollow at forefoot, sharp and very hollow run, and...midsection with rising straight floor, hard bilge, and rather upright topside.

Scale of the model is 3/4 inch to the foot, giving a boat 26 feet overall, 9 feet 3 inches beam, 2 feet 6 inches depth. This appears to have been an average size boat of the type.

USNM 22215 ...shows a boat having easy sheer, straight keel, upright curved stem, upright post, sharp entrance hollow near forefoot, a fine, hollow run, and the midsection formed with a rising straight floor, high easy bilge, and slightly flaring topside.

Scale of model is 3/4 inch to the foot, representing a large boat of the type, about 37 feet 10 inches overall, 11 feet 6 inches beam, and 3 feet depth.

All three models exhibit the felucca's typical high-crowned deck with low bulwarks, a long hatch roughly amidships, and a small standing-room hatch right aft for the helmsman. Each is rigged with a single
lateen sail, and a jib set to the bowsprit. All the models' "depth" dimensions seem slightly low. While Chapelle is certainly not referring to draught, he may be measuring internal depth from the bottom of the deck beams to the top of the keel or keelson, if these structures are present in these models; these dimensions would be less than the deck-line to bottom of canoe body depth taken from the drawings of other feluccas in this study.

That these models are dated to 1876, the year paranzella appeared in California, is interesting. Jordan notes that in this year, larger boats than previously seen began to appear for use with the new net; while they were "similar to those employed by Italians in other fishing" they ranged from 6 to 9 tons burden (Jordan, 1887:610). The largest model, USNM 22215, has a calculated tonnage of 9.8 tons (see Appendix B), and undoubtedly represents one of the new big boats. These new boats must have paid for themselves well, because boats over five registered tons required a skipper with United States citizenship, and many non-naturalized Italian fishermen had to hire titular captains while at sea. The largest feluccas used previously seem to have been built just short of the five ton mark. The smaller boats, USNM 22213 and 22214, have calculated tonnages of 4.7 and 4.5 respectively, and appear to fall into this category.

Henry Hall provides the first measured drawing of the felucca (1884:41). He notes that the felucca, which he calls simply a San Francisco fishing boat, was the only example of a lateen rig in use in America. He makes a strange comparison in stating that it most nearly approaches the Norwegian pilot-boat in form, yet he states that it was introduced by people from Mexico and Central America. He records that feluccas ranged from 20 to 35 feet long (6 - 10.5 m), and that in San Francisco there were 50 of the larger variety, boats just below the size which could make them liable to a tonnage tax, ie less than 5 tons. He notes a hull "very sharp on the floor", with hollow waterlines fore and aft. Beam was one third of the length and depths ranged from 2 1/2 to 4 feet (.76 - 1.2 m) deep. He notes the masts, characteristically stepped slightly forward of amidships and raked sharply forward, and that jibs,

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13 A newspaper report of 1876 described the typical "figure-head master" as "...some lazy Yankee or Irishman,... paid as high as $100 per month, ...to keep out of the way and furnish his own whiskey" (cited in Goode & Collins, 1887:37). By 1879, most Italian skippers of large boats had their naturalization papers (Goode & Collins, 1887:37).

14 Hall, like many other authors, does not acknowledge the use of lateens by Chinese fishermen in California. Two other examples of lateen rigs used in America, the seine and sponge fishing boats operated in Florida, appeared after Hall's report (Chapelle, 1951:286, 291).
sometimes carried, were set on bowsprits. Between 800 and 1,500 pounds (360 - 680 kg) of stone ballast was carried (Hall, 1884:40).

Collins provides a very thorough description of the type (1892b:41-42):

The felucca of the Pacific coast is distinctively European in type; it differs from any other fishing boat used in the United States and resembles the small craft of Italy. The fact that the boats of this class are mostly built by an Italian [sic] at San Francisco and that they are manned almost wholly by natives of Southern Europe (Italians, Portuguese, and Greeks), make it easy to understand how this form of fishing craft has peculiarities that characterize the boats of the Mediterranean. There are slight variations in boats of this type, as may be found in all other kinds of fishing craft, but these are of minor importance, and with few exceptions the feluccas resemble each other so closely that none but an expert could tell one boat from another except by the difference in size. Hall claims that 'the model is the nearest approach to the Norwegian pilot boat of anything built in America for practical use.' There is, nevertheless, comparatively little resemblance between a Norwegian pilot boat and the market felucca of California. The very hollow floor, great depth, curved and strongly raking stem and stern post, which are noticeable characteristics of the Norwegian vessel, are not seen in the California felucca.

The size of the feluccas ranges from about 20 to 36 feet in length, though the greater number that fish outside of the Golden Gate are upwards of 28 feet long.... [They are] excellent sailors... [with a] large amount of sail carrying power.... It has been claimed that with 800 to 1,300 pounds of stone ballast in the hold these feluccas will rise lightly over any wave, 'and are fast and seaworthy.' It is a matter of record that only one has ever been lost from the San Francisco fleet. This immunity from disaster may, however, be chiefly due to good seamanship.

A marked peculiarity, and one which characterizes nearly all of the Mediterranean boats, is the strong 'crowning' or upward curve of the deck in the center, the middle line of the deck being, in some cases, nearly as high as the rails at the side.

Collins continues to describe the long, large hatch amidships which typically extended about half the length of the boat, its opening covered by four or five large sliding hatch covers placed athwartships. The hulls were "tight-bottomed", that is, no caulking was used between the planks of Oregon cedar, which were secured to eastern oak frames. The bottoms were never sheathed with copper but were usually covered with metallic paint. Collins notes that most boats remained in good condition for 12 or 15 years, and some of them much longer (Collins, 1892b:42).

Collins also provides descriptions of two specific feluccas, the first of which is illustrated (Fig. 1, see page 7) (1892b:42-44):

It is a carvel-built, keel craft, with broad beam, moderate depth, and rather strong sheer. It is sharp at both ends, slightly concave at and below the waterline, and strongly convex at the rail, the bow and stern being very similar in shape and having considerable flare above water.
There is a moderate rise in the floor, a round bilge, and a slight flare above water on the midship section. It has a rather deep keel, and a straight, nearly vertical, sternpost, with rudder hung outside. The stem is straight and almost perpendicular above water, and curved below, with a knob or cap on its top, a characteristic feature of fishing boats of the Mediterranean. It is flush-decked, with a large hatchway amidship, nearly half as long as the boat, and more than half as wide. There is a small cockpit aft for the steersman to sit in; this is generally covered with a hatch when not in use. A bulwark, or waist, 6 or 8 inches high, with a rail at its top, extends around the boat from stem to stern, in the ordinary manner.

There are two rowlocks on a side, each fitted with two thole-pins, and one on each side near the stern, each having a single pin. A stout wooden 'hawse piece' crosses the bow from side to side and fastens to the rail about 3 1/2 feet abaft the fore side of the stem. There are three cleats on each side of the deck near the waist, for belaying sheets, tacks, etc., one just abaft the hawse piece, another a little forward of amidships, and one abreast of the cockpit. The deck has a strong upward curve, and the 'crown' of the hatches is made to correspond with it. The mast is stepped nearly amidships, and has a strong rake forward. It is supported by shrouds, or tackles, on each side. Upon it is hoisted a long slender yard, to which is bent a large triangular lateen sail. The halyard passes over a sheave in the masthead, and is bent to the yard about two-fifths of its length from its forward end, a little forward of the point where it will balance. As ordinarily set, when sailing by the wind or reaching, the forward end of the yard comes down near the stem head, where it is held by a tack-rope, while the foot of the sail is nearly parallel with the deck; but when running before the wind it is common to let the forward end go up, so that the yard is nearly horizontal, the sail being held below simply by the sheet. A jib is carried; it is set flying from a long bowsprit that runs through the bulwarks on the starboard side of the stem, extending outboard about 15 feet, and supported by a bobstay and a shroud on each side. The following are the dimensions of the boat referred to:

| LOA, outside of stem to outside of stern post | 32'0" |
| Beam, extreme | 10'5" |
| Depth, top of keel to deck amidships | 5'0" |
| Length of hatch | 14'9" |
| Width of hatch | 5'9" |
| Cockpit | square 2'3" |
| Height of stem above rail | 9" |
| Width of stem and stern posts | 6" |
| Depth of keel from rabbet | 10" |
| Fore side of stem to fore side of mast at deck | 14'0" |
| Length of mast above rail | 24'0" |
| Length of yard | 42'0" |
| Length of bowsprit outside of stem | 14'2" |
| Length of tiller | 4'0" |
| Width of rudder, extreme | 2'0" |

The dimensions of the sails are as follows:

Mainsail:
- Luff | 41'0"
- Foot | 31'6"
- Leach | 36'9"
Jib:
Luff........................................25'6"
Foot.........................................18'0"
Leach........................................16'0"

A boat like that described above will carry from 4 to 6 men in a crew, and will cost from $1,000 to $1,200 when ready for sea, including sails, rigging, etc.

The ordinary dimensions of these boats... are: Length, 23 to 24 feet; beam, 8 to 9 feet; depth of hold, 24 to 28 inches; cost, before rigging, from $240 to $350. The sails and equipment cost about as much as the hull, so that when a common-sized felucca is ready for sea she will be worth from $480 to $700.

The following are the dimensions of a boat of this [smaller, more numerous] class:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>24'0&quot;</td>
</tr>
<tr>
<td>Beam</td>
<td>7'9&quot;</td>
</tr>
<tr>
<td>Depth</td>
<td>2'9&quot;</td>
</tr>
<tr>
<td>Draft above top of keel with 1 1/2 tons cargo</td>
<td>1'2&quot;</td>
</tr>
<tr>
<td>Weight with ballast and outfit</td>
<td>2,500 lbs.</td>
</tr>
</tbody>
</table>

This last description matches exactly the description and drawing provided earlier by Hall; clearly this was the source. The boat's description is referenced to Hall in Table 2 (see page 62). The listed weight, or displacement, of this boat, 2,500 pounds (1133 kg), represents the only time this specification is recorded for a felucca. At first impression this figure seems light for a boat of this size ballasted with something in excess of 800 pounds (360 kg), given the felucca's structural elements, which might be described as moderately heavy. However, calculations based on the loaded waterline for this boat correspond well with results based on the waterlines indicated on other measured drawings of feluccas; this gives credence to the figures of Hall and Collins and helps establish the validity of contrasting available data in that they are based on loaded displacements for all examples.

In Collins' drawing of the 32-footer, slightly hollow floors at the midsection are indicated. At 10.7 tons, this boat has the greatest capacity of those sampled. In a midship construction detail, a beam keel is shown which, as near as can be determined by scaling off the small scale drawing, has a molded dimension of 14 inches (350 mm) and a maximum sided dimension of 4 inches (100 mm) below the frames. There is no planking rabbet. The keel tapers to 2 inches (50 mm) sided some 10 inches (250 mm) below the bottom of the frames which are let into the top of the keel so that the upper surfaces of frames and keel are flush. A keelson, 6 inches (150 mm) molded by 3 inches (125 mm) sided lies above; the method of securing this member to the keel is not indicated. Frames are not tapered and show a molded dimension of approximately 2 1/2 inches (70 mm).
Chapelle drew the lines for two feluccas, the measurements for which were taken from surviving hulls towards the middle of the twentieth century. He bases his general description largely on these boats and the National Museum models (Chapelle, 1951:287-90):

The hull-form was that of a shallow keel boat, double-ended, with a rather upright stem and sternposts. Some of the boats showed a slight curve in the bow profile and some a straight stem with a slight tumblehome above the water. The midssections seem to have followed no standard form. Some showed a very rounded shape, in which the rise of the floor was moderate, the bilges slack, and the sides flaring. Others appear to have had a strong dead rise and a midssection not unlike that of the old New York sloop but without a centerboard. Drawings of larger craft of the type and a rigged model indicate many of these had a rising floor, hard bilge, and a slight flare in the sides. The water lines fore and aft were more or less hollow; the degree of sharpness appears to have varied also.

The rig was a large single lateen sail set on a mast, which raked forward and was not supported by shrouds or stays. The jib was set to a bowsprit which came through the bulwarks to starboard of the stemhead; the latter reached well above the rail. The bowsprits appear to have been hogged downward by a bobstay. On the bowsprit the jib was set flying, as in an old cutter, to an iron ring travelling on the stick. The bowsprits could be run inboard. The mast-head was usually swelled at the halyard sheave and followed the old galley style.

The construction was plain and neat. The frames were sawn, single futtocks of natural oak crooks. The caravel-planking was cedar and was protected by two rather heavy, half-round, oak guards, one on each side at plank-sheer level, and by projecting rail caps, or halfrounds applied to them, at sheer. Between these, some of the boats had a number of small vertical guards spaced about 30 inches apart. The boats were ceiled except in the smallest sizes...

Single thole pins in high chocks on the rail cap were used, and rowing was done standing and facing forward. Stone ballast from about 400 to 1,500 pounds, according to the size of the boat was carried.

The mast was stepped in the large hatch, where there was a mast thwart fitted with the common mast clamp. A heavy wooden beam fitted across the bows, which, with the high stem head was used as a means of securing the tack tackle at any desired position. The beam also supported the heel of the bowsprit, which could be run in when desired.

The boat shown in Chapelle's Figure 105 (1951:287) represents the smallest of the type. Prints of Chapelle's drawing are available from the Smithsonian Institution under the designation ASSC 105, and the boat will be so referred to here. The hull had survived for some years in the Mariner's Museum, Newport News. The measurements were taken by museum staff member S.B. Besse, though the rig and some details had to be reconstructed from photographs. The drawing indicates a hull and deck thickness of 3/4 inch (20 mm). The ceiling may have been 5/8 inches (16 mm) thick, and was laid on frames with a 1 1/4 inch (32 mm) molded size at the heads and 2 1/2 (64 mm) inches at the heels, spaced 12 inches (305 mm)
on centre. What appear to be grown floors are notched over the keel, which measures 5 inches (130 mm) molded by 2 inches (50 mm) sided. Displacement indicated by load waterline is 3,072 pounds (1392 kg). This leaves a freeboard to the deck amidships of only 6 inches (150 mm). A comparison of displacement/waterline lengths among the feluccas where required data is available, show that the load waterline indicated by Chapelle may be high for a boat in this size range. Unusual features include a well-rounded transition from keel to sternpost opening a 6 inch (150 mm) gap between the keel and rudder heel; the lower gudgeon is located barely below the waterline. The keel has a rabbet for the planking, a feature ascribed nowhere else to feluccas; as this feature may not be obvious on an intact boat, it is possible that Besse assumed this detail. The mast is also located uncharacteristically far forward, the step is located only a third of the waterline aft, while the mast displays very little rake forward.

The second felucca drawn by Chapelle (1951:289), designated ASSC 106, is a somewhat larger version, approaching the average size. Its lines were taken by Henry Rusk in Sacramento in 1941, with Chapelle drawing in the topsides from photographs. A replica, based "loosely" on these lines was built by Dean Stephens in 1975 (Gilkerson, 1976; 1977). The Matilda D. is now displayed on dry land at the Hyde Street Pier in San Francisco, but did not prove a successful sailer. The boat was very tender under sail, and its leeward decks submerged at a relatively low angle of heel. Staff members of the National Maritime Museum have since speculated that errors in the original measurements taken by Rusk led to Chapelle drawing "screwy" lines with insufficient freeboard, too great a deadrise, and a bilge which is too slack (Steven Canright, pers. comm. 1989). A glance at Table 2 (see page 62) shows that all calculations based on this boat's underbody are in line with other recorded feluccas; the problem would not seem to lie with underbody shape. Not shown in the calculations are this boat's slightly hollow floors amidships, a characteristic shared with Collin's 32-footer. On the other hand, if the USNM models are discounted (see page 64), it is the most shallow hull (proportion of depth, amidships sheer to fairbody, to length overall) considered, and the only hull based on lines drawings which would be rated as shallow according to McKee's parameters (1983:81; Appendix B) even if the depth measurement were taken from the sheer (top of the bulwark) instead of the deck. It seems most likely that the error occurred in Chapelle's interpretation of the topsides which he acknowledges were not measured, but drawn from photographs; the likely result being an inaccurately low freeboard. The plans which Henry Rusk developed for Stephens from Chapelle's lines are not available for inspection. It is
possible that the replica also carries too much canvas, as Chapelle did not include a sail plan. One change incorporated in the replica was a beam increase from 8 feet 1 inch to 8 feet 10 inches (2.46 - 2.69 m), apparently in anticipation of stability difficulties. The increased beam, however, seems to have been added entirely above the waterline creating an extremely slack bilge with unimproved initial stability. Adding beam to an already relatively beamy boat without freeboard increase would actually submerge the deck at an even smaller angle of heel, quickly offsetting what little stability might be gained as the broadened sections are submerged with inclination. Weight of the replica was guessed by the builders to be about two tons without ballast. ASSC 106 displaces 5,237 pounds (2,375 kg) calculated to Chapelle's loaded waterline.

The keel of ASSC 106 is unusually wide, gradually broadening to a sided dimension amidships exceeding 7 inches (180 mm) amidships, as if for a centreboard. The typical felucca keel, on its lower face, has a sided dimension of about 2 inches (50 mm) regardless of boat size. These keels could extend up to 12 inches (300 mm) below the garboard, but on this hull the keel extends externally less than 5 inches (130 mm). ASSC 105 and 106 both have a slight drag to their keels as do the models USNM 22213 and 22214.

Chapelle notes on his plan of ASSC 106 that the boat carried the number "28 D 915", and was formerly "B891". It is not uncommon for these boats to be unnamed. As fisherman Bud Wetton noted: "We never put a name on the boat. My Dad said, 'The fish commissioner would get to know you too much, you got a name up there broadcastin', the fish cop will know that boat too much'" (cited in Kowalla, 1992:27). Old registration numbers should be noted, however, as future research may be able to link these numbers to specific fisheries, or localized areas of fishing activity. The earlier registration seems to correspond with the licensing system in place in the 1880s under which boats were rated by the number of men carried; a "B" licence was for boats carrying three men.  

Another boat for which lines are available is a boat measured by the Works Progress Administration, part of the Historic American Merchant Marine Survey, number 16-21, entitled "Lateen Rigged Fishing Smack." The plans are available on three sheets from the Smithsonian Institution under

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15 An "A" licence was given to a boat with a crew of less than three men, and is the licence most likely granted to boats fishing only salmon. "C" licenses were for four-man boats, and so on, to "E" licenses, given to boats with crews of six or more (Collins, 1892a:128). Weaver states that only those boats which used "net and seine" required annual licences. "About 30 [boats] use nets for the purpose of catching crabs, ... (25) are boats that use trawl lines and fish beyond the Heads, and are not subject to pay a license" (1892:151).
the designation HAMMS 16-21, including a sail plan (copied from Collins, 1892b:Plate XIV), construction details (Fig. 11), as well as lines. There are no details with the plans indicating the history of the boat surveyed. Like ASSC 105, HAMMS 16-21 represents a felucca of the smallest class. These two small feluccas share comparatively flat floors and a full, low turn of the bilge. HAMMS 16-21 is proportionally the most beamy of the boats sampled, while its keel protrudes the least, only two inches extending below the garboard. The construction plan reveals some telling details. A belaying pin protrudes from a curved chock mounted "on the starboard rail only"; this feature may have been used to haul crab pots as it is visible in photographs of crab boats (NMM A12.114Gpl; B7.24170p). The "hawse piece", used to secure the inboard end of the felucca's bowsprit, is lacking, and the customary hole for the bowsprit to pass through the bulwark just to starboard of the stem is not indicated. Given that the drawn sail plan, which includes a jib set to a bowsprit, was based on Collins' sail plan for a 32 foot boat, HAMMS 16-21 may have been a silena, without jib or bowsprit. However, examination of the maststep shows that it is placed very far forward, just over 5 feet (1.5 m) from the stem, near the forward end of the hatch. The angle indicated in the construction profile drawing by the step in relation to the hinged mast clamp at deck level shows no forward rake at all (Fig. 11). The sail plan bears no relationship to construction plan details. The mast placement and alignment is not that of a lateen rig at all, but would be more appropriate for a gaff, or sprit rig. While the standard crab boats sported sprit rigs and had shallow keels, they usually flew jibs from small bow sprits, typically had a deck layout comprised of a single large cockpit, and had transom sterns.

The substantial, crowned thwart (6 by 2 inches (150 by 50 mm) in this case), which characteristically spans the middle of a felucca's hatch and partners its raking mast at deck level, is present on this boat, but shows no accommodation for a mast. Two lodge knees secure each end of this thwart while single lodge knees help to anchor each end of the mast.

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16 The "hawse piece", to use Collins' terminology (described simply as a beam across the bows by Chapelle), is often an carefully shaped timber which provides a transition between the bulwark and filling pieces of the bow. This feature is usually considered unique to the Mediterranean. With timber heads secured through it, the macarroa, as it is called in Portugal, is a very solid structure used for securing the tack ropes, the poggia and orza, anchoring the heel of the bowsprit and attendant tackle, and serves as a mooring bollard (Leitao, 1978:17; Rosellini, 1988:416; de Negri, 1988:525).

17 Without exception, examined photographs of feluccas and silenas show strongly raked masts for lateen rigs placed approximately amidships.
Figure 11. Construction details of a felucca. Recorded as part of the Historic American Merchant Marine Survey, 16-21 (Courtesy of the Smithsonian, NMAH, Division of Transport).

partner and each end of the aft main hatch beam. Light soles have been placed in the way of both hatches, but there is no ceiling over the frames, only two stringers, measuring 1 by 2 1/2 inches (25 by 64 mm) in section, stretching for less than 11 feet (3.3 m) within a few inches of the keel. There is no keelson. Steam-bent futtocks are consistent in section, except at their heads near the boat's ends, measuring 1 1/2 inches (38 mm) sided by 1 inch (25 mm) molded, and butt over the keel. Sawn floors double the frames; amidships the floors measure 3 inches (75 mm) molded by 1 inch (25 mm) sided, and extend about 11 inches (280 mm) either side of the centreline. The beam keel is very shallow for the type, measuring 3 inches (75 mm) molded by 2 inches (50 mm) sided. It is
Figure 12. *Nuovo Mondo*, felucca replica (photograph by author).

chamfered but not rabbetted for the garboard. Planking is 3/4 inch (19 mm) thick.

The lines for another small felucca were taken in 1986 by Marco Meneketti. The boat had been converted for power, but the original lines remained beneath layers of fibreglass, except where the stern had been modified to take a propeller. The data was used by Larry Hitchcock to build a second felucca replica for the National Maritime Museum in 1987 (Fig. 12). This replica, named *Nuovo Mondo*, has proven far more successful under sail than the *Matilda D*. Its length is 18 1/2 feet (5.64 m) with a beam of 6 feet 8 inches (2.03 m) and a draught of 1 foot 8 inches (0.51 m). Unfortunately, the original lines taken by Meneketti have been misplaced, and the Museum has not been able to locate the offsets used by Hitchcock in the construction, so no further information on hull form or construction can be relayed here. The original hull has been destroyed.

While it may appear that the last felucca for which excavation will not be necessary to recover may have disappeared, there remains the hope that somewhere a survivor still exists. These hopes were fanned with news that a felucca was still in use on Tomales Bay in 1986. The boat is said to have been built in the 1890s; it had been preserved in recent years by
a restauranteur who still propelled his craft with oars to set crab pots (Tom Fordham, pers. comm. 1991). There were apparently two feluccas on Tomales Bay as late as 1976 (Douthit, 1977:30). While these boats had apparently been largely rebuilt over the years, some original planks and steam-bent frames remained (Gilkerson, 1976:46). Unfortunately, neither boat could be located in 1992. A photograph, however, taken in 1986 shows a 24-foot (7.3 m) felucca lying at its mooring. There is no sign of a sailing rig. With no trace of gudgeons on her stern post, the boat has apparently not been sailed for some years. Fordham asserts that the boat may never have been rigged for sail (pers. comm. 1991). However, there is a broad, flat thwart across the forward end of the main hatch, which is pierced by a hole large enough to take a small mast. The positioning corresponds with the mast partner on the HAMMS 16-21 boat. A sprit rig may once have been used. The felucca's usual midship thwart is also visible, but no accommodation for securing a mast is evident. Two pairs of oar chocks show the wear of many years use. The oars lying on the deck are each fitted with a grommet, or strop, which passes over a single thole-pin, the wear marks showing that the oars work in front of the pins, the strops bearing the pull of the strokes. It cannot be seen whether the oars have rounded blade tips, a characteristic of the traditional Italian oar (Gumina, 1976:13).

In 1900, Brooks stated that the Italian fishermen, who always rowed standing, facing forward, invariably use the "thole-pin and grommet" arrangement, as this enabled them to trail their oars quickly when necessary to handle their nets (1900:238). However, the boats which might safely be presumed the earliest in this study, that is the National Museum models, and boats drawn by Collins and Hall, all have chocks mounting two thole pins each.16

With respect to the use of rigs other than the lateen on feluccas in San Francisco, opinion has been divided. Some secondary sources (eg Gumina, 1976:13) claim that some of the smaller feluccas were sprit-rigged to enhance windward performance. In some photographs of feluccas tied at the San Francisco wharves, there are sprit rigs visible in the row of lateen-rigged boats (Tom Fordham, pers. comm. 1991). However, in the photos examined by this author the sprit rigs belonged to the small

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16 In Collins' (1982b:43) description, although the 2 sets of midships chocks, or rowlocks, have two thole-pins each, the pair in the stern near the helmsman's well have one thole-pin in each.

McGrall and Farrell provide some ethnographic background to rowing methods (1979:159-160); however, they may leave the impression with the reader that the arrangement of thole straps, or "grommets" bearing the weight of the stroke with thole-pin behind the loom of the oar is rare in a modern context (1979:159-169), whereas it is quite common in the Mediterranean (Gillmer, 1941, 1942, 1972:16-17; Gaspard, 1987).
transom-sterned crab boats, in one instance a Columbia River sailing gillnetter, or the hulls were too obscured for identification. Feluccas used in San Pedro were sloop-rigged with gaff mainsails in a fishery for barracuda and halibut which involved a lot of windward work; in the local conditions of Catalina Channel not only did gaff-rigged feluccas point higher, but they were said to be faster also (Buckwalter, n.d.). The boats had been built with a lateen rig in San Francisco, and retained the heavy midships thwart to which the mast had originally been secured; leaving this member in place served "a useful purpose in strengthening the hull and preventing it from working in a seaway..." (Anon, n.d.:1). The new mast placement was farther forward, stepped about 5 feet (1.5 m) aft of the stem (Buckwalter, n.d.), the bowsprit, and jib were retained, but a pair of shrouds secured to chainplates at the bulwarks were added to each side. A sprit rig would also require a mast stepped well forward, but would generally not have shrouds.

Lateen-rigged feluccas had neither shrouds nor stays; the guntackle halyard, known as a drizza (Rosellini, 1988:416), was secured to one of two eyes secured to the deck near the bulwarks port and starboard slightly aft of the mast step. It is generally accepted that the drizza was set to windward where it functioned as a shroud/backstay (eg Shaw, n.d.:12). Alternatively, another tackle, a sort of running shroud could be set on the opposite side to the halyard (Gilkerson, 1977:46). Undoubtedly, in strong winds these tackles would provide welcome support, however, photographs of boats under sail show the halyard often left set to leeward with no support on the windward side of the mast19 (Fig. 9, see page 59). The mast was clearly strong enough to stand in most weather conditions unstayed. The wind-spilling flex of an unstayed mast and the long, tapered antenna was surely a safe feature in the gusty conditions often found in San Francisco Bay.

By the turn of the century the stone ballast noted by Hall and Collins seems to have been replaced generally by cast pig iron (Anon., n.d.:1). Brooks claims that ballast was not carried at all (1900:238). Several references, along with replica building experience, convincingly contradict this statement in the general sense; however, it may be true that some feluccas were not ballasted. Feluccas rigged with gaffs in San Pedro seem to have increased their ballast, carrying a ton of ballast (1000 kg) in boats only 26 feet (8 m) long (Buckwalter, n.d.).

19 The felucca yards were not tacked around the mast, as photographs also frequently show yards to windward and sails pressed against the mast, on the "wrong" tack. The condition of sails set free to leeward of the mast was known as alla bona; a d'ardos described the sail's condition when pressed against the mast (Rosellini, 1988:419).
It is unfortunate that more is not known from primary sources about how feluccas were built, who built them, and under what circumstances. While Collins states all market fishermen repaired their own boats:30 the "...boats are built at San Francisco by Italians and Greeks, who also turn out small craft of this type for use elsewhere along the coast. There are three boat-building shops (with an average value, with accessories, etc., of about $1,000) that employ two or three men each" (Collins, 1892a:120). According to Shaw, felucca builders were "invariably Italian" who built to no particular set of lines, but from a set of molds which they adjusted "to suit the ideas of the owner" (Shaw, n.d.:12). One yard known to have built feluccas in the early years of this century was the Atlantic Boat Building Plant, located at the foot of Turney St., Sausalito. The builder, Stephen Brigante, sold the business to J.H. Madden in 1915 (Tracy, 1983:97); perhaps he was unable or unwilling to make the transition to building power boats.

The Monterey clipper was the engine-powered successor to the felucca, which retained many of the former's Mediterranean features. Some yards known primarily for building Monterey Clippers began by turning out sail boats; the Genoa Boat Works, opened by Mr. Bevaciaqua in 1902 next to the then newly-relocated Fisherman's Wharf, is an example. Most of the building techniques used on the Monterey clippers were inherited from the felucca builders. Yards building Monterey clippers, like Labruzzu's, continued to plank their boats with Port Orford cedar, sometimes steaming the 7/8 inch (21 mm) planks into place. Caulking was used only between the garboard and the keel which was not rabbeted. Fir was used for the deck beams and deck (Douthit, 1977:30; Defur, 1989). The planks were secured to frame molds and steam-bent oak frames were secured to sawn oak floors as the molds were removed. The floors rested on the keel and were not notched into it (Kowalla, 1992:28). On the older boats frames were sawn (Gillmer, 1972:67). At some point the keel material of choice became Australian spotted gum (Douthit, 1977:30).

Both steam-bent and sawn frames were used on feluccas (Steven Canright, pers. comm. 1989; Tom Fordham, pers. comm. 1991). Frames were both notched into the keel (eg Collins' boat) and rested atop it (eg HAMM 16-21). Floors were sometimes sawn from straight-grained wood, but were probably more often taken from grown stock. Although the practices of using steam-bent frames exclusively, and resting these atop the keel became universally popular with the later Monterey's, no dramatic change in these practices can be directly linked to the transition to motors.

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30 By 1885, 265 boats, mostly feluccas, were already operating out of the Filburt St. Wharf in San Francisco (Gumina, 1978:97).
It is not clear if any feluccas detailed in this section were used to fish salmon. Weaver mentions that the larger boats were used to fish for salmon, although they fished other species in season (1892:51). He may be implying that, in general, it was the owners of the larger boats who were most able to afford the disparate gear types necessary for fishing various species year-round. However, some boats were built for specific fisheries: Gumina states that builders modified the placement of their molds "according to the desires of the owner and the type of fish gamed" (1976:13). A young Sicilian fisherman, Gaetano Tarantino, came to San Francisco in 1883 at the age of 16, "purchased a boat and set out to fish salmon. Within a few years... he purchased another boat and hired a second crew and became one of the most successful salmon fishermen of San Francisco Bay" (Gumina, 1976:9). A young fishermen straight from the old country would certainly not be able to purchase a large boat.21 Salmon gill-netting feluccas operating out of San Francisco probably fished the grounds located in the northeastern portion of San Francisco Bay (Fig. 13) until June, but may not have travelled the greater distance into the inner grounds of San Pablo and Suisun Bay later in the season.

Photographs of Italian fishing boats at Marin County docks, or other areas closer to salmon gill-netting grounds than the city docks of San Francisco, consistently show the smaller varieties (e.g. Weaver, 1892:155; NNM photo:B6.17780p; Tracy, 1983:97), supporting an hypothesis that any feluccas specifically built for salmon were small.22 The smallest two boats in this study (ASSC 105 and HAMMS 16-21) share two important qualities besides size: relatively flat floors; and masts stepped so far forward as to argue against the rigs being lateen. With relatively shallow draughts and sprit rigs these boats would be better suited to the shoal and sometimes narrow waters of the Sacramento River and its approaches where a deeper boat with a lateen-rig would maneuver less easily. Unfortunately, to confound this line of logic, it must be noted that, in their respective seasons, herring, shad, flounder, perch, 21 Gumina does not state explicitly that the boats purchased by Tarantino were feluccas. Most Sicilians fished for salmon with Columbia River sailing gillnetters, but were based in riverside communities and fished primarily for Sacramento River salmon canneries to which they remained in as close proximity as possible. The fact that Tarantino fished for the San Francisco market and was based at the city’s market docks where Columbia River sailing gillnetters were a rare sight makes it very likely that his boats were feluccas.

22 In future examinations of photographic evidence for feluccas fishing salmon, a useful lead is provided by Brooks, who notes that while Italian fishermen had adopted circular cork floats for most of their nets, those fishing salmon "still use the turned egg-shaped floats" (1900:238).
sturgeon and smelt were also sought in shallow waters with feluccas (Collins, 1892a:126). Weaver states that "the larger boats" generally fished for these species "in their respective seasons" (1892:151), but he may again be referring to the larger boats of more prosperous fishermen who could afford to diversify, purchasing varied gear for different fisheries and seasons; or, he may simply mean that the boats were larger than the smallest boats of the fleet, crab boats, in other words, "larger" boats were more than 18 feet (6 m) in length.

Collins samples 126 San Francisco market boats by length. Eight of them fall within the 32 to 36-foot (10.5 - 12 m) range, 51 are between 20 and 25 feet (6.5 - 8 m) long, 20 are between 18 and 20 feet (6 - 6.5 m), while 47 are between 15 and 18 feet (5 - 6 m) in length (1892a:128). 15 of the largest feluccas from the San Francisco Bay area used trawls year-round outside the Golden-Gate (Collins, 1892a:126). These boats clearly constitute a distinct class by length and seem not to have been used at any season to fish inside waters. Many smaller boats joined them in the summer months. The smallest boats Collins lists are certainly crab boats. Alexander states that throughout the Bay "on an average 100 boats follow crab fishing year round; the smallest boats, as a rule, are used in this fishery" (cited in Collins, 1892a:129). It is impossible to state at this time what length of felucca between the two extremes may have been preferred, or specifically built for fishing salmon.

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23 Drift gillnets (albeit with varying mesh sizes) were also used for shad, and sometimes for herring and smelt (Collins, 1892a:126).
Whitehalls on the Sacramento River

Nathaniel Wyatt's efforts in 1849 to establish an annual fishery for salmon on the Sacramento were thwarted when his crew abandoned him for the nearby gold fields. Gold continued to lure fishermen away from the Sacramento; in 1858, two-thirds of them abandoned their nets again, this time to make for the fields up the Fraser River (McEvoy, 1986:71). But the fishery's commercial beginning was made possible by the market created with the huge influx of people brought by gold. Among the first to see value in the living resource of Sacramento River salmon were New-Englanders. In the fall of 1849, three men fresh from New Haven, Connecticut, began experimenting with different kinds of twine to make gill-nets (McEvoy, 1986:71):

After they found shoe thread heavy enough to pull twenty- to thirty-pound salmon out of the Sacramento and customers eager to pay a dollar a pound for them, several partnerships formed at once in Sacramento City. In 1852 the harvest produced 332,000 pounds of salmon at fifteen cents per pound. In contrast to the generally high price of foodstuffs in California at the time, another New England native noted that fifteen cents "would be low at home." The resource was abundant enough, however, to sustain a profitable fishery at that price. Shipments of cured fish began leaving San Francisco for Australia, which became one of the industry's most important markets in 1853.

The future canning pioneer, William Hume, was among these early fishermen. He arrived in 1852 ostensibly to seek gold, though he had had the foresight to bring with him a net made back home for salmon on the Kennebec River, Maine. Seeing salmon run in numbers unlike anything his East Coast fishing experience had prepared him for, he remained on the lower Sacramento with two other men, fishing as his family had done on the other side of the continent since the American Revolution (Hume, 1920:71).

From what manner of boat Hume and the other New England immigrant fishermen set their nets is not known. But, by 1860, even after Italians, Greeks, and other Mediterranean immigrants had come to dominate the salmon fishery, Whitehall boats were most commonly used on the Sacramento (McEvoy, 1986:70; Kirkpatrick 1860:3). Though "skiffs" were also used on the river, this eastern, round-bottomed transplant may have been used from the outset of this commercial fishery.

"Through the 1850s some sixty boats worked the Sacramento from a few miles above Sutter's Fort, at the confluence with the American River, down to its outlet into Suisun Bay. ...prices were apparently high enough and the fish abundant enough that one 'drift' produced a satisfactory daily income..." (McEvoy, 1986:70). On the Sacramento River gillnets were set on ebb tides. Except during spring run-off, boats fished only at night (Collins, 1892a:165). Before hydraulic mining depleted the Sacramento's spawning beds two fishermen in a boat could bring in 300 fish in a night
at the height of the run (Kirkpatrick, 1860:4). Even if fishermen received only five cents per pound, a third of retail price, with a haul of 300 fish averaging 15 pounds (6.8 kg) a piece, each fisherman would earn over $100 a day, a very respectable sum even for heady Gold Rush years. Fish could be caught year-round with gill nets on the river, but the largest catches were only made during two annual runs, in the months of April and May, and in August and September (Collins, 1892a:162). Collins' resident informants claimed that "in the early days... as many as 1,000 boats were used on the river between Sacramento and San Francisco Bay" (1892a:166), but as Jordan acknowledges only 853 fishing boats for all of California in 1879 (1887:594), this figure is surely exaggerated. Nevertheless, 200,000 salmon were taken out of the river in 1857 (Muscatine, 1975:225).

Fish were unloaded at steamer landings for delivery to San Francisco's fresh market, or sometimes, at the peak of the runs, steamers would stop to take on fish directly from the boats (McEvoy, 1986:70). Some fish were salt-cured for export (Kirkpatrick, 1860:6). The export of salt-cured salmon, particularly to Australia and the Atlantic seaboard, expanded rapidly around 1860, the business benefitting from plentiful salt now available from San Quentin and Carmen lakes, and then by the outbreak of Civil War (Smith, 1857a:121; McEvoy, 1986:67). As the runs declined, and food imports slowed the price of salmon at market rose to $1 per pound in 1862 and 1863 (Jordan, 1887:614). Fishermen prospered and remained independent, owning their own boats, as well as the scows on which they lived during the runs.24

The Whitehall boat (Fig. 14) is said to have came into existence around 1820 in New York, taking its name from the New York waterfront street. "The New York Whitehall was apparently an accepted and recognized type, or class, by the end of the 1830's, and by 1855 was in use in practically every large port in the United States" (Chapelle, 1951:196).

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24 In 1889, salmon caught on the Sacramento at the height of the August run ranged from 5 to 50 pounds, (2.3 - 23 kg) but 15 pounds (6.8 kg) was average. Average weights seem to have been greater in earlier years (Smith, 1857a:121; Collins, 1892a:162).

25 Placer miners working "moderately successful" claims would earn $600 a week. "Poor ground" could yield as much as $15 a day, while the average working man in the United States at this time could only expect about $3 a day (Watkins & Olmsted, 1976:22).

26 These scows would remind Collins in 1888 of the "arks" used by gill-net shad fishermen on the Potomac River (1892a:164).
Figure 14. Gill-netting from a Whitehall boat on the Sacramento River (from Kirkpatrick, 1860:5).

Though Whitehalls were best known as harbour runners, the Sacramento was not the only place they were used as fishing boats: the Connecticut River shad boat; the Hudson River shad boat; the Cape Roseway wherry; the Reach boat; and the Delaware gill-net skiff, were all East Coast fishing boats based on the Whitehall model (Chapelle, 1951:200-203; Barton, 1976). Whitehalls also fished the Columbia River (see pages 120-121).

Whitehalls followed the model of the fast pulling boats, wherries, cutters, and gigs. The proportions were relatively lean with a fine entry and an elegant heart-shaped transom. The Whitehall is defined not only shape but other characteristics as well (Bray, 1979:121):

Her frames must lay square to the keel and be bevelled to fit the planking which is hung later; her frames also must be tapered so they are deeper at their heels than at their heads. Whitehalls always had an oak sheer strake, bevelled on its lower edge to fit against, and stand out slightly beyond, a matching bevel on the top edge of the binding strake as the
second plank down was called. The rest of the planking was smooth seamed. An inwale always covered the heads of the frames and a horseshoe-shaped stern seat with a backrest was standard on whitehall models. 

"By 1840, the New York Whitehall was being built in quantity production, on a stock-boat basis" (Chapelle, 1951:198). Prior to the eruption of war Whitehalls could well have been imported whole from East Coast yards. It is not clear how quickly boat-building developed in California. By 1848, Napa, Benecia, Stockton and Sacramento, all had ship-building facilities turning out small vessels for local requirements (Wyllie, 1917:61). However, items requiring specialized manufacture continued to be imported: a drydock, boilers and engines, even knock-down steamer hulls were brought from the East in the 1850s (Wyllie, 1917:61), while prices for labour and materials remained much higher in California than in the East through the 1860s. Whether boats used in the Sacramento fishery through the 1850s and 1860s were built locally in undocumented boat yards or were imported as stock boats from eastern yards is uncertain.

Another boat of eastern origin was the catboat. Shaw remembers seeing these boats, which found employment primarily in the oyster trade, still being used in the last decade of the nineteenth century. He notes, however, that catboats were "not particularly suited for the Bay on account of the high winds and short tidal seas" (Shaw, n.d.:10). On the other hand, the Whitehall was well-suited to Bay conditions; it "...rowed easily and moved fast in smooth or choppy water; it was safe, carried a load easily, and was dry. The boat was not for use in the open sea, but was designed for large bays and harbor work, where a heavy chop might be met" (Chapelle, 1951:195). After the Whitehall was replaced in the salmon fishery by the Suisun Bay/Columbia River sailing gillnetter it continued in use as the popular harbour utility boat and a recreational club boat.

The J.C. Beetle boat-building firm of New Bedford began operations in San Francisco in the 1880s following the Whaling industry. Though primarily concerned with whaleboat manufacture, the firm joined other local yards building Whitehalls for West Coast use. Beetle probably brought molds with him from the East Coast for both his whaleboats and Whitehalls (Ansel, 1978:35). Shaw recalls his experiences with general-purpose Whitehalls around the turn of the century (n.d.:4-5):

There were four thwarts, as I remember. The first was pierced for the mast, but I have forgotten from which thwarts she was rowed. The oarlocks were of wood, rounded on the outer edges, and consisted of oak strips about two inches wide, and thick enough to slip between the clamp and planking. In other words they were about the thickness of the ribs, which were not very heavy. Old whitehall boatmen have told me that the oarlocks extended down about the depth of two planks, and were fastened at their lower end on a kind of riser. I
have forgotten this detail. There was a long, shallow centerboard, made of wood, that extended between the two thwarts -- which ones I have forgotten, but I can remember sitting astride this when we rowed. The case did not extend above the thwarts. The ribs were about a foot apart. The boat was a rather light boat, being essentially a rowing boat, but using sail when conditions warranted it. The mast was a short mast and fitted with a long, low spritsail. No shrouds were fitted to the mast, and the mast could be taken down, with the sail rolled about it, and stored in the boat. They carried a small jib, set flying, and fastened to the stem head. As I remember, the 22 footer I had, carried a slight lee helm. I can say they were not good surfboats, or we were not good surfmen. When I was about 15 or 16, a chum and I tried to take one through the surf near Point Reyes. We didn't make it, and the surf scattered boat, small boys and various other equipment all up and down the Pacific Coast north of S.F. Also this same chum and I tried to buy one from Beetle. He said he would build one for $5.00 per foot. My chum offered to buy the middle foot, thinking that Beetle would have to throw in the ends. But Beetle was a good businessman and saw through this, and the deal fell through.

The 16 foot or bastard Whitehall was a smaller counterpart of her larger sister. There were not so many of them used. I think they only rowed two pairs of oars. They were fairly fast under sail, but not particularly good to windward, probably on account of their small sail plan. These boats were built to plans as I remember. Each builder had a set of molds, that he shipped out or contracted to suit the whim of the buyer. Several years ago, I found a set of these molds in the possession of an old Whitehall builder, and tried to borrow them to make a drawing. Norwithstanding [sic] the fact that I had known him all my life, and had done him many favors, he refused to let me use them, unless I gave him $125.00. He was one of those pig-headed Englishmen that had no interest in nautical research. He died a year ago, and maybe I can find those molds. A number of years ago I found two old ones in storage, but I do not remember where. If I could find one I would try to take the lines off.

Beetle's $5.00 per foot price seems at par with the East Coast prices. John Gardner has located an 1891 catalogue for a Boston boat-building firm, Partalow's (Gardner, 1973:37-39). Partalow's Whitehalls could be built to one of six standards, or grades, ranging from "Fancy, Grade A" to Utility and costing from $6 to 3.75 per foot. Interestingly, dories and skiffs offered by the same company were more expensive, ranging from $7 down to $5 per foot. The principal difference in costs for Whitehalls was based on materials: Grade A utilized "Selected clear Cypress or cedar plank, White Oak frame, mahogany seats and benches, gratings and backboards, rudder of oak or cherry, copper fastened and burred. Finished in oil shellack, and varnish. Polished Rowlocks and Stem Band" (cited in Gardner, 1973:37); Grade D employed "Good sound Cedar planking. White Oak frame, Ash seats, Cedar or Cypress benches, backboard, grating and rudder, galvanized clinched fastening" (cited in Gardner, 1973:38). Two still cheaper grades with copper or galvanized
fastenings were available which used six instead of seven strakes, thereby saving the builder both lumber and labour. Price per foot quotations indicate that boats were built on the same molds, which were moved further apart or closer together as suited boats of different lengths. Same-sized boats were the same shape regardless of grade (Gardner, 1973:39).

Shaw apparently never found any Whitehall molds on the West Coast, leaving researchers today to rely on generalized descriptions, or the hopes of finding a surviving hull. Chapelle claims that the Pacific Coast model developed some distinguishing characteristics (1951:198):

A very similar boat [to the Boston Whitehall] was used at San Francisco, but with greater proportionate beam. The Pacific Coast model was apparently the most powerful of all and was often fitted to sail. Here the crimps' boats were 22 feet long and usually carried a jib tacked to the stem-head, in addition to the low spritsail. Both the Boston and San Francisco boats usually had their centerboards off center, with the slot in the garboard. The 22-foot boats carried three oarsmen rowing six oars. The smallest Pacific Coast Whitehall was 16 feet long. All Whitehall boats steered with an outboard rudder, controlled by a yoke and rudderlines. The San Francisco boats were built of imported eastern cedar, which had many small "pin" knots, and with imported oak frames, steament. Some bastard Whitehalls were fitted with washboards but were otherwise the same as the standard model.

One surviving Pacific Coast Whitehall is believed to have been built about 1890 by the San Francisco builder George Kneiss: Azulkykit was discovered beneath a house in Inverness, California, in 1963, and is now part of the Mystic Seaport Museum collection. The boat was fully documented with lines, offsets, sail plan, and construction drawings, by R.H. Baker in 1967. Unfortunately, Azulkykit was built for a boat club, and is not an example of a working Whitehall. At 14 foot 11 1/2 inches (4.56 m) overall length it is smaller than even the smallest "bastard" Whitehalls used commercially. In contrast to the small East Coast Whitehalls reproduced by Chapelle (1951:197,199), ASSC 72 and ASSC 73, it does not show the greater beam which might be expected (the length to beam ratio is 3.56 compared to 3.29 and 3.88 respectively), but the floor is somewhat flatter. The depth of Azulkykit is noticeably greater, however, at 1 foot 9 inches (53 cm) providing a beam to depth ratio of 2.41 compared with 3.09 and 2.86 for the two East Coast models. While the eastern boats have a centre of flotation just aft of waterline midpoint, Azulkykit, has a centre of flotation 46.8 percent of its length from the stem. The West Coast boat's keel is plank in form measuring 3 1/2 by 1 inch (89 by 25 mm), while the Boston Whitehall (ASSC 73) has a beam keel, and the similarly-sized Whitehall from New York (ASSC 72) has a plank keel of nearly twice the sectional size at 7 by 7/8 inches (178 by 22 mm). ASSC 72 also boasts a keelson, a feature not found on the other two Whitehalls. Where ASSC 72's planking is a thin 3/8 of an inch (10 mm),
the skin of the West Coast boat is thicker at 1/2 inch (13 mm), and as on
other boats of this class the seams were caulked. The frames of Azulykit
are 3/4 inch (19 mm) square at the heel whereas the ASSC 72 frames are
rectangular in section measuring 1 by 1/2 inches (25 by 13 mm). The mast
step position at 25 percent of waterline length seems to be typical, at
least for Whitehalls carrying a sprit sail without a head sail. The West
Coast centreboard is mounted on the centreline while the Boston Whitehall
has one offset.

Several of Azulykit's distinctive characteristics highlighted in
this brief comparison contradict Chapelle's description of Pacific Coast
Whitehalls. However, as this example is not a work boat, it was built
long after the Whitehalls which were used in the salmon fishery, and is
undersized. There is little to be learned from it beyond the inference
that Whitehall form and construction might be as varied on the West Coast
as it was on the East.

Another Whitehall built for pleasure on the West Coast may be viewed
at the maritime museum at Eureka. Built for local timber baron William
Carson, the boat has been finished to yacht trim in all respects.
Interestingly, a boat-builder could not be found in the town just before
the turn of the century, so a plumber was contracted to build this boat,
which he turned out so very beautifully. While it stands as a tribute to
the abilities of an untrained builder working in an isolated area, this
pleasure craft was not measured.

Unfortunately, no example of a working Whitehall has been located
for study. A Whitehall had been on display in front of the Sausalito City
Hall (Steven Canright, pers. comm. 1992). However, the boat was removed
before it could be determined whether it was a working version. Results
of queries with civic officials leave the impression that the boat was not
destroyed, but no one seems able to locate it (Marco Meniketti, pers.

Finally, it is clear that very little concrete data regarding
Whitehalls used on the Sacramento River are currently at hand. It is
known only that the favoured size was relatively large, ranging between
nineteen to twenty-two feet in length of keel, with a beam from four to
five feet (Kirkpatrick, 1860:3-4). They were rigged to sail with a sprit,
but whether they regularly mounted centreboards is uncertain. One drawing
indicates that shrouds were rigged (Kirkpatrick, 1860:3), though this is
contrary to later documentary evidence and usual practice on Whitehalls.
There is no indication that any were clinker-built. Two men comprised the
typical crew. When the first of these boats were used to fish the
Sacramento is not clear, but they likely were well-represented by the mid
1850s and probably before. By 1860, they would have been made locally, if
not before. Versions intended for fishing may have relied less heavily on imported materials than those used for harbour duties or pleasure. Whitehalls were rapidly replaced as salmon fishing boats by Suisun Bay/Columbia River sailing gillnetters in the 1870s, though they continued to be manufactured by Bay area yards for use as light harbour transports and pleasure craft into the twentieth century.

Suisun Bay boats

Suisun Bay is a two mile (3 km) wide bight located between the confluence of the Sacramento and San Joaquin Rivers and San Pablo Bay at the northern end of San Francisco Bay (Fig. 13, see page 79). Its shallow waters constitute a large part of the Sacramento River estuary. Here, the salmon congregated prior to ascending the Sacramento and San Joaquin Rivers, and their presence attracted gill-netting fishermen. With the advent of salmon canning in the area, many canneries would be located on the river banks in the vicinity of Suisun Bay.

The first cannery, however, was located about 50 miles (80 km) upstream from Suisun Bay. The cannery was located on a barge moored in front of the cabin which had been built by William Hume and his two fishing associates in 1852 at Washington, (its name changed later to Broderick), across the river from Sacramento City. Hume, joined by his younger half-brother George and a tinsmith named Andrew Hapgood, began canning operations in the spring of 1864.27 The operation was small and primitive. With scarcely more than a half dozen employees, all the cans were fabricated with hand tools, and about half the pack of 4,000 cases spoiled. Nevertheless, a market was found through the trade already established with Australia in salt-cured salmon. After a second season on the Sacramento the operation moved north to the Columbia River where the runs had not yet begun to decline (Hume, 1920:71-76).

Two canneries reappeared on the Sacramento in 1874 and put up 2,500 cases. Packs steadily grew larger on a river which seemed to be recovering with the assistance of pioneer hatchery operations which began in 1872. While the reduction in hydraulic mining operations probably had more to do with the improvement, a record 200,000 case pack by 19 canneries would be made on the Sacramento in 1882. However, packs fell sharply in the following years. By 1889, only three canneries remained (Fig. 13), and these would continue on-and-off operations until the end of the century. After 1900 only a few thousand cases per year were packed,

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27 Hapgood had previously been involved with the new and growing business of canning lobster in Maine. He had also worked on the Bay of Chaleur, off the Gulf of St. Lawrence, where, in addition to lobster, salmon was also canned (Hume, 1920:71).
and after 1920 canning operations ceased entirely (Cobb, 1917:572; Freeman, 1935:112).

In the interim years between the departure of the Humes and the reappearance of canneries on the Sacramento a new type of boat appeared on the Sacramento, a boat which would remain inseparably associated with the salmon canning industry, the Columbia River sailing salmon gillnetter. Collins provides the version of the boat’s Sacramento River origin most frequently cited: "The first boat of this type used on the Sacramento was built by Mr. Griffin [a boat-builder in San Francisco] for a fisherman nicknamed ‘Greek Joe’, its keel being laid on May 2, 1868" (1892b:38). Noting that the Whitehall boats and skiffs then employed in the salmon fishery "were not so well adapted as the [new] type", Collins seems to imply that the principal advantage of the new gillnetters was a sturdiness providing for longer service: "a well-built salmon boat will last, with occasional repairs, from 14 to 15 years" (1892b:38). The next year J.J. Griffin built one of his boats for George and Robert Hume, who introduced the boat to the river after which the type would be named. This particular boat was still in use in 1888 (Collins, 1892b:38).

Another with a claim as first builder, according to R.D. Hume (1908:25) goes to a man named Collins, who worked out of either Broderick or Collinsville (Kemble, 1957:68; Yates & Erikson, 1978:27). Regardless of origin, in short order this type was being built in large numbers by various San Francisco yards, in addition to those built by Griffin and his partner Cooper, to meet the demand of the Columbia River fishery. At one point it was said that half the cotton duck imported to San Francisco went into their sails (Yates, 1979:23). Presumably other Sacramento River fishermen besides "Greek Joe" were using this type for the salt-cure and market salmon fishery which persisted until canneries were re-established on the river. Certainly, after 1874, the sailing gillnetter was the boat of choice for Sacramento canneries.

A search for "Greek Joe" or his kin was not satisfied by Collins' list of Sacramento River fishermen by nativity which listed none born in Greece; those born in Italy comprise the largest component, 477 out of 1,202 in 1888 (Collins, 1892a:170). A few Greek fishermen were tallied in 1879 (Jordan & Gilbert, 1897:732), but their numbers only became substantial in 1892, when 117 Greek-born fishermen in Contra Costa and Solano counties flanking the lower Sacramento represented about one fifth of the salmon fishermen based around Suisun Bay (Wilcox, 1895:153). Their fiercely territorial presence was noted in 1905: "Greek fishers marked the upper ends of their drifts with makeshift Greek flags. From this point the boats set out at fifteen to twenty minute intervals on their downstream course, and Italian or other gill-netters who intruded on the
ground did so at their own peril" (Fisk, 1905:382). Because they seem to have entered the fishery in numbers at a late date, it is unlikely that any on-going influence on gill-net boat design should be attributed to Greek-born fishermen and their traditions.

The Suisun Bay boat is often seen not as a distinct variant, but rather as a name applied locally to Columbia River sailing gillnetters used in the area (Weilepp, 1991a:44). Shaw claims these were "similar" boats, but is vague about the distinctions. He describes Suisun Bay boats in use about the turn of the century (n.d:9-10):

These boats were about thirty feet long.... On deck they were rather bluff boxed, but were fairly sharp at the water line. Stem and stern were plumb, or nearly so. They had short decks at the ends, and had rather narrow washboards at the sides, with a low combing. The washboards followed the sweep of the hull and the ends of the standing room were round. They were rather broad of beam and shallow in section, Suisun Bay being notorious for its flats. They had a single mast with no backstays or shrouds, and carried a low spirtsail and a small jib to the stem head. These boats were net boats, and were used to catch the salmon that at one time were plentiful in the Bay. They were locally built in Black Diamond (now Pittsburg), Antioch, and perhaps Collinsville. They were generally sailed and used by Sicilians.... I have never owned one of these, but I have sailed them. They were not particularly weatherly, as they had to be sailed about... due to the long straight keel [they were] slow in stays.

These boats were roughly cut, strongly built, and were rather heavy.

The Columbia River boat was very much the same, although I have seen them entirely open without decks. Alaska packers built theirs at Alameda.

Nothing in Shaw's description will help us discern the difference between the Suisun Bay boat and the Columbia River sailing gillnetter, although it is interesting to note that there were builders on the Sacramento, and perhaps the boats were a little more roughly built there than those from San Francisco. Apparently a demand persisted for undecked Columbia River boats in California at this late date; farther north, only very early boats were completely open. That the boats grew to a thirty-foot length is very interesting if this dimension is accurate, for while the boats built for Alaska were this length in the twentieth century, sailing gillnetters used on the Columbia rarely exceeded 28 feet and those of the Sacramento were said to be smaller still. Earlier boats certainly were smaller. Collins saw the boats used on the Sacramento and elsewhere on the coast as variants of what he calls the salmon gill-net boat (Collins, 1892b:38-39):

The boat used in the river and coast gill-net salmon fishery of the Pacific is a distinct type, and differs from any other small craft employed in the fisheries of the United States. It is found in the greatest numbers on the Columbia River, as might naturally be supposed, but it is distributed
along the whole coast line of the United States from the lower counties of California to Alaska. This type is also used to some extent in the shore market fisheries, which are not particularly related to the salmon fishery. At first, the ordinary length was 22 or 23 feet, and usually they were entirely open. Later, boats of 25 and 26 feet in length were built, but they were found to be rather unwieldy for two men to manage, and at present the majority do not exceed 24 feet in length, but as a rule there is now a washboard on each side and a short section of deck at each end. According to Mr. Wilcox, the boats now range from 23 to 28 feet long, 6 or 8 feet wide, and from 24 to 30 inches deep, and cost when rigged for use from $300 to $400. On the Sacramento River the length varies from 15 to 25 feet.

About 1872 an underecked salmon boat could be built in San Francisco for $220, but in 1880 the washboard had been added, with small deck spaces at the ends, and the price had increased to $240 per boat. Many of these boats are built at San Francisco, but a large number are also constructed on the Columbia River, in some cases the owners of canneries having boats made at their own establishments.

Occasionally a jib is carried. On the Sacramento and San Joaquin Rivers a single leg-of-mutton-sail rig is in favor.

The following is a description of a typical Columbia River salmon boat: It is an open carvel-built, centerboard craft, sharp forward and aft, the ends being shaped nearly alike, moderately concave at and below the water line, and with rather full convex lines above the water. It has a long, low floor, round bilge, and flares slightly at the top. It has a very shallow keel, and has little or no rake to the stem and stern post, both of which are straight, with the exception of the rounded fore foot. It is decked for two or three feet at each end, and has washboards extending along both sides. A coaming 2 or 3 inches high runs around on the inner edge of the washboards and the decked spaces of the bow and stern, making the open part of the boat of an oval form. It has four thwarts, and there are three rowlocks (each with a single thole-pin) on each side. A single mast, upon which is set a spritsail, is stepped well forward. Oars are carried and used when there is no wind.

Collins’ description of the Columbia River salmon boat, except for references to size, could just as easily describe boats used on Suisun Bay in the 1880s, or those in use some 70 years hence in Bristol Bay, Alaska. Without examples of early craft, however, it is not possible to say how boats from different areas or eras followed slightly different guidelines of form or construction. Collins states elsewhere that the “typical salmon gill-net boat is used [on the Sacramento]..., but it is not so large, on an average, as the boats on the Columbia River, and has less stability and seaworthiness” (Collins, 1892a:164). Certainly, fishermen could often tell the difference between boats originating in different places or following different traditions, even if they did not articulate the distinctions.
Some variations respective of place, or changes over time were obvious. The leg-of-mutton sail may have been popular at one time in California, but was apparently replaced by the sprit by the end of century for it does not show up in photographs. Construction details are harder to determine. For example, while boats built in the twentieth century for the Alaska fishery were fully caulked (Weilepp, 1991b:46; Cary, 1970:105), even power boats built on the Sacramento continued the traditional tight-planked technique used on the first sailing gillnetters. According to one fisherman, "...those [boats] built in Collinville.... for the gill netters.... They didn't caulk those hulls. They were built like a barrel and they swell up and they stay tight. The last plank they put in they hit with a sledge hammer so you'd think the whole boat was going to fall apart" (cited in Kowalla, 1992:27). However, it is rarely clear how planks were set at other locations, or when techniques may have changed elsewhere on the coast. Form is even more elusive. Steven Canright, who has carefully studied photographs of Sacramento River gillnetters, feels that they were perhaps slimmer than those used on the Columbia, and employed somewhat lighter construction (1989).

No detailed dimensions have been recorded of Suisun Bay boats, and no known examples have survived. Boats dating to any period of the Sacramento fishery would be particularly interesting because, unlike salmon fishermen on rivers farther north who for the most part rented their boats and gear from the canneries, the majority of Sacramento River salmon fishermen owned their own boats (Collins, 1892a:169). The opportunity to contrast the characteristics of boats largely owned by canneries on the Columbia with boats largely under private ownership on the Sacramento is greatly missed.

What can be gleaned from the history of the Sacramento salmon fishery which might explain the few distinctive features which have been ascribed to them? The leg-of-mutton sail, set on a gillnetter, would present a smaller area than a sprit and would seemingly be preferred only where particularly strong winds were consistently expected, or under conditions where sail was used so rarely that the simplicity of the leg-of-mutton would outweigh its poor performance. Given that there was no apparent cultural bias towards the leg-of-mutton sail in California, it seems that simplicity for a fishery where sails were rarely employed applies to the Sacramento River. Strong winds and challenging sea conditions were encountered only as boats ventured out late in the nineteenth century onto San Pablo Bay; at this time the sprit became predominant.
Slimmer and more lightly built craft, as the Sacramento gillnetters may well have been, would more likely appeal to men owning their own boats, for whom an easy rowing craft might pay higher dividends than a robust craft built to withstand rough usage at the hands of sundry skippers. The perception that Sacramento gillnetters were smaller probably reflects an average size affected by boats used in the continued fishing of narrow, protected reaches, farther upstream than on other rivers; the largest boats, on the lower Sacramento, were probably comparable in size to boats used elsewhere along the coast, or larger, if Shaw's description is accepted.\(^2\) The persistence of open decks on many of the smaller boats makes sense for boats used in very protected, inland waters. That the fishermen of the Sacramento lived on mobile houseboats\(^2\) for the duration of the season, and rarely slept on their boats, may also have a bearing on the relatively smaller size of boats used on this river.

In a fishery where fishermen were not renters, small open-decked boats were relatively inexpensive purchases. While they may not have been the optimum boats for the fishery, these small boats would have suited young fishermen entering the business, and would also have been used by old fishermen wishing to continue working within their physical as well as financial means. In a fishery with efficient, but more physically demanding boats for rent, inexperienced young fishermen often finished the season in debt, while older fishermen might simply not be taken on.

The pattern of boats moving farther downstream as the salmon stocks become stressed is one repeated on all large salmon streams of the coast. The Sacramento is no exception. The first fishermen who received 15 cents a pound for their fish could easily get their catches far upstream where conditions demanded little of their boats. Hume located his cabin at what in 1852 was the heart of the fishery, 50 miles (80 km) away from the river's mouth. By 1860, Rio Vista, located 12 miles (20 km) above Suisun Bay where the river is one third of a mile wide, was the principal fishing port on the Sacramento. As catches diminished, fishermen slowly ventured farther downstream and into Suisun Bay. Vallejo, where the Sacramento River empties into San Pablo Bay (Fig. 13, see page 79), was still too far down stream to be a frequent resort for gill-net fishermen in 1879 (Jordan & Gilbert, 1887:731). Economic pressure continued, however. While the

\(^{28}\) Collins' figure of 15 feet (4.6 m) for the smallest gillnetters on the Sacramento (1892b:38) is a good 5 to 7 feet (1.5 to 2.1 m) shorter than the smallest Columbia River sailing gillnetters noted.

\(^{29}\) The one-room scow houseboats, on which many married fishermen brought their families cost $250 in 1888. With the cost of a rigged boat ($350) and a net ($300), the capital investment for an independent fishermen was about $900 (Collins, 1892a:165).
base price paid to fishermen in 1888 was only 4 1/2 cents per pound, a fish caught in prime downriver condition might fetch 6 cents per pound. For this year Collins lists Vallejo as one of the principal fishing centres for salmon gill-netting, and most of San Pablo Bay was being fished by gill nets from April to September (Collins, 1892a:67, 161). The number of gillnetters in the Bay was increasing in 1892 "on account of the scarcity of salmon in the rivers, which is growing greater every year" (Weaver, 1892:151).

Not only did working in broader, more exposed waterways demand more of boats in terms of seaworthiness, but they were also required to carry larger nets. Boats which still worked the upper reaches near Sacramento City in 1888 used nets ranging from 75 to 100 fathoms (135-180 m) in length, from Rio Vista to Collinsville they ranged from 150 to 250 (170-460 m) fathoms, and in Suisun Bay from 200 to 300 fathoms (170-550 m) in length and between 4 and 5 fathoms (7.5-9 m) depth (Collins, 1892a:165). Interestingly, Jordan and Gilbert found nets the same length, but deeper, 6 to 9 fathoms (11-16.5 m), on the lower Sacramento in 1879 (cited in Collins, 1892a:165). The trend to ever larger net sizes seems to have surpassed its optimum application in the late 1870s and then stabilized. The tendency to deeper nets probably began on the Sacramento in 1870. That year, two fishermen, Peter and Rosario Aiello, arrived on the river after having accomplished the unprecedented feat of becoming "high boat" in their first season in Astoria, either in 1867 or 1868. Their secret, which they no doubt introduced to the Sacramento, had been to use a net twice as deep as those used previously (Wolfenden, 1975:12).

There is a compelling confluence of events surrounding the year 1870. The Aielllos fished the Columbia with oversized nets just one to three years before the salmon gillnetter would be introduced there. They arrived in California when "Greek Joe's" gillnetter was still a new boat and the fishery was just expanding into Suisun Bay where deeper nets could be used and better boats were needed. It is on, and from, this bay that the California variant of the sailing salmon gillnetter would earn its name.
Monterey hand-line trollers

Along the full length of the Pacific Coast where salmon were caught were used a variety of flat-bottomed, and occasionally V-bottomed, craft which have suffered from very sparse descriptions in the literature. Nomenclature includes the terms skiff, sharpie-skiff, skip-jack, bateau, and salmon dory, but precise definitions of these terms in a West Coast context are very rare. West Coast flat-bottomed boats were typically planked longitudinally along the bottom, though some early models were cross-planked; some of these boats were double-ended, some used the dory's narrow "tomb-stone" stern, and some had full transom sterns. Photographic evidence is also sparse, but is often the only tool available for defining types and where they were used.

One boat benefitting from some photographic evidence is a small skiff used in Monterey Bay around the turn of the century. This boat is the first examined in this study which was used to troll salmon. The type has been given no name in the few references which acknowledge it, so the name arbitrarily applied here is the Monterey hand-troller.

Though Monterey had been the capital of Mexican California, the town declined after statehood, with San Jose becoming the next capital, and San Francisco becoming by far the State's largest settlement in the wake of the Gold Rush. The sea near Monterey is unusually rich with sea-life owing to mixing of ocean currents (Hubbs, 1948:478); Chinese fishing villages and shore whaling stations provided the town's only industry for a while. A handful of Portuguese fishermen may have arrived as early as 1860 (Goode & Collins, 1887:33). By the 1870s shore whaling had become a sporadic enterprise. But, when a railroad linked Monterey to San Francisco in 1876, a resort industry sprang up, and with it came a handful of Italian fishermen who settled in the area, supplying the resorts with fresh fish and shipping the remainder by rail to the big city market. While the now more numerous Portuguese fishermen continued to use only set lines and caught primarily red rockfish (Goode & Collins, 1887:33), the Italians used set lines, small gill nets, and seines of various mesh sizes (Jordan, 1887:604). Several species were caught, and with the course-meshed seines they also caught salmon, though there are no figures as to how many (Goode & Collins, 1887:30).

By 1879, fishermen in Monterey were earning more than their counterparts in San Francisco (Jordan, 1887:604). The fishery did not expand, however. In 1879, the Italian group had five sailboats (one lateen- and four sloop-rigged) and three skiffs while the Portuguese fishermen had craft similar in number and type (Goode & Collins, 1887:30, 33). In 1888, there were 53 caucasian fishermen in Monterey, all of Mediterranean birth, working with four feluccas, 17 sprit-rigged boats,
and 7 small rowboats. Collins values the feluccas at $750 each, sprit-rigged boats at just over $80 each, and rowboats at $25 (1892a:62). The 5,000 pounds of salmon caught that year represents only 0.4 percent of the total catch for Monterey, and was clearly still an incidental catch for the fishery.

The numerous feeding salmon frequenting the shores of Monterey went largely undetected for years because they are not easily captured by nets in clear water. The "discovery" of taking Monterey salmon by hook has several claimants; perhaps it was a Chinese fisherman with an abalone lure (see page 50), perhaps the "California" who accidentally hooked a 53-pounder (Hemp, 1986:47), or sport anglers (Wilcox, 1898:642), but most likely it was one of the fishermen who had long ventured out alone in their small boats with light set lines hauled by hand (Smith, 1895:233):

For many years the hand-line fishermen of Monterey Bay, who seek cultus-cod, bonito, rock cod, etc., have from time to time had their hooks carried away by fish, sometimes supposed to be large bonito, which their lines were not strong enough to retain. Some years ago, when a large body of small mackerel suddenly appeared in the bay and were taken with handlines, the fishermen, when hauling in the fish, would often have them seized by other fish and taken off, with parts of the line. Occasionally a salmon was caught, but it was not known that salmon would regularly take the hook or that they occurred there in sufficient numbers to warrant a special attempt to obtain them. In 1893, however, a troll-line fishery was established there by anglers which reached large proportions and resulted in the capture of a great many salmon. It was the first year that any formal attempt was made to take the fish in that way or place. The fishing was done principally from Santa Cruz and Capitola. It was carried on from sail and row boats, with stout lines and hooks, attached to fly rods or simply fished by hand. Sardines were used for bait.

The salmon were found in the bay from early in June to about September 1. Some very large catches were made. Mr. G. M. Ord, of Soquel, California, took 1,900 pounds in four days, using a nine-ounce fly rod, with sardines as bait.

Salmon trolling rapidly became a lucrative business with Monterey replacing Santa Cruz and Capitola as the troll fishery's principal port in the area. Wilcox does not report an increase in the salmon catch for 1893. An angler, J. Parker Whitney, joined the fishermen for a day in 1894, while they waited ashore for the tell-tale disturbance made by hunted schools of small fish (cited in Smith, 1895:234):

This is the signal for the Italians, Portuguese and other market fishermen to get out for them, which they do in both row and sail boats. They are equipped with large cotton lines sufficiently strong to pull in salmon hand over hand. A stout sea hook is used, with a sinker weighing half a pound. The line is 200 feet in length, the sinker is attached a short distance above the hook, and the line laid out about 100 feet from the boat, and in the slow sailing or rowing, which is about the same as is followed in trolling for trout, the bait sinks down 20-odd feet.
Two or three miles of rowing has been required to reach the fishing ground from Monterey pier, and the fishing ground I have found so far to extend over an area of about 2 miles long by 1 mile wide.

Whitney reports 15 boats on the water that morning, and in all 100 salmon were caught. Though the first seasons began in June (van Dusen, 1903:70), later-day fishing seasons started in January or February (Scofield, 1921:22). In 1895, 159,500 pounds of salmon were caught. Boats were not counted by Wilcox, but he determined their worth to be $2,500 with gear (Wilcox, 1898:578, 579).

Commission agents quickly came to Monterey and paid top prices for ocean-caught salmon and by the turn of the century salmon was the area's largest catch. Haller's salmon cannery opened briefly in 1896; salteries were established, and another cannery opened in 1901 (Hemp, 1986:47). 175 boats were trolling salmon from Monterey in 1904 (McEvoy, 1986:88). Despite the seeming unwieldiness of handlines, these fishermen could bring in 7,000 salmon per day and Booth's cannery processed on average 25 tons of fish a day in 1904 (Hemp, 1986:48).

The boats used in Monterey to troll for salmon are illustrated in Figure 15. The photo from which this drawing was taken is said to be taken at Fisherman's Wharf, (Monterey Public Library Photo Archives, #585), though Reinaud identifies the location as Booth's warehouse (1978:30). These boats look remarkably like Chesapeake Bay crabbing skiffs. This observation highlights the following description by Collins (1892b:46): "In some localities, particularly on the southern coast of California, the typical sharp or bateau is sometimes used for fishing. Those seen were similar to the small flat-bottomed craft in common use on the Chesapeake and Delaware Bays." Though Collins does not relate this description specifically to Monterey, there seems to be no illustrations or telling descriptions which place the type anywhere to the north of Monterey. Just as Monterey represents the northern extremity of the tropical fish zone, perhaps it defined the northern limit of this particular southern Californian craft as well. Similar craft appear in photographs taken at the more southerly port of Santa Monica.

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30 Allowing $400 for gear, and assuming the fleet split equally between sail boats and row boats based on Collins' values, the troll fleet might have consisted of 40 boats in 1895.
Figure 15 provides a useful elevated look at a over nine boats, with a number of men in the picture to provide a rough scale. Overall lengths seem to vary from approximately 18 to 25 feet (5.5 - 7.5 m), with beam between five and six feet (1.5 - 1.8 m), providing for a length to beam ratio of 3.5 - 4 to 1. All are rigged for sail, though some have their masts unstepped. Those with sails up are gaff-rigged without stays. All have two sets of oarlocks, one located slightly aft of amidships, the other quite near the stern. With a good view of four transoms it is seems that the bottoms at the stern are not strictly flat but are slightly "veed" or cambered. Rudders are secured to the transoms and skegs which
run beneath. Though one boat is not decked, the remainder have short decks across the bows and most have washboards along the sides. Some appear to have small open compartments aft of the cockpit. In the boats where futtocks are visible, the frame spacing appears to be almost three feet. Floors are not visible. In profile the bottoms round up quite sharply towards the stern. It is not possible to determine the extent of rocker. In two boats there appears to be some structure aligned fore and aft on the centerline just forward of amidships; this hints at the presence of a low centreboard trunk but it is not possible to say with assurance that these boats carried centreboards.

Other photographs are also available, all taken between the years of 1900 and 1910, which give a fair idea of what these boats were like. An undated panoramic glassplate in the Pat Hathaway Historical Photo Collection show about 200 small craft jockeying for position on the narrow grounds. Only about 7 percent of these do not have sails set. In no case is more than man visible aboard; most fishermen are stationed near the sterns of their boats. Most of the sails are gaff, though some are spirt, and perhaps 25 percent of the boats are flying small jibs, tackd to the stem. Some sails are shortened, though the breeze is light; notably, the method used is to leave the gaff at full hoist, and shorten sail from the foot by raising the boom, not an unseamanlike procedure because full sail was clearly too much only in terms of a desired trolling speed. There seems to be one dark-sailed felucca among them. Another Pat Hathaway photo (78-62-1) reproduced in Reinstedt (1978:31) and Hemp (1986:48) shows a similar view of the boats. Some here seem to sport short bowsprits, perhaps more boats are flying jibs, but all are under sail. Again, a lone lateen is seen, this time a light-coloured sail. Another photo from the Monterey Public Library (#191), entitled "Fishing skiffs on beach", shows seven of these boats beached. One boat has a spirt rig, three set gaffs, one has its rig struck, while two appear to be smaller row boats. It cannot be determined from this photograph whether the boat's bottoms are slightly V-shaped or completely flat.

While these photos provide a very good impression of what these boats looked like, they only hint at important details of form and construction. As written descriptions are so few and so poor, it is difficult to place the boats in context. Without more information, there is no simple explanation of how a boat closely resembling a model from the Chesapeake appears in a Pacific Coast fishing community comprised almost entirely of Mediterranean-born fishermen.

Many fishermen drawn to Monterey after the troll fishery became established came from a wide variety of ethnic backgrounds. For example, Japanese fishermen entered the fishery in 1896 (Hemp, 1986:34), but the
skiffs seem to pre-date this influx. The majority of fishermen at Santa Cruz and Capitola, important centres of the fishery's first couple of years, were born in California, and may have used boats more associated with a North American tradition which were quickly brought to Monterey along with the new trolling methods. However, Brooks provides some details of a boat type used by Italians fishermen in San Francisco which seem incongruous until compared with what we know of Monterey hand-trollers (1900:238-239).

To begin at the bottom there is the hand-line fisherman, whose boat is rarely more than eighteen feet long, generally less -- was formerly always a skiff -- built with rising floors something of the skip-jack model; but of late they are building very fair molded boats with bent oak frames, and today I saw one with a neat overhang; but as a rule they are plumb stern. They are always jib and sprit mainsail boats, the jib being set as a spinnaker when before the wind, and they can run like the devil -- close-hauled they don't do so well. All that I have seen were keel boats -- there may be a centreboard or so among them, but I doubt it. Like the others, they carry no ballast, yet carry on sail like demons in their occasional races.

The fishing lines, which are very long, and of which there are a goodly number, are tanned, as are all fishermen's nets, sails and ropes, and carry a large number of tinned hooks of generous size.

These boats go several miles up and down the coast, staying out all night... with no regard to the weather, unless it is an absolute gale.

Compare this with some selected comments by Shaw regarding crab boats of San Francisco (n.d:6):

These boats were keel boats, about sixteen feet long, and were of two types, the conventional molded type, and a vee-bottom type. I have sailed both types. The molded was by far the better boat. I do not know her derivation. She was single-ended with a long, straight keel. She carried no ballast.

The vee-bottom type was not used much. She was rigged exactly like the molded boat [with an unstayed sprit main and small jib]. In light of our present knowledge of vee-bottomed boats, I think she had too much vee in her sections. There were not too many of these.... As I remember their bottom was planked longitudinally. I think that most of the vee-bottom type were backyard boats.

Both crab boats and hand-liners used to catch bottom fish were sailed and built by Mediterranean-born fishermen, both used a sprit and jib, and both were small, transom-sterned, unballasted keel boats, built in vee- and round-bottomed versions, the latter superceding the former. Crab boats were admittedly smaller, beamier and deeper than the boats observed at Monterey. However, it may be significant that crab boats and small hand-lining boats have never both been described by any one source. Both certainly existed simultaneously in at least the San Francisco Bay area, however, to the uninitiated, a fishermen bringing in his buoyed set
lines could easily be confused with one checking his buoyed crab-trap lines, if the boats used in both fisheries were similar. Nevertheless, there clearly was a tradition of the mostly Italian-born San Francisco fishermen using and probably building vee-bottomed boats, perhaps of two varieties. These boats are scarce in the photographic record because, as both Shaw and Brooks observe, round-bottomed boats had largely replaced vee-bottomed models in San Francisco by the turn of the century. As it appears that the first hand-line trollers of Monterey were Italian fishermen previously employed hand-lining for bottom fish in one-man "sloop-rigged boats" or skiffs, which quite likely match Brook's description, it is not far-fetched to suggest that this established type might continue in a salmon fishery which exacted similar requirements of the boat.

Ground-fish hand-lining boats were mostly sprit-rigged, while the gaff-rig came to dominate the salmon fishing fleet. This difference might be explained by the peculiar method of light-weather reefing sometimes employed by these trolling boats. A fisherman hauling set lines, lies hove to, or with sails struck; he would reef conventionally only in heavy weather. Unless the sprit was secured well up the mast, the sprit and attendant snorter would foul the jaws of a raised boom, making the sprit rig less suitable for reefing in troller fashion.

Like feluccas used in Monterey, the hand-trollers may have been built by the fishermen themselves or by local yards. Photographed trollers demonstrate sufficient variation to justify the supposition that some were home-built. However, some are very much alike and were probably built in a yard somewhere. Monterey Boat works, located at the base of China Point, is said to have been established by Pearson and Cochrane in 1915. It is possible that they had bought out a previous boat-builder by the name of Meritt who had worked in the area since perhaps the 1870s (Tom Fordham, pers. comm. 1991). However, Meritt's name did not appear in a search of early Monterey lease holdings, nor did anyone else identified as boat builder prior to 1915.

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31 One exception is an early photograph (ca 1880) in the library of the National Maritime Museum (B12.10667pl) taken at a Sausalito dock, showing a felucca as well as a skiff which closely resembles those later photographed at Monterey. There is perhaps more flare built into the sides. The bottom is slightly veed. No rig is evident, but single wooden tholes like those seen on feluccas are used.
The Monterey hand-troller outlasted many sailing fish boats. However, motorized trollers began to appear in Monterey in 1908 (Damron, 1975:24-5). The change to power was not immediate, as the scene dated to 1910 and illustrated in Figure 15 demonstrates. A 1916 photograph in California Fish and Game (1916, 2.1:62) shows several powered trolling boats with paired trolling outriggers set at permanently oblique angles. Interestingly, the hulls are clearly derived from feluccas, if they are not direct conversions. The beaked prow, fuller stern sections, and deeper bilge, which later Monterey clippers would incorporate, are not yet apparent. Flat, or vee-bottomed Monterey hand-trollers, unsuitable for the installation of inboard motors, had now vanished from the commercial troll fishery.

Californian coastal streams

Along the northern California Coast the salmon fishery was slow to develop. Four salmon streams of significance enter the Pacific along this stretch: the Mad and Eel Rivers which enter into Humboldt Bay, Humboldt County; and the Klamath and Smith Rivers entering through Del Norte County. The remoteness of the region combined with the relatively small size of the streams contributed to the lack of early development, though on the Eel and Smith Rivers salmon were being taken for salt-cure by 1857 (Smith, 1857b:153).

Canneries came late to the area, the first, a small one, was installed on the Eel River in 1877. Little is known of the earlier salmon fishery, but generally fish were taken for local consumption and salt-cured. Fresh fish exports were always difficult from these areas as steamer arrivals and departures were curtailed by heavy seas which often closed access across the bars which straddled river entrances. The dried fish shipped by Chinese fishermen who maintained a colony in Humboldt Bay between 1857 and 1879 did not include salmon (Jordan, 1887:622).

This is the first region examined in this study where Native fishermen had a noticeable representation in the commercial fishery. Much of the fishing on the Klamath River to the turn of the century was carried out by Native fishermen living at the mouth of that river. 1870-1890 spanned the historic minima for Native population in California when their numbers dropped to about 20,000, or 5-6 percent of original population (McEvoy, 1986:41). Goode and Collins claim there were no Native fishermen active commercially on coastal streams in 1879 (1887:43), though in

32 Sport fishermen were using naphtha launches in the area by 1902 (van Dusen, 1903:75), but these were apparently not economically viable for the commercial fishery.
earlier years they probably participated in the salmon fishery on most, if not all, these northern Californian rivers.

Most of the early salmon catch was consumed locally, some of it pickled, yet it was sufficient to warrant the special act passed in 1859 to regulate Eel River salmon fishing (McEvoy, 1986:41). What sort of boats were used is unclear. An 1854 sketch by a Miss Josephine Ryan shows one man in a small gaff-rigged sloop at Eureka (Martin, 1983:xvi), a town founded just four years previously as a logging centre, but whether the boat was fishing or not is not clear.

As two more canneries appeared through the 1880s more attention began to be paid to the area. Hall reported that employed on the Sacramento and other Californian salmon rivers was a flat-bottomed skiff like those used on the Mississippi and Ohio Rivers. Though he does not describe the West Coast skiffs specifically, the interior river boats, in turn fashioned after a Connecticut model, were large, 36 feet (11 m) long on average, and open with an average beam of 10 1/2 feet (3.2 m). The greatest beam was forward of amidships and the sides flared 10 to 12 inches (250 - 300 mm). They employed a centreboard, carried two masts, and despite their size, were very fast and manageable (Hall, 1884:44). There is no indication from any other report of skiffs of this size being employed in California, nor any which carried two masts, however Hall's description regarding form may be accurate for the much smaller West Coast boats.

Exports of cured salmon from Humboldt Bay consisted of 409 barrels in 1870 and 3418 half-barrels in 1875 (Coy, 1929:268, 274). Seines as well as gill nets were being employed on the Eel river as early as 1878, but is not known if both of these nets were used to supply salteries before the cannery arrived. Canneries brought in fishermen from both San Francisco and the Columbia; in 1888 there were 388 fishermen in Humboldt County, the great majority, 203, of these fishermen were Mediterranean-born, 83 were of Scandinavian origin,33 there were 75 U.S. born caucasian fishermen, and 26 were Native American (Collins, 1892a:173). With a cannery closure the proportions of the remaining fishermen changed; the 26 Native fishermen remained, U.S. caucasian numbers grew to 110, Scandinavians remained relatively static at 80, while Mediterranean fishermen maintained a much reduced majority at 104. Several of the Italian and Portuguese fishermen who remained in the area were employed in

33 In nativity statistics of the period, fishermen originating in Finland are tallied as "Russian". Since few, if any, West Coast fishermen originated in any other part of what was then Russia, these men are grouped with other Scandinavian fishermen, primarily Swedish, for the purposes of this study.
taking flounders in Humboldt Bay. This illustrates that while Mediterranean-born fishermen remained numerically very significant among fishermen in all U.S. canning operations, north of the Sacramento River they tended to be transient, and were less likely than other groups to take up local residency. It also implies that they were less likely to have been salmon fishermen in significant numbers prior to the introduction of canneries in these northern areas, and, therefore, less likely to have been directly responsible for small craft traditions established there.

Collins describes the typical boat used on the Mad and Eel Rivers of Humboldt County as "small and inexpensive.... 16 feet in length and 4 feet beam; [it has] a square stern and a flat bottom." Two-man crews were used and the boats' average worth was set at $20 each (Collins, 1892a:172). The gill nets were small; those used on the Eel River, where seines were also employed, were only 60 fathoms (110 m) long, while those on the Mad River ranged between 100 and 150 fathoms (180 - 275 m) long (Collins, 1892a:172). In 1892, there were 119 gill-netting boats active, and these were still valued at about $20 each (Wilcox, 1895:155).

In 1888, there were two salmon canneries in Del Norte County, one built that year on the Klamath River, and one which had been established on the Smith River in 1878 (Cobb, 1930:570). There was a strong resistance to imported labour at these canneries. They were among the few West Coast canneries where Chinese workers were blocked by locals, primarily Native workers, from working the canning line (Wilcox, 1895:212); there were also no Mediterranean-born fishermen employed. Of 70 men fishing that year, the largest number were Native Americans at 42, followed by U.S. born caucasians at 15. That 84 boats were used indicates that most boats were operated by only one man. Gill nets were only 50 fathoms (92 m) long on average. The boats used were "small skiffs and Indian canoes" which were valued at $25 each (Collins, 1892a:175).

The Klamath River is rare in that it is one of only four streams on the West Coast which has both a spring and fall runs. But, by 1895, the number of fishermen on the Klamath and Smith Rivers had fallen to only 42. Most of these were Native (Wilcox, 1895:647). On the Klamath, the "few white men engaged to take their catch near the mouth of the river with drift net 75 to 90 fathoms long.... The Indians fish higher [as far as to 10 miles] up the stream with gill nets 30 to 50 fathoms long" (Wilcox, 1898:639). The Tolowas and Yuroks living in the area would likely have employed river canoes, carved from redwood about 15 feet (4.6 m) long. In prehistoric times these would have been built in the "shovel nose" form with blunt ends crowned with an angular peak (Waterman & Coffin, 1920:30), but by the 1880s ends were sharp, in imitation of the
European fashion (Jobson & Hildebrandt, 1980:167; Hudson, 1981:283). Canoes used in the commercial fishery might also be expected to bear the marks of metal tools which had come to supplant, if not completely replace, traditional stone tools used in the reduction process. No details are supplied as to the boats used by the white fishermen intercepting salmon near the Klamath River mouth.

In 1895 Wilcox could still state that there was no fishing undertaken "outside the bar" at Humboldt Bay (Wilcox, 1898:639). Certainly, this was typical of all the coastal streams from northern California to Puget Sound as long as gill and seine nets, or traps, used in the river fishery were seen as the only way to capture salmon. When trolling for feeder salmon was recognized as a viable technique for capture, most of the coastal ports, located at river mouths from Fort Bragg, on the Noyo River, to Gray's Harbor, became bases for gas-powered trolling boats. These boats were large and powerful enough to brave the bars in most conditions (Gilmore, 1981). But trolling had its beginnings in small boats powered by oar and sail, and manned by a handful brave men.

Frank Hyman wrote of the humble beginnings for the troll fishery off the Noyo River, Mendocino County, in his memoirs. A similar story could surely be repeated at any number of Pacific Coast outports, but these first endeavours escaped notice in Fisheries Reports (Hyman, 1966:10, 18, 20):

Fishing along the Mendocino Coast in 1890's was by a few men, fishing dories or large rowboats, out of the Noyo River, and from a small cove on the south side of Cleone Point, known as Boat House Cove. In the 90's, there were a number of fishermen who netted and seined Silver Salmon on the Noyo River in the winter months, and in the summer, would venture out to sea for rock, ling cod and halibut.

Among the fishermen who fished out of the Noyo in the 1890's - 1900 were: Little Phil, a Spaniard, who sailed his dory down from Bureka; Harry the Jap, who was shipwrecked off the coast and found his way to Noyo; Jack Sari, a Finnish saloon keeper, who quit his business to go fishing; Cap Olson and son Olis, who settled on the river in 1894 at a place now known as Olson's Landing. Others who fished on the Noyo in the 1890's were; Bert and Bill Miller, Gus Wickstrom, Charles Brink, Van Blake, Charles Brosart, John Dahl, Nelson, Big Nick Matson, Matt Lax and Kallio.

Prices received then were 3-4 cents a pound for the rock and ling cod and 10 cents a pound for the halibut. River salmon brought 25 cents apiece.

In 1898, a few salmon were caught on set lines. Peter Johnson remembered catching them by trolling in the Baltic, so he made a flasher out of a silver table spoon and fastened a hook to it.

This started many dories and skiffs to troll for salmon. It was not unusual to catch 40 to 50 king salmon a day from a row boat with one line and spoon hook, home made.

I remember one Sunday, Dave Miller and Ralph Funk from a row boat with a line and spoon hook, in the Cleone inner
harbor, caught 48 King Salmon, one weighed 76 pounds, many around 50 pounds. These fishermen would catch and peddle their fish from horse and wagon as there were no fish dealers then. The large King Salmon was salted down by the Scandinavian and other people for winter use.

"It was with the mild-curers that trolling was to find its market, and for the next decade trolling was to be virtually the sole supplier of chinook for mild-curing" (Damron, 1975:34). It is not certain how long the "dories and skiffs" of the less prosperous fishermen continued operation along side power boats which appeared in numbers after 1908. How these small craft may have differed from those boats used locally in the gill net fishery or similar types used elsewhere is also unknown. An interesting example of the West Coast surf dory is displayed in front of the museum at Crescent City (at the mouth of the Smith River). This particular boat was used as shore-based life boat in the twentieth century, but it may have had its antecedents in dories used in the salmon troll fishery. Its outstanding features are its clinker planking and molded form. It is just over 20 feet (6.2 m) long, with a beam of 5 foot 8 inches (1.72 m), and a depth of about 2 foot 8 inches (0.81 m). It may be safely supposed that this type of dory was not used in the earlier gill net fishery as its relatively expensive manner of construction was clearly meant to meet the challenges of work outside the bars.

Originals and replicas in California

The recovery of the China Point Sampan demonstrates that the potential for archaeological recovery of small craft is high, and that the conditions for preservation of small craft remains are favourable in the San Francisco Bay area. Archaeological discoveries as a consequence of building along the San Francisco waterfront have revealed several ships and a chandlery to date, and with more work, the recovery of small salmon fishing boats, such as feluccas, Whitehalls, and Suisun Bay boats, and other boats used along the harbour front, remains a distinct possibility. Archaeological potential is also high along the lower reaches of the Sacramento. Farther away from areas of urban development, archaeological excavations are less likely to be undertaken, but the potential for preservation in lower estuary environments is equally favourable.

"Chinese" boats are sometimes reported still in use as pleasure craft or displayed on land. An example of the latter, a "junk" of about 18 foot length was observed at the end of Ocean View Avenue in Monterey in 1988. It was no longer there in 1991, but its round-bottomed hull matched in shape and size none of the Chinese boats recorded historically, and seemed to be a relatively modern "reconstruction", not scientifically based on any Chinese fishing boats known to be used in California.
Chinese hulls, in the 20 to 25 foot range, used recently as pleasure boats, were reported, but, owing to changes of ownership, none of these could be located in 1991 for examination.

Two of the three Pacific Whitehalls mentioned above were clearly built as pleasure craft. Azulykit was built for a San Francisco boat club and is now in storage at Mystic Seaport. A beautifully preserved example of a "yacht-finished" Whitehall is a centre-piece at the Eureka Maritime Museum. The third Pacific Whitehall may have been a working boat. It was on display in front of the Sausalito's former City Hall until a few years ago, but recent efforts to locate it for examination have been unsuccessful. While the Whitehall is a popular type among traditional small boat builders today, there is no reason to think any of those recently built on the West Coast follow the lines based on a Pacific Coast Whitehall, but are built after East Coast models instead.

The felucca has inspired at least three full-size replicas. The first, based on Chapelle's lines, was built in 1975. Matilda D.'s poor performance provides a cautionary tale against accepting measured drawings for which the original craft no longer exists, without question. The Matilda D. is now on permanent dry display with rig standing at the Hyde Street Pier, San Francisco. The second National Maritime Museum felucca reconstruction was based on a disintegrating felucca hull, the lines for which were taken in 1986. Although the boat had been converted to power, it was originally built as a sailing felucca. The replica performs well under sail, and is currently kept in the water near the museum facilities. A third felucca replica was built in Monterey. The lines and rigging were worked up from photographs and guess-work with the assistance of Maritime Historian and model builder, Tom Fordham. This "replica" sailed well enough once ballast was installed, but is now on permanent display hanging from the ceiling in the foyer of the Monterey Aquarium. Rumours suggest that at least one felucca hull still floats beneath a "houseboat" superstructure in a Sausalito marina, but none could not be located in 1991. Two feluccas have been in use in Tomales Bay within the last 10 to 15 years. No engines had ever been installed, no sign of sailing rigs remained, and the hulls had been rebuilt extensively, still it would be worthwhile to examine these boats if they can still be located. There is an early power fishing boat based on the felucca in storage at the National Maritime Museum; this boat appears to be an interesting transition between the felucca and the Monterey clipper, and deserves to be fully documented. An early Monterey clipper was being documented by volunteers at the museum in 1989.
Of the skiffs used to catch salmon out of Monterey and the ports of northern California, no known examples exist. Given that fishermen in Northern California were often rural residents for whom fishing was a secondary employment, the likelihood of an example having survived the years in a field, shed, or barn, is much higher than for boats used near sprawling urban centres. However, if such examples exist, it will remain for a local enthusiast to uncover them, as notices posted by the author in local historical society newsletters have elicited no response.

An interesting dory variant is currently displayed outside the Crescent City Museum. While the general profile and overall dimensions of the dory is followed, the hull is round-bottomed and covered with narrow lapstrakes. While this example was used as a lifeboat capable of operating in surf, it is clearly part of the story of the development of the dories of the West Coast, but any link with the salmon dories used for gill-netting or early hand-lining outside the rivers would be strictly speculation without more information.

In addition to the large vessels used as transports for the Alaskan salmon fishery, the C.A. Thayer and the Balclutha displayed in San Francisco, and the Star of India in San Diego, two Bristol Bay boats are held in Museum storage in California, one by the Maritime Museum of San Diego and the other by the National Maritime Museum in San Francisco. Also in storage at the National Maritime Museum is a "Norwegian pram", a type of boat used by the tugs and monkey boats of the Alaska salmon fishery as a tender.
Oregon

The Oregon salmon fishery has always been centered on the Columbia River. In this state, there was no true salt water fishery rivaling that for river-caught salmon. Salmon figured prominently in early written accounts. After Robert Gray brought the first ship, Columbia Redevida, across the bar of the river which would inherit that ship's name in 1792, he traded for salmon as well as furs. Lewis and Clark were only able to complete their journey to the river's mouth in 1805 because salmon provided by the Nez Perce kept them from starving (Ronda, 1990:212).

The Columbia River was blessed with huge runs of salmon. It is the longest river entering the Pacific Ocean from the North American continent, and drains a 259,000 square mile (671,000 km²) basin (Craig & Hacker, 1940:136). Most streams of the American Pacific Coast have only one Chinook run, just four streams enjoy two runs, but the Columbia River has three distinct Chinook runs: "the first entering during January, February and March.... The second, which is the best run, enters during May, June and part of July,... The third run occurs during late July, August, September and part of October,..." (Cobb, 1914:32). Before European contact, a Native population estimated at 50,000 caught perhaps 30 million pounds (13,000 metric tons) of Columbia River salmon each year. A trading nexus, using the Chinook trade jargon based on the language family of the lower Columbian Natives, extended to over 100 groups ranging from the Columbia River as far as the Great Plains (Smith, 1979:6). The vast numbers of fish extracted for nineteenth century canneries is illustrated by the calculation that if the commercial catch from 1866 to 1892 were loaded on railway cars, it would fill 42,500 ordinary freight cars requiring 280 miles (450 km) of track (Wilcox, 1895:249). The commercial catch on the river by the 1970s, made by planing power boats with fish-finding sonar and hydraulically powered drums for setting nets, amounted annually to only about 15 percent of the 1883 pack (Smith, 1977:216), the catch for which had been caught and delivered only with muscle, wind, and wit.

American fur-trading ships followed Gray's lead, taking on stores of salmon. The Pacific Fur Company's settlement at Astoria also relied on Native-caught salmon as a food source for employees stationed there, and built a fishing station at Oak Point in 1812 (Harris, 1987:pl.66). The first experimental shipment of Columbia River salmon to England took place

34 Since 1853, when Oregon Territory was divided, the Columbia River formed part of the boundary between Oregon and Washington. Both territories and later states shared jurisdiction over the Columbia River, but the Columbia River fishery is entirely treated under the Oregon section of this study.
shortly after the Hudson's Bay Company bought out the Montreal-based Northwest Company in 1821. Under terms of the Anglo-American Convention of 1818, which recognized the historic claims of both Britain and the United States to Oregon, but without offering any means by whereby the matter could be resolved by arbitration (Gough, 1981:15), American traders entered the river by ship to challenge not only British trade in furs, but also salmon. Without a permanent land base on the river and the year-round working relationship with the Natives enjoyed by the Hudson's Bay Company, the American ventures were largely unsuccessful with respect to the salmon trade.

Salmon exported by all traders was essentially the product of a Native fishery, with the catch, and often the labour of cleaning and curing the salmon, provided by the Natives in exchange for European trade goods (Dodds, 1961:32). It was only following permanent American settlement, beginning in 1843 with the "Great Emigration" over the Oregon Trail, that caucasians began regularly to work beside Natives as fishermen of Columbia River salmon. This was in large part a necessity brought on by the devastation which European diseases wrought to the Native population, leaving scarcely a hundred individuals on the lower Columbia by the mid 1850s (Swan, 1857:108).

American salt-cured salmon was exported to Hawaii as the Hudson's Bay salmon had been before, and a small coastal trade to San Francisco was established (Craig & Hacker, 1940:149). However, it was not until Hapgood and Hume established the first Columbia River cannery at Eagle Cliff, on the Washington side of the river, in 1866, which began a glut of canning-building on the river, that the commercial fishery became a significant industry. As early as 1874, Portland's Morning Oregonian credited salmon production on the Columbia with exceeding all Oregon commodities in value, except for wheat (cited in Damron, 1975:3). The town of Astoria, located 14 miles (22.5 km) from the open Pacific, became the principal fishing and boat-building centre on the river.

The Columbia River is famous for its chinook salmon. This was the only species canned there until the late 1880s when other species were first accepted by Columbia River canners following decline in the Chinook stocks. It continued to comprise, however, by far the most valuable portion of this river's catch, surpassing all other salmon species in value throughout the period of oar and sail.

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35 Some authors date the birth of the Columbia River's commercial fishery to 1866. This paper recognizes 1830, the date which marked the beginning of uninterrupted extra-continental salmon exportation, as the commencement of the Columbia River commercial fishery.
The prime Salmon fishing grounds for Columbia River canneries extended from the infamous bar at the river's mouth, a treacherous zone known as the "Graveyard of the Pacific", to about 15 miles (24 km) above Astoria. Drift gill nets were chiefly found in this area, though they were found fishing the channel in reduced numbers much farther upstream. In 1891, 70 percent of the chinook catch was taken with gill nets. Six percent of the chinook catch was made with beach, or haul seines, which worked the bars and shallow shores primarily located upriver of Astoria. Most pound-net traps were located in Baker's Bay, across from Astoria but their range did not extend beyond 5 miles (8 km) above Astoria. Twenty-two percent of the 1891 chinook catch was made with pound-nets. Fish wheels, trap nets, dip nets, and squaw nets were all used farther upriver, and provided the remainder of the catch. The extreme interior limit of the commercial salmon fishery was Celilo, located about 200 miles (322 km) inland (Collins, 1892a:203; Wilcox, 1895:246).

In 1866, there were perhaps only two gill-net boats on the river, by 1878 this number had passed 500, three years later it had passed 1,000, by 1894 the 2,000 mark, and in 1904 the greatest number of boats, 2,596, had been attained (Craig & Hacker, 1940:183). There were so many boats on the river by 1890 that the U.S. Army Corps of Engineers suggested that "all this fishing gear actually slowed down the flow of water in Columbia" (Carstensen, 1971:67). The largest pack of chinook had occurred in 1883, however. This was also the year when the largest number of canneries were in operation on the river, 39 (Craig & Hacker, 1940:152).

Analogous to the canner's diversification into other salmon species, canneries began appearing on other Oregon salmon streams in the 1880s. In 1877, only the Rogue River, among Oregon rivers besides the Columbia, had a cannery (Jordan, 1887:625). By 1888, there were 16 canneries on the smaller rivers (Collins, 1892a:176), although by 1895 this number had shrunk to nine (Cobb, 1930:565-570). The catch from several smaller

36 By 1904 powerboats had made their appearance, but of this figure all but 43 were sail or row boats. The all-time high number for Columbia River gill-net boats occurred in 1915, when 2,800 boats fished the river (Smith, 1979:27). This was the also the first year when all boats tallied were gas-powered.

37 The value of the 629,400 case chinook-only pack in 1883 was $3,147,000. Only in 1895 was the size of this pack exceeded (634,696 cases), in a year which included cases of blueback, silver, and chum salmon, as well as steelhead trout, and was worth $3,111,000 (Craig & Hacker, 1940:152).

38 Thirty-nine canneries were also in operation for the years 1886 and 1887, but by 1890 the number had dropped to 17 and would not rise above 20 again (Craig & Hacker, 1940:152).
rivers continued to be shipped to off-stream canneries, particularly those on the Columbia.

The great need for manpower in the canning industry meant that much of the early labour was seasonally transient, with positions in boats and on cannery floors most often filled with workers who arrived each season by ship from San Francisco. With the arrival of the Union Pacific railroad in 1883, the number of resident fishermen began to rise more sharply. In the off season many worked in the area as farmers, mill workers, carpenters, road builders, or found employment knitting nets for next season (Cleveland, 1903:149).

The commercial salmon fishery of the Columbia River may be roughly divided into three periods before power boats were introduced. The first, essentially a fishery where Native fishermen using traditional fishing methods served an export trade of salt-cured fish, began in 1830 and lasted to the end of the Hudson’s Bay Company’s activities on the river in 1846. The second was a transition period, with Native fishermen and their capture techniques beginning to disappear or be modified as American settlers began to fish, gradually introducing their own fishing techniques and boats; this period may be said to last to about 1870. The third phase spans the period in which the Columbia River sailing gillnetter was supreme on the river with canning interests becoming huge employers of men and commanding an increasingly mechanized industry marked by distinctive West Coast fishing and production techniques and equipment which was manufactured locally.

Native fishery for salt-cured salmon

There is no mention of Native fishermen on the Columbia River adopting European methods of capture for the early salt-cure fishery, although it is possible that they responded in a manner analogous to groups elsewhere on the coast by adapting some imported materials for their traditional gear, such as metal for fishhooks, and rope fiber of European manufacture for nets. The Native fishery and barter economy, established long before the fur traders arrived, persisted; but Native fishermen and processors, primarily women, were now linked with the

"Salt salmon was produced in quantity on the Columbia for domestic consumption and for trade with the Sandwich Islands. When the fish were landed, Indian women cut out the backbones and chopped off the heads. The salter then placed them in a large hogshead with a quantity of coarse salt, and there they remained for several days until they became quite firm. The pickle produced from this process was boiled in large copper kettle and the blood, which was floated by the boiling process, was skimmed off, leaving the pickle perfectly clear.

The salmon were then taken from the hogshead and packed in tierces (casks holding 42 gallons [or 180 pounds of fish]) with a little more
European trade network by way of European methods of fish curing and transport.

Captain Gray of the Columbia Redeviva had traded one board nail for two salmon in 1792 (Morison, 1927a:7). Ronda makes the remarkable claim that few of Astor's men were experienced outdoors men, so that virtually all fresh game as well as fish was supplied by the Natives (1990:204). Apparently, a standard of barter for fish was not established then (Craig & Hacker, 1940:148), and no salmon was exported by the Pacific Fur Company. Any fresh fish which could not be immediately consumed was preserved the Native way, dried and smoked (Ronda, 1990:204). By 1830, the standard exchange for one salmon was three leaves of tobacco (Craig & Hacker, 1940:148), although the equivalent value could also be met with ammunition, baize, buttons, etc. (Dunn, 1844:163).

Native methods of capture varied according to the parts of the river fished. Up to three Native methods anticipated and perhaps inspired methods extensively used later by caucasian commercial fishermen. In the lower river as well as along the outside shoreline and off-lying reefs double-hooked troll lines were employed which provided at least some of the salt-cured catch (Damron, 1975:18). Suckley and Cooper relate seeing in 1855 Natives trolling for salmon in the Columbia from canoes, with smell on a single hooks for lures and small stones attached to the lines as sinkers (1860:179). Whether Native trolling survived the 1800s to serve as a model for troll fishermen supplying the mild cure industry around the turn of the century is not recorded.

Native haul, or drag, seines were also employed. These traditional nets were small by later standards, but some were said to reach 300 foot (91 m) lengths. They were constructed with spruce roots, and the inner bark of white cedar, or "silkglass", with flat, bored stone sinkers of about one pound (450 g) weight, and cedar floats (Bumble Bee, 1945 1.11:5). Early caucasian fishermen used seines which were small by later standards: "In 1877, the Daily Astorian printed a letter from an old fisherman who claimed that when he began fishing in the lower Columbia in 1847, he could catch more salmon than he could manage in a thirty-fathom seine -- 'now such a seine would not bring in a single fish'" (cited in Carstensen, 1971:67). The Native seine was set by canoe just as the tide

salt. The tierces were then sealed and laid on their sides with the bunghole left open. The pickle recovered from the boiling process was poured in until the tierce was full and a circle of clay about 4 inches high into which the oil from the salmon rose. The oil was skimmed off, and as the salmon absorbed the pickle, more was poured in. When the oil had ceased to rise, the clay circle was removed and the cask was sealed. It was said that salmon cured in this manner would keep for three years" (Simpson, 1973:48).
began to ebb, and was hauled to the beach by hand with a crew of five to ten men. Two men handled the canoe which had a "frame... resting on the canoe's gunwale" near the stern for the purpose of supporting the coiled net (Swan, 1857:104-105).

It is also possible the Native fishermen used gill nets in the Columbia Estuary (Spurlock, 1940:74). It cannot be definitely stated that gill nets were used prior to the white introduction of these, as early reports refer only to Indian seines or "seynes", a term which could often, in the early nineteenth century, as easily refer a gill net as a true seine. Net weights found archaeologically are apparently not diagnostic with respect to net type (Hewes, 1947). Small gill nets were used by Natives in the Puget Sound/Georgia Strait area. Dunn describes a "straight net" employed by Natives on the Columbia for catching large fish in deep water (1844:138). This likely refers to their use of a non-floating type of gill net known as a "diver", a type which was "introduced" by the commercial fishers on the Columbia around the end of the nineteenth century. Many accounts credit the introduction of the common "drift" gill net to Columbia River waters to American settlers near the middle of the century.

The Native dipnet fishery was productive upstream where the river narrowed into white water or falls. Platforms were built over rocks and from cliffs so the long-handled nets could be easily swept through the back- eddies where salmon sought temporary respite from the current. Robert Stuart, who observed fishermen working The Dalles, estimated that an experienced fisherman could land 500 salmon daily (Johansen & Gates, 1957:17). In addition to seines, early caucasian fishermen also used dipnets and spears where terrain allowed (Carstensen, 1971:66).

Canoes would certainly have been used to set gill nets, if indeed they were part of the Native fishing repertoire, as well as for setting seines, and for trolling. A Native drag net designed to catch sturgeon was also set by canoe (Payette, 1962:5). Dugout canoes were used extensively in the Native fishery from below Celilo falls to river's mouth. They ranged from 15 to 50 feet (4.5 - 15 m) in length and were usually hewn from white cedar (Chamaecyparis lawsoniana) or fir (Abies grandis). The larger ones, which carried 20 to 30 people, were largely confined to tidewater and were too cumbersome to have found employment in fishing. Even smallest ones had an overhang or flare built into the gunwale (Craig & Hacker, 1940:147). There is scant indication of how canoe size or shape may have varied according to the method of fishing. Collins indicates that "salmon canoes" (used for trolling) of Washington were only about 10 feet long, with a beam of 2 1/2 to 3 feet (.75 - 1.0 m), and were valued at about $10 each (1892b:21). Canoes used in the
Native hook-and-line fishery for sturgeon on the Columbia River "not more than 10 feet long" (Dunn, 1844:134), and may not have differed in proportion and shape for those canoes used to troll for salmon. It is not clear if canoes mounting "frames" for setting seine nets were distinctive in any other manner. Among the other smaller varieties, one class of canoe identified by traders but not associated with any fishery was a "sharp" canoe, noted for the great speed it could attain when paddled by two men (Payette, 1962:123). Linguistic evidence suggests a limited variety of canoe types among groups living higher up the river: "The 'salt-water' people, [of the lower Columbia River and surrounding coast] ...relate with amusement that 'forest dwellers', ...that is the people living up the rivers, have only one word for canoe" (Waterman & Coffin, 1920:20).

Natives on the Columbia River showed no interest in replacing their canoes with boats built in European fashion. On at least one occasion a New England trader tried to offer boats in trade: this individual shipped boats to Hawaii, but found the Hawaiians uninterested "as every man here has a whale boat, which they buy from homeward bound [whaling] ships for four or five large hogs". The trader took the boats, along with wagons and carts on the next leg of his journey to the Columbia River (Morison, 1927b:119-120). There he found that "nothing will buy Skins but Columbia River Blankets, Scarlet & Blue Cloths, Beads, Muskets, Duffil [sic], Trunks, etc." (D.W. Thompson in Morison, 1927b:125).

The first major smallpox epidemic struck the area in 1824; in 1829, after a second wave, the Native population in the Columbia River valley had been reduced to 1/5, or perhaps even 1/10 of its former number (Craig & Hacker, 1940:141). Yet, the natives still provided the fish when, in 1830, McLoughlin found his export market and began shipping barreled salmon to Hawaii (Morison, 1927b:111). The summer of this same year Josiah Marshall's brig, Owhyee, packed 53 barrels of salmon as a byproduct of a fur trading venture before returning to Boston (Morison, 1927b:112). "The salmon sold at $14.00 a barrel, wholesale, but proved of indifferent quality, and difficult to work off at retail. Yet that very autumn the brig Sultana left Boston for the Columbia with a thousand empty salmon barrels, and in 1834 Nathaniel J. Wyeth made the salmon fishery one of the principal objects of his Oregon expedition" (Morison, 1927b:116).

Wyeth seems to be the only one of the American traders to try packing salmon more than once. His Columbia River Fishing and Trading Company was sold to the Hudson's Bay Company in 1836 after encountering

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40 Canvas for sprit sails set on dugouts was a popular trade item, and a notable Native adaptation.
many difficulties (Spurlock, 1940:107). One problem lay in the poor quality of salt-cured salmon shipped to either side of the North Atlantic Seaboard owing to it having to pass twice through equatorial high temperatures. Another difficulty lay with American duties levied on barrels of salmon caught by Natives in Oregon Country as it was "not claimed as a part of the territory of the United States, and the fish, not having been taken by the crew of the vessel, are to be considered as foreign caught fish, and accordingly are liable to $2.00 per barrel duty" (Comptroller of the Treasury (1831), in Morison, 1927b:130). The principal problem may have been in methods of collecting the fish. Wyeth complained that the hope of developing a Columbia River salmon industry for export trade was "premature" and blamed the Indians' primitive methods of catching fish and transporting them to his processing plant: "It was essential that the fish be fresh but this was a requirement the Indians could not appreciate" (cited in Johansen & Gates, 1957:180). Clearly, Native methods of capture were not inadequate; in 1845, when the new American settlers had not yet cleared enough land to be self-sufficient, Native fishermen caught enough fish to feed themselves, some fish for the traders, "but also in sufficient quantities to supply all different settlers, during the entire year" (Hastings, 1845) 1969:47). Wyeth had also tried bringing a number of Sandwich Islanders as fishermen along with a cargo of fishing nets; what type of nets these were is not mentioned, but they proved "totally unfit for the occupation..." which provided, to an observer in the employ of the Hudson’s Bay Company, proof of the Natives’ "...superior usefulness and adaptation to the fishery of the Columbia" (Dunn, 1844:139). Wyeth’s failing, along with that of other American traders was that he awaited delivery of fish by the Natives instead of using his own boats to collect the catch. 41 The Hudson’s Bay Company followed the lead of the Northwest Company, and sent boats in search of freshly caught fish where Natives seasonally camped at their traditional fishing grounds. Gabriel Franchere describes trips he used to take in 1814 (cited in Fayette, 1962:230):

I used to take a boat with four or five men, visit every fishing station, trade for as much fish as would load the boat, and send her down to the Fort. The surplus fish traded in the interval between the departure and the return of the boat, was cut up, salted and barrelled for future use. The salt had been recently obtained...

Though the boats of the Northwest and Hudson’s Bay Companies were not built for fishing, brief reference to what little is known of their

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41 River-caught salmon deteriorate more quickly than other species of fish, or salmon caught in the open ocean, and must be processed quickly after being caught.
characteristics is appropriate as they were the products of the first non-Native boat-building enterprise on the West Coast, and may have provided models for the building of fish boats which followed. Of 175 men sent to Oregon Country by the Northwest Company in 1813, two were carpenters, and there was also one boat-builder attached to the Company ship, Raccoon (Payette, 1962:188-190). These men probably built boats for trading. Boats used later on the Columbia River by trading companies were not normally used for fishing, although there is one mention in a trader's journal of an attempt made in a "boat" to catch sturgeon (Payette, 1962:101). In 1814, canoes were being built at Fort George (Payette, 1962:89). Boats were used as well as canoes for trading at this time, although accounts left by traders do not give construction details except that two types of canoes were built, one with wood, and the other with bark, a construction technique imported from eastern inland waterways. Boats and canoes used for trading were roughly the same size, carrying about 10 men (Payette, 1962:89).

One boat used by the Northwest Company was large enough to carry a name, Dolly, and to be anchored rather than beached. Dolly was oak planked, probably imported as a knock-down boat, and seems to have been used primarily as a lighter (Payette, 1962:123). Other boats used to liaise between ship and shore were referred to in terms such as long boat, jolly boat, and shallow, were probably all boats attached to visiting vessels (Payette, 1962:151).

The Hudson's Bay Company relied more heavily on planked boats than the large bark canoes favoured by the Northwest Company. York boats, used by the Hudson's Bay Company into the twentieth century are well known (McDonald, 1923a:20; 1923b:53; Anon., 1931:281; Glover, 1948:252). These boats had been developed by company boat-builders from the Orkney Islands for the company's expansion into the continent's interior, and were used throughout western North America (Harris, 1987:144). Six to eight oarsmen propelled the craft with a sit/stand stroke applied to 20 foot sweeps.\footnote{Boats were better than canoes for the Hudson's Bay Company because its northern-based operations did not have access to birch utilized for canoes in the south. Boats were also more easily handled by novices, particularly the "dotards and dwarfs" the company complained of receiving while Britain was at war. The first boats sent inland from Albany in 1794 were apparently like later York boats but smaller (3600 pound, or 1630 kg, cargo capacity) "neatly built and painted, and sharp at both ends". By 1810 York boats carried 4200 pounds (1900 kg), more cargo than freighting canoes, yet were more seaworthy on Lakes, not appreciably slower, though still more difficult to portage (Glover, 1948:252).}

York boats soon divided into two classes: "launchers", measuring 28-30 feet (8.5-9 m) were portagable, while the larger class of 38-40 feet (11.5-12 m) were not. Planks for the latter class were 1 1/4 inch (32 mm) knot-free spruce steamed over 2 inch (50 mm) square frames of spruce or tamarack root. Copper rivets secured the top two strakes which were laid
How closely the boats and "batteaux" mentioned in connection with the company's operations west of the Rockies were related to these later-day York boats is uncertain. It seems, however, that the demands of swiftly running streams and mountainous portages resulted in a boat lighter and more maneuverable than the York boat, though Hudson's Bay Company accounts are sparse in their details.

After the company's arrival on the lower Columbia River it was found that Scots and Orkney Islanders did not adapt quickly to handling small craft through the Cascade Mountains, and French Canadian and Iroquois boat-men were much in demand. Under the tutelage of these veterans of the Northwest Company it might be expected that a more canoe-like product would result. Regular accounts of men lost in rapids make it clear how hazardous navigation was and what persistent incentives there were to build better boats (Harriott, (1831) 1907; Anderson, 1878:7).

For one of the first boat-building projects by the Hudson's Bay Company on the Columbia the quantity lumber required for three boats of the period is listed in a diary entry dated October 24, 1825 (Work, 1914:175):

Two men employed sawing, 2 beating & changing the furs to another place, 5 cutting wood, 1 making wheels & arranging a carriage for wood, 2 sundry jobs. --- The sawyers finished the wood for three boats, in all 73 boards 6 Inches wide and 40 feet long & 3 broad pieces for keels 40 feet long & 14 Inches wide, and 6 pieces for gunwales 40 feet long and 2 Inches wide in 15 days, they worked well, they were retarded a good deal by bad weather when they commenced.

Boats and bateaux of the Hudson's Bay Company are mentioned often, but not usefully described until observed in 1845 by Commander Wilkes. He describes one boat which landed with a crew of 14 voyageurs at Fort Vancouver (1845, V:371):

The boat was somewhat of the model of our whale-boats, only much larger, and of the kind built expressly to accommodate the trade: They are provided yearly at Okonangan, and are constructed in a few days: they are clinker-built, and all the timbers are flat. These boats are so light that they are easily carried across the portages. They use the gum of the pine to cover them instead of pitch.43

Wilkes provides more details in describing boats used for the Columbia River Brigade (Wilkes, 1845 IV:378-391):

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on clinker while the flush-laid planks of the lower sides and bottom were secured with clenched iron nails. Seams were caulked with oakum, before the hull surface was rubbed with pitch and burnt (McDonald, 1923a:19-21).

43 Pine gum was traditionally used by Natives of the area in conjunction with withe ties to repair and seal cracks in dugout hulls (Collins, 1892b:20).
"...they have great strength and buoyancy, carry three tons weight, and have a crew of eight men, besides a padroon. They are thirty feet long and five and a half feet beam, sharp at both ends, clinker-built, and have no knees. In building them flat timbers of oak are bent to the requisite shape by steaming; they are bolted to a flat keel, at distances of a foot from each other: the planks are of cedar, and generally extend the whole length of the boat. The gunwale is of the same kind of wood, but the rowlocks are of birch. The peculiarity in the construction of these boats is, that they are only riveted at each end with a strong rivet, and being well gummed, they have no occasion for nailing. They answer, and indeed are admirably adapted to, all the purposes for which they are intended; are so light as to be easily transported over the portages by their crews, and in case of accident are easily repaired."

Interestingly, these descriptions give every indication that the boats round-, rather than flat-bottomed, the form normally associated with the term bateau.

Large craft known as bateaux continued to be used in the area, however. On the Cowlitz River, for example, bateaux could be hired by passengers, or for freight, bound for Puget Sound (Columbian, June 11, 1853:3); reports state this river's 30-foot (9 m) bateaux were planked with material only 1/4 inch (6 mm) thick (Bruce Weilepp, pers. comm. 1993). This is improbably thin for boats of this size used frequently in white water, and probably represents the thickness of the bevelled top of planks visible in the boat's interior. Nevertheless, such comments reflect that these boats were of remarkably light build.

With the Hudson's Bay Company establishing its headquarters at Fort Vancouver, opposite modern-day Portland, Fort George (Astoria) was reduced to "...only a small outer depot... kept up for the convenience of the trade with the Indians towards the mouth of the river, and for the salmon fishery" (Dunn, 1844:113-114). That salmon was also of key importance at Fort Vancouver is demonstrated in an 1846 plan of the fort in which the "Salmon Store" is shown as largest structure in the settlement, and one which dominates the only wharf (Rich, 1946:48).

The salmon collected, if not caught by Hudson's Bay Company boats continued to earn $10 to $12 per barrel in Hawaii for the company which also developed a small trade with China and Australia, although salmon exports to England ceased in 1843 (Rich, 1943:305). In 1841, the Natives working Willamette Falls alone supplied salmon to fill 800 barrels (Craig & Hacker, 1940:159). The Company made a steady, if not outstanding profit in the trade, and over the years had firmly established trading relations not only with Native fishermen on the Columbia, but also purchasers in Hawaii where shipments were sent two to three times per year (Throckmorton, 1961:39). These relations made it difficult for American traders to cut into the trade.
In 1846, the "Oregon Question" was finally settled and the western continental boundary between the United States and British North America was established along the forty-ninth parallel. The Hudson's Bay Company withdrew northwards to centre its West Coast activities in Fort Victoria, a site which had for sometime been emerging as a preferred location for "an organization whose interests west of the Rockies were becoming increasingly involved in coastal shipping, trade with the Hawaiian Islands and commerce with London by way of the sea lane around Cape Horn" (Gough, 1981:36; Rich, 1946:186). While the Hudson's Bay Company maintained its Hawaiian salmon trade with salmon from Georgia Strait and the Fraser River, American companies and settlers were free to develop the Columbia River fishery.

American settlement

American settlers began appearing in numbers in 1843, and American enterprises began to get a firmer footing as well. Agents for Cushing & Co. established small fisheries, first at Pillar Rock on the Columbia in 1841, and then in 1844 between Astoria and Tongue Point (Craig & Hacker, 1940:149). At irregular intervals this company sent shipments of 250 to 400 barrels of salmon to Hawaii along with wheat, lumber and beaver skins. Despite the tripling of salt prices in 1845, a barrel of salmon still cost only $5.00 to produce, and could be sold in Hawaii for twice that (Throckmorton, 1961:39,59). By 1847, coasters were carrying salmon down to a developing market in California (Craig & Hacker, 1940:149). In 1860, when the non-Native population of the lower Columbia Valley was about 250, there was still a "considerable quantity" shipped to the Sandwich Islands (Cleveland, 1903:136). But the salmon fishery remained a tertiary enterprise prior to the introduction of canning. Salmon produced in Oregon in 1860 was worth only $13,450, while salmon, cod, and Halibut produced in Washington was worth $18,900. At this time, the oyster fishery of Shoalwater (Willapa) Bay, Washington, was worth more than all the other fisheries in the State of Oregon and Washington Territory combined (Throckmorton, 1961:222-223). Smith states that the restraints on the early caucasian fishery on the Columbia stemmed from poor fishing equipment, shortages of salt and barrels, competition, shipping problems, and unstable market conditions (1979:16).

Most fishermen seem still to be Natives in the early 1860s, though now they were paid in cash. For example, H.N. Rice and Jotham Reed paid $40 per month to their fishermen (Craig & Hacker, 1940:8). Records of these firms are scarce, so it is not possible to determine the extent to which imported materials or ideas may have been used in capture gear, or to what extent caucasians may have fished along side Natives. The seine
net seen by Swan in 1852 was made of traditional Native fiber and form, and was fished by Natives in the employ of a Bill M’Cart (1857:104-107). In the 1850s, it appears that white settlers were beginning to fish and salt salmon themselves for their own consumption (Craig & Hacker, 1940:149). The first American-made gill net used on the Columbia probably belonged to two men fishing in the vicinity of Oak Point in 1853. A Mr. Hodgkin had brought it with him from Maine (Craig & Hacker, 1940:165), just a year after William Hume had brought his net with him from the same state to the Sacramento River. The next gill net was one homemade on the Columbia by Rice and Reed, who used flax thread spun into twine on a spinning wheel, fashioning it into a net 60 fathoms long by three fathoms deep (Spurlock, 1940:74). When Hapgood, Hume & Co. established their pioneer canny on the river they brought with them two gill nets, 125 fathoms long and four fathoms deep. In 1871, gill nets ranged from 20 to 125 fathoms long (Craig and Hacker, 1940:165). Gill nets grew much larger later, a trend aided by the introduction of machine-woven nets and the Columbia River sailing gillnetter.

Little is known of the early boats used by non-Native fishermen on the Columbia. Dugout canoes of Native manufacture were undoubtedly popular in the early years. Labour costs were quite high locally, so that planked boats were probably made either inexpensively by amateur boatbuilders, or imported. The skiffs and Whitehalls which were reported (Victor, 1872:58; Craig & Hacker, 1940:183), fit respectively into each of these categories. Virtually nothing is known of size or proportions of these boats used in the early Columbia River fishery, however, as early Columbia River sailing gillnetters were called "double-enders" to distinguish them from other fishing boats, it may be presumed that the skiffs, like the Whitehalls, were transom-sterned. R.D. Hume notes that in the first year he brought double-enders to the Columbia (1872) he also used a "square stern clinker-built boat 21 feet in length" (Hume, 1908:25), but he does not elaborate whether this was a flat-bottom skiff, or a boat of round-bottom construction, perhaps a clinker-built Whitehall.

Three brothers, Richard, Benjamin and Joseph Leathers became known as the builders of "the craftiest Whitehall boats on the coast". They arrived, however, in 1872, as Columbia River sailing gillnetters were rapidly replacing Whitehalls on the fishing grounds, so it is unlikely

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"Laborers received from $2.00 to $3.00; carpenters, from $3.00 to $7.00; and other skilled workmen from $4.00 to $6.00 per day in 1857 and 1858. Skilled workers and clerks had charged the government as high as $10 per day during the Indian wars. With reference to the high cost of living, a member of the constitutional convention remarked in 1857 that $400 was "more money" in Rhode Island than $1,500 was in Oregon" (Throckmorton, 1961:223)."
that their Whitehalls, best known as "delicately built" and speedy craft (Hankel, 1988:20), were ever used in the fishery. On the contrary, an 1877 account describes one fishing boat as "something like a Whitehall", but "much heavier" (Anon., 1877:174). Whitehalls disappear from written accounts of the Columbia River fishery after 1877. However, an engraving published in the Frank Leslie's Illustrated Newspaper (August 28, 1880:436) shows a cannery and its fleet which includes Whitehalls as well as Columbia River sailing gillnet boats. Though it is not explicit from caption or text, it may be inferred that the cannery was located upstream. Whitehalls may then have continued in the up-river fishery, plying more protected waters in limited numbers, as late as 1880.

One Whitehall, built around 1900, was displayed in the recent Paddle Oak and Sail exhibit at the Oregon Historical Society. Found in Lakeview, Oregon, this boat was certainly never used in the fishery, probably finding employment for recreation and transportation on Goose Lake. Nevertheless it is a rare example of a Pacific Whitehall and deserves at least brief notice. With an overall length of 16 feet (4.88 m) and a breadth of 47 inches (1.19 m), it is narrow even for a Whitehall pulling boat. The depth of 16 inches (0.41 m) is proportionally typical of Whitehalls. The most interesting feature is its strip planking of western red cedar which is only 1/4 of an inch (6 mm) thick. Steam-bent oak frames are secured with galvanized clench nails. Fine craftsmanship have led the exhibit's curators to suspect that this boat was built in a professional yard, located in either Portland or San Francisco (Oregon Historical Society, 1989). However, that high quality construction is not the sole preserve of professional builders has been demonstrated by the Eureka Whitehall (see page 87). The relatively slow strip-plank method of construction would not appeal to the production-oriented professional builders who turned out most Whitehalls on both coasts of the continent at the end of the nineteenth century. Furthermore, an example from British Columbia (see page 227) demonstrates that, on occasion, strip-planked boats were built by their owners, and that boats could also be built in this manner for use in the salmon fishery.
Columbia River sailing gillnetters

...brave fishermen under full sail are darting in every direction, many boats showing half their keel's length...

(Chittenden, 1882:11).

Figure 17. Columbia River gillnetters under sail (composite drawing after two photographs: Oregon Historical Society, O.Hi.26104; University of Washington Library, FM-25/412).

The Columbia River estuary from the bar to Pillar Rock, 21 miles upstream, averages five miles wide (Fig. 16). On the ebb, the current can reach six knots, and with the water's flow opposed by the prevailing westerlies, the area became a challenging one for man and boat (Fig. 17). Sometimes hulls were cracked open by falling masts broken loose in the vicious wave action (Puustinen, 1985:20). As many as 50 fishermen a year died here in the 1880s (Smith, 1977:224). The newspapers often blamed fatalities on drunkenness. While poor judgement as well as adverse weather conditions on the inner estuary certainly played a part, by far the largest number of accidents occurred when boats were carried on to the bar where the breakers brought almost certain death if any sort of sea was

The name, "Columbia River sailing gillnetter", evolved over time. In early references they were usually referred to as "double-enders". In the 1880s the simple appellation "salmon boat" was common on the river, and these boats when used elsewhere were of the "Columbia River type". "Columbia River gillnetter" had became the common term by the turn of the century, but one inherited by power boats. "Columbia River sailing gillnetter" distinguishes the early gill-net boat without an engine.
running. No suitable rescue craft were on hand for much of the nineteenth century, and death by exposure at sea was the usual result if the hapless victims were not drowned outright. The design of the Columbia River sailing gillnetter was no match for the bar in a blow, and it is doubtful that any small craft of the era could have been, as the danger lay not so much in swamping but in boats being tossed end over end (Yates, 1979:24)." What then were the characteristics which made the Columbia River sailing gillnetter more desirable than the skiffs and Whitehall boats which it succeeded?

In the early years of the canning industry the boats attached to the canneries were few in number (Table 3). Hapgood and Hume, in 1866, had two Whitehalls which brought in about 12,000 fish between them for the season (Cobb, 1930:562; Bumble Bee, 1952 5.3:4). In 1870, a 75 boat fleet, comprised almost entirely of Whitehalls and flat-bottom skiffs, was operating for five canneries, and brought in an average of 9,000" fish each for the season (Craig & Hacker, 1940:183). But, for the remainder of the nineteenth century, a rapid increase in the numbers of boats, the fleet consisting almost exclusively of the more capacious Columbia River sailing gillnetter, mirrored the steady decline in the number of fish caught by each boat per season. Before 1876, the largest canning firm on the River, Booth & Co., had 30 boats (Appleton's Journal, 1876 XV.374:641). By 1895, there were an average of 92 boats per cannyery; 2,207 gillnetters ranged the Columbia River catching an average of 450 fish for the season per boat, 10 percent fewer than the year before (Table 3).

"A special fishing boat was designed in 1896 by Richard Leathers for cannyery owner J.W. Cook. It was fitted with flotation tanks like a lifeboat to make it self-righting (Weilepp, 1991a:46), but the boat may not to have been successful or economically viable as it seems not to have been imitated.

Near the turn of the century, breakwaters and jetties were erected over the bar which made its crossing much safer. However, that it remains treacherous was graphically demonstrated in the fall of 1977 when a 41 foot (12.5 m) U.S. Coast Guard boat sank on the bar and was washed out to sea, not to be recovered until the following spring (Barrett, 1987:23).

"The calculation of 9,000 fish per boat is slightly high as it is based on the total catch by all gear types divided by the number of gillnet boats, however the figure is close; wooden traps had only just been introduced (Craig & Hacker, 1940:170), and the calculation compares well with annual average catches per boat recorded by Bardollet & Co. for the years 1876 to 1879 (Jordan & Gilbert, 1887:746):"
Table 3. Columbia River salmon fishery 1866-1904. Number and distribution of gill-net boats in use, the size of their catches, and earnings produced for fishermen (see Appendix B).

1. Average number of fish taken per boat, per year.
2. Average annual earnings per boat.
3. Average number of boats per cannery.
4. Total number of boats.

Not only did the Columbia River sailing gillnetter have a greater capacity than the Whitehalls and skiffs, but over the years the gillnetters increased in size: the earliest models were said to be about 22 feet (6.7 m) long, but grew, by the early 1880s to about 26 feet (7.9 m) in length before shrinking slightly to an average length of 24 feet by 1888 (Collins, 1892b:38). Later, boats grew again slightly in length, though by the time power was introduced, a 28 foot (8.5 m) boat was still considered large by Columbia River standards. Apparently, this increase in size was not prompted by the necessity of carrying a larger catch. This assumption is based, however, on the premise that fishing conditions remained the same, which they did not.

Early canneries were placed well upstream where the relatively narrow and protected reaches directly off the cannery landing wharf could be fished by the small number of boats employed. If necessary, a boat's catch could easily be unloaded after every drift. Under suitable tidal

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"The first cannery was erected 43 miles (69 km) from the river mouth, and the second was located directly opposite (Throckmorton, 1961:310)."
conditions, a boat could undertake up to five drifts a night (Spurlock, 1940:73). With more boats, competition increased and the lower estuary was resorted to more frequently. As fishermen worked a larger expanse of water they had to make more drifts between visits to fish collection points. 85 fish represented a "good" load at the barge or wharf in 1883 (Smith, 1979:45); at an average fish weight of 24 pounds (11 kg) (Collins 1892a:207) this load of fish weighed 2,040 pounds (924 kg), a heavy load for a Whitehall when two crew and their equipment including a large wet gill net are included.49

Canneries followed the boats downriver. 1873 saw the first cannery, one of eight operating that year, erected at Astoria. Three years later, five were operating in the town (Cleveland, 1903:140). By 1879, "A hundred salmon boats may be counted at almost any time in sight at Astoria" (Jordan & Gilbert, 1887:747). A letter written to Europe by a Norwegian businessman in Astoria demonstrates the dilemma of working the lower river: "Fishermen have often told me that the closer they can come to the Columbia Bar's obstruction and to the breakers, the more salmon they can expect to haul in, and this is the reason that so many row too far out. [Up river, the fishing is] "...very pleasant, but this pleasantness one must pay a little for, as the catch there is generally much smaller" (Bjork, 1958:554). Clearly, many fishermen, and most canners were drawn by the economic incentives of fishing the lower estuary. By 1889, though there was still a cannery operating at Eagle Cliff, 15 of 21 canneries operating on the Columbia River were on the shores of the lower estuary, 11 of these in and around Astoria (Collins, 1892a:198).

49 A record-setting catch for one night was 7,000 pounds (3,180 kg) made by Frank Mercurio in 1896 (Smith 1979:41). Average catches, however, were far less. The daily catches of four boats are recorded in Smith (1895:246-250) for the seasons 1892-1894. In 1893, the high-line boat of the four caught a daily average of 402 pounds (183 kg) in May, with a single day high of 1,914 pounds (869 kg); for June the same boat's average was 277 pounds (126 kg), with a single day high of 894 pounds (406 kg); July saw only a 179 pound (81 kg) average, but a high of 1,315 pounds (597 kg); and August yielded a 513 pound (233 kg) average, with a 1,812 pound (823 kg) catch the greatest for a single day. It may be seen that average daily catches did not particularly tax the boat's capacity. Still, the numbers of fish delivered at the height of the season did strain the canneries' production capabilities; boats were sometimes limited to 800 pounds (363 kg) of fish each per delivery at the collecting stations, the remainder to be dumped (Beard, 1984:3). Examination of Smith's records shows that this might have applied to the catches of the high-line boat a maximum of only seven days of the 56 fished throughout the season. It is possible that boats in close proximity to fish scows or cannery docks made more than one delivery per 24 hour period, however, it seems that one delivery per day was typical for boats fishing the lower reaches of the river, one delivery every two days being acceptable when catches were light and the weather cool.
A greater capacity was also needed for larger nets. As previously mentioned, nets had began to grow in the 1870s, probably in concert with boats ranging farther down the reaches. In 1871, one cannery on the Columbia was still able to pack 25,000 cases of salmon in a ninety-day season employing only four fishing boats, each with a drift net 125 fathoms (229 m) in length and twenty-five to thirty meshes deep (Carstensen, 1971:66). The trend to larger nets may have been stimulated, by the Aiello brothers, who became "highliners" for the year of 1868, by doubling the depth of their net (Wolfenden, 1975:12). Hand-woven nets grew through the mid-seventies to a length of 200 fathoms (336 m), and many were over 350 fathoms long by the end of the decade (Jordan & Gilbert, 1887:747).50 The most common length of nets on the Columbia in 1887 was 300 fathoms (550 m) long, and 45 meshes deep (Collins, 1892a:209). In other words, fishing boats, by the mid 1880s, had to carry almost four times the volume and weight of net they had carried during the first five years of cannery operation.51 The Columbia River sailing gillnetters are recognized as "boats which could carry a great deal of weight for their length and draft" (Chapelle, 1951:186).

Boats travelling farther abroad with the increased load of larger nets and catches accumulated over longer periods would rely less on oar power and more on sail. The Columbia River sailing gillnetters carried more sail than the normal rigs for either Whitehalls or skiffs, and, furthermore sailed best loaded, provided there was a good breeze (Chapelle, 1951:188-189).

The Columbia River sailing gillnetter also provided security in the estuary where conditions could be rough even well inside the bar. Freeboard could not be increased without hindering gill net handling, but greater length and beam increased safety, while the ends could be raised with like effect, and washboards added inside the gunwales would discourage the shipping of waves while increasing the sturdiness and

50 In 1877, a Portland mechanic devised a machine to weave nets at half the cost of hand-weaving, but while this may have contributed to the lengthening of nets, it was not a criticalfactor as, by the mid 1880s, the fishermen's union had banned its members from using nets which were either factory-made or woven by Chinese labour (Carstensen, 1971:66; Collins, 1892a:209).

51 No reference has been found to the weight of an old natural fibre gill net complete with lead line when wet. However, fisherman Ed Rasmussen remembers his mother being paid 60 cents per pound to make nets around the turn of the century. Each "paper" weighed 24 pounds, and 9 papers were required to make a 380 fathom net (Washington State Oral/Aural History Program, 1976 PAC 75-14dm:24-25). The mesh of this net then weighed 216 pounds dry, perhaps twice this when wet. Add 570 pounds for the lead line, and the net could easily weigh 1,000 pounds when wet.
longevity of the boats. The double-ended form made the boats ride better while drifting with the net out: "...when the boat was drifting, it was pulled stern-first through the water by the net. A seaworthy design with a fine entrance at the bow and stern allowed the boats to stay with the net regardless of how rough the waves got" (Weilepp, 1991a:46)(Fig.18). The "lead" to the net was also assisted by the slightly rockered keel employed on the Columbia River sailing gillnetter (Bruce Weilepp, pers. comm. 1993). The strongly flared ends were also advantageous in choppy estuarine waters.\footnote{Another local type, the oyster sloop, was said to be known by the epithet "plunger" because it was such a wet boat when driven through the Columbia River chop. The plunger did not share the Columbia River sailing gillnetter's flaring bow sections (Weilepp, pers. comm. 1993).}

Figure 18. Setting a gill net on the Columbia River, 1894 (after photograph, 1963.2, on file at the Columbia River Maritime Museum).

R.D. Hume, William Hume's younger half-brother, claims to have introduced the first double-enders to the Columbia River. According to Hume's biography, during the winter of either 1869-70 or 1870-71 (it is not clear which), he had "had made in San Francisco three of the first double-end, partly decked boats, with centre-boards, which had ever been
brought to the Columbia River" (Dodds, 1961:39). Collins supports the 1869 date, but states that J.J. Griffin built only a single double-ender for George and Robert Hume that year, and that this particular boat was still in use in 1888 (Collins, 1892b:38). However, in a 1908 Pacific Fisherman article, Hume offers an alternate date of 1872 as the season in which he introduced boats to the Columbia River "of the pattern now used on the Columbia, being the first of the kind brought to the river, these being 24 feet in length and 8 feet beam." Hume claims the boats were built by the boat builder Collins of San Francisco (Hume, 1908:25).

Challenging this date for introduction is Captain Joshua Slocum, best-known through his writings of his single-handed circumnavigation of the globe. According to his son, Victor, before returning to the sea in 1869 at the age of 25, the Nova Scotia-born Slocum had fished salmon for one season on the Columbia River. He was familiar with the boats then being built in San Francisco through his discussions there with builder Griffin. While fishing from a "punt" with a partner on the Columbia, Slocum built a gillnetter to his own specifications. Slocum recorded his Columbia River experiences in a diary, which has regrettably not survived; it may have included technical notes and sketches of interest, as well as specific dates. Slocum's boat is said to have had a length of 25 feet (7.6 m), with a 6 foot (1.83 m) beam and 2 1/2 foot (0.76 m) depth. It was bought by an Astoria cannery, which had subsequent boats built on its model (Slocum, 1950:41-42). Victor Slocum claims his father's boat was an improved Columbia River sailing gillnetter, not the first, and noted that some boats were already being built on the Columbia River, which is a difficult statement to accept before 1869. While Slocum may have fished the Columbia and built his own fishing boat, in all likelihood it was some time later than 1869.

Whichever year the double-end, round-bottom gillnetter was actually introduced to the Columbia, it rapidly supplanted the Whitehalls and skiffs previously used exclusively to set gill nets for the canneries. By 1873, Hume was operating a full fleet of gillnetters built by Griffin (Yates, 1979:23). While most of the early boats were shipped up from San Francisco, Columbia River sailing gillnetters were being built on the Columbia at least by 1875. The Weekly Astorian carried an advertisement that year by fisherman/boat-builder Tim Driscoll of Westport, claiming that fishing boats were his specialty, that "Oregon-built boats are most suitable for the Columbia River", and asking customers to "keep the money in-state" (cited in Weilepp, 1991a:45). The boat-building Leathers brothers of Astoria had probably begun building the Columbia River sailing gillnetters they later became famous for shortly after their arrival in Astoria in 1872 (Hankel, 1988:20). In 1877, a Daily Astorian
advertisement placed by C.M. Stark, for his Gray's Bay Boat Shop, claimed production capabilities of six keels at a time, and that he was "prepared to do a better job than any California builder" (cited in Weilepp, 1991a:45). Other early builders on the Columbia known by name include S.B. and J.F. Barrows, who had a shop on the Lewis and Clark River, and H. Farnsworth, operating in Upper Astoria (Craig & Hacker, 1940:184). M.W. Doyle, V.W. Bouton, the Palo Brothers (Alexander, Matt, and Joseph), John Gustafson, John Riswick, and John Gerttula were other independent boat-builders who, along with builders working in cannery-owned boat shops, produced gillnetters into the twentieth century for the Columbia River, and, in some instances, to the end of the 1940s for the Bristol Bay salmon fishery (Weilepp, 1991a:46).

It was clearly a point of pride for Oregon builders that their product was a local one, and they expected their prospective customers to respond to the idea that locally-built was synonymous with better quality. Under these circumstances the builders were not likely to draw attention to where they received training if this was on the disdained East Coast, Europe, or even California. Obviously, some builders were born in Scandinavia and other parts of Europe, but the extent of traditional Old World training they introduced to the West Coast is uncertain. At least three important nineteenth-century builders in the area were completely trained in the building vernacular of the West Coast: the Leathers Brothers came to Astoria from Redwood City, California (Hankel, 1988:20); the senior brother in the Holland Bros. Boat Building Co. was born in Coos County, Oregon in 1868 (Marshfield Sun, 1901); and Dan Louderback, who built boats on Shoalwater (Willapa) Bay, was born in Washington Territory in 1864 (Weilepp, 1989a:9).

The Holland shop, on Coos Bay, was perhaps larger than most, a building 28 by 100 feet (8.5 x 30 m) with 50 feet (15 m) of waterfront, but not out of the ordinary. A photograph in the Oregon Historical Society collection (O.Hi.82487) shows the inside of their shop, and gives some idea as to the variety of boats built there: two sailing gillnetters stand upright at the back of the shop, framed and planked except for the closing strake; a small round-bottom, transom-stern boat stands freshly painted in the foreground; and hanging from the rafters are two completed, flat-iron skiffs of about 15 foot length. The Holland Brothers were not afraid of the new, and though they established themselves in Marshfield only in 1894, within two years they had turned out their first gas boat. In 1897-99, W.W. Holland left is brother in charge of the shop while he built 60 scows and 100 small boats on Lake Bennett, Yukon, for Klondike gold-seekers (Marshfield Sun, 1901).
An oral account by a Mr. Kola provides a glimpse of a small boat shop which had been run on the Columbia River by his Finnish-born father. The building crew consisted of the proprietor Mr. Kola Sr., a senior boatwright, "old man Saari", who earned $2.25 per day, a younger worker named Steinback who earned $2.00 per day, and the respondent, who as a boy earned $.50 a day. This shop turned out 9 sailing gillnetters in a year (Washington State Oral/Aural History Program, 1976 PAC 75-28dm:9).

Knowing a number of builders and their shop locations does not necessarily mean that more is known of the boats they built. The builders of the Columbia were typical in the dearth of records left by them. Collins' description of the early boats used on the Sacramento and Columbia Rivers has been cited (see pages 90-91). He claims the early boats were 22 (6.7 m) to 23 feet (7 m) long, without providing any information regarding proportion: "Later, boats of 25 and 26 feet in length were built;—but they were found to be rather unwieldy for two men to manage, and at present the majority do not exceed 24 feet in length..." (Collins, 1892b:38). The smallest versions of the type (boats as small as 15 feet (4.6 m) were used on the Sacramento River) have never been reported in the Columbia River commercial fishery and boats of "25 and 26 feet in length" seem to have been used from the beginning.

In 1879, each cannery possessed on average forty-five boats, which they rented to the fishermen (Table 3, see page 125). Only fifty boats, less than 7 percent of the fleet, were owned by fishermen themselves. The boats were still built "usually without deck" and were "mostly" from San Francisco, "but as they can be made in Astoria somewhat more cheaply than they can be bought in San Francisco, some of the canneries are having them made at their own establishments. They can be built in Astoria for $175, without paint or rigging; painted and rigged they are worth about $225" (Jordan & Gilbert, 1887:746).

Table 4 allows data available pertaining to the shape and proportions of various Columbia River sailing gillnetters to be compared. The boats are represented in rough chronological order, with Slocum's boat heading the selection. As suggested, this boat does not represent the small end of an even progression of boats growing steadily larger to the end of the century. Its most outstanding characteristic is its relatively narrow beam; with a length to beam proportion of 4.16, it is the narrowest boat sampled. The narrow beam combined with a depth of 2.5 feet (0.76 m), a depth not far out of the average but perhaps slightly high for a boat of its length, yields a beam to depth proportion which is also at the extreme end of the sample, all other boats being relatively shallower.
Table 1. Summarized data pertaining to form and proportion of Columbia River sailing gillnetters (see Appendix B).

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<th>BOAT ID</th>
<th>LOA</th>
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<th>FLOOR</th>
<th>BELGE</th>
<th>DEPTH</th>
<th>GM</th>
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<th>BOAT ID</th>
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<th>ENT BDR</th>
<th>ENT WLD</th>
<th>TWIST</th>
<th>PC</th>
<th>CF</th>
<th>DISP</th>
<th>DISP/LWL</th>
<th>MASP</th>
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<tbody>
<tr>
<td>USNM 22216</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>3.585</td>
<td>141</td>
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<tr>
<td>USNM 285833</td>
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<td>43</td>
<td>18</td>
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<td>.55</td>
<td>50%</td>
<td>5,580</td>
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<td>10%</td>
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<tr>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>3,570</td>
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<td>45</td>
<td>22</td>
<td>23</td>
<td>.55</td>
<td>46%</td>
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<tr>
<td>RSWICK</td>
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<td>36</td>
<td>16</td>
<td>40</td>
<td>.57</td>
<td>55%</td>
<td>5,595</td>
<td>215</td>
<td>14%</td>
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<tr>
<td>CARLSON</td>
<td>78%</td>
<td>48</td>
<td>27</td>
<td>21</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>BARFUELT</td>
<td>64%</td>
<td>39</td>
<td>15</td>
<td>26</td>
<td>.60</td>
<td>50%</td>
<td>4,935</td>
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<td>17%</td>
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<tr>
<td>FELUCCA AVE (RNG)</td>
<td>-</td>
<td>29</td>
<td>20 (33.41) (14.21)</td>
<td>19</td>
<td>16</td>
<td>16 (16-23)</td>
<td>-</td>
<td>-</td>
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<tr>
<td>WHITEHALL AVE</td>
<td>-</td>
<td>30</td>
<td>15</td>
<td>15</td>
<td>-</td>
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<td>-</td>
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The next boat listed is a rigged model in the National Museum collection, with catalogue number USNM 22216. Like the National Museum felucca models, it was donated by Livingston Stone and is dated to 1876. Chapelle describes the model (1976:297-298):

The model shows a sharp stern, caravel-planked, centerboard, sailing hull, having sharp entrance and run, the latter the finer of the two and both with hollow in the waterlines; full-ended at deck; strong sheer; straight keel; straight and rather upright sternpost; ...upright curved stem; washboards along gunwales, with low combing. The midsection shows a rising straight floor, low and rather hard bilge, and upright topside. The model is fitted to row, having three thwarts and three oars. A mast is stepped in a clamp well forward, and rigged with a single spritsail.

Scale of model is 1 inch to the foot, giving a boat 25 feet 6 inches at gunwale, 6 feet 3 inches beam, 2 feet 3 inches deep amidships, 3 feet at ends, mast 16 feet 3 inches, spritsail 14 feet 6 inches, and oars 12 feet long. This was considered large for a boat of the type when she was built, 24 feet then being the average.

The model is quite close to Slocum's in both size and basic proportions, just 6 inches (15.2 cm) longer, 3 inches (7.6 cm) beamier, but with 3 inches (7.6 cm) less depth. Two rowing stations are typical on later Columbia River gillnetters; Collins also notes three sets of rowlocks, each with a single thole pin, which may be a characteristic of early large boats (1892b:39).51 Tanner noted that in 1888 the crews were not always limited to two as generally reported, but when fishing was good, three men went out in a boat (1890:68).

The sample seems to be generally biased towards larger than average boats, if reports of the average sizes are accepted. Hittel provides three basic dimensions for boats used on the Columbia which he describes as "uniform in size and pattern" and his figures match the "average" suggested by other authors for the period: 24 feet (7.3 m) long, 6 1/2 feet (2.0 m) wide, and 2 1/2 feet (.76 m) deep (1882:371). This "average" boat is beamier than earlier boats. He attributes to the boat, which at this time cost $250 to $300, a carrying capacity of four tons, and a service period of ten years (Hittel, 1882:371).

The trend towards greater beam continues in the next boat examined, dated to 1885. USNM 285033 is a rigged model which shows the inboard arrangement of these boats in great detail. The boat had been transferred from the Bureau of Fisheries to the National Museum and is described by Chapelle (1976:298-299):

51 The sheet on sailing gillnetters was typically secured to one of two belaying pins, which penetrated both side decks just forward of the aft deck. At a glance, they might look like the single wooden thole pins. Gillnetters, at least by the 1880s, used patent metal rowlocks mounted on substantial chocks.
The entrance and run are sharp and somewhat hollow, the sheer moderate, the keel straight and with slight drag, the stem and sternposts both rather upright and with heels rounded, the stem more so. The midsection is formed with a rising straight floor, rather easy turn of the bilge and flaring topside.

There are three thwarts, with a 'dividing board' just abaft the after thwart. The centerboard case extends from the forward to the aftermost thwart and is capped; the centerboard is raised and lowered by a jointed iron handle. The boat is fitted to row two pairs of oars...

Scale of model is 1 inch to the foot; the boat represented was 26 feet 5 inches overall, 7 feet 6 inches beam, 2 feet 9 inches deep amidships, 3 feet 9 inches at bow, and 3 feet 10 inches at stern, centerboard about 6 feet 6 inches long, mast 22 feet 6 inches, sprit 22 feet, sprit boom 26 feet long.

Unlike the other models from the Smithsonian Collection, USNM 285033 is readily accessible as it is on permanent loan to the Columbia River Maritime Museum. Bruce Weilepp, then a staff member of the museum, scaled off four sections of the model in 1989. These have been worked into lines which approximate the model. The model is longer and wider than previous boats, but not out of line with length/beam proportions shown in Collins' "large" boat of 1888. The centre of flotation is amidships which is expected on boats where lines forward very nearly match lines aft. USNM 285033 has the greatest depth of any boat listed (actually 2 feet 11 inches (0.89 m) based on Weilepp's information); a depth which would probably not result in much increased freeboard given the midship section with an uncharacteristically steep rise in the floors. The lines are unusually fine towards the ends below the water, while above the water the usual pronounced flare at the ends is absent. Weilepp is 'suspicious of the shape' of this model (pers. comm. 1989), and his distrust may be well-founded. However, the half entrance angles and flare of this model are still considerably greater than those exhibited in Whitehall hulls, and the flare is somewhat greater than the average for feluccas. Without further evidence regarding the end forms of early Columbia River boats, it should not be ruled out that the distinctive flare of the Columbia River sailing gillnetters may only have evolved in the last decade and a half of the nineteenth century. Providing slight evidence in support of this suggestion is an engraving dated 1876: a cannery is depicted with numerous double-ended gill-net boats, all of which sport small decks over noticeably fine ends (Appleton's Journal, 1876 XV.374:641).

Collins provides the outside range for boats on the Columbia River in 1888. The smallest boats were 23 feet (7.0 m) long with a beam of 6 feet (1.83 m) and a depth of 2 feet (0.61 m), while the largest boats were 28 feet (8.53 m) long with 8 feet (2.43 m) beam and 2 1/2 foot (0.76 m) depth. These extremes are represented in Table 3 (see page 125) as
Collins' "large" and "small" respectively. Unfortunately, Collins has not offered a lines drawing of the Columbia River sailing gillnetter as he has for the felucca. However, he provides some details of a "typical Columbia River salmon boat" he says is a "trifle larger than average" (Collins, 1892b:39):

- Length over all: 25 3/4 feet
- Beam: 6 3/4
- Depth: 2
- Height amidships, gunwale to keel bottom: 2 1/2
- Height at ends: 3
- Length of mast: 16 1/2
- Length of cars: 12
- Cost, ready for use: $400

This boat is identified as Collins' "detail" in Table 4. Both Collins' "small" and "detail" are the last boats in the chronology to exhibit "narrow" proportions. They are also the first to show "shallow" proportions in beam/depth.

So far, all boats listed in Table 4 have been either rigged display models or are the basic dimensions of boats supplied with little reference to shape. Data for boats of more recent construction are based on much more concrete and detailed sources. Boats built for the Sanborn cannery in the 1890s were known to be large and particularly beamy. Fortunately, the lines for one of these boats has been committed to paper (Weilepp, 1991b:47):

This drawing was created by W.H. Dole, a naval architect at Astoria Marine, in 1942. According to Dole, he and the company's loftsmen lifted the lines of an old, derelict gillnet boat belonging to a friend of the company's owner, Joseph Dyer.

Although it had been motorized, there was little doubt of the boat's sailing origins. Older workers at Astoria Marine recalled that it had been built for the Sanborn Cannery and nicknamed a 'flounder' boat, not for any connection with flounder fishing, but for its unusual size and broad beam. Sanborn boats were faster sailors than other gillnet boats, making them popular favorites at fish boat races during the annual Astoria Regatta.

At 27'2" in length, the Sanborn boat was one of the largest sailing gillnet boats built for the Columbia River...

The Sanborn boat drawing is reproduced in Figure 19. The boat cannot be dated with assurance, but as the type was best known and recognized in the 1890s, it is arbitrarily dated to 1895 in Table 4 (see page 132). It is indeed the beamiest boat in the sample. Yates asserts that Columbia River sailing gillnetters did not broaden beyond 8 feet (1979:25). Generally, the statement is true, as the "flounder boat" probably represents the extreme of beam for Columbia River boats at 3 inches over 8 feet (2.5 m). The centre of flotation is located surprisingly far forward, 46 percent of waterline from the bow. The Sanborn boat does not stretch the envelope in other respects, such as rise...
of floors, bilge curvature, or breadth and depth proportions, although it is the most capacious of the boats listed.

Figure 19. Lines of a Sanborn Cannery gillnetter, c. 1895 (Courtesy of the Columbia River Maritime Museum, accession # 82.17.261).

Information for the next boat came from a builder's model, the only such model for a sailing fish boat so far located on the West Coast. The 26 inch (66 cm) model was made and used by John Riswick, a Columbia River boat-builder who built boats for both the Columbia River fishery and for Bristol Bay. John Riswick's grandson, Don, believes this model represents a 32 foot (9.8 m) boat of the type shipped to Alaska (Bruce Weilepp, pers. comm. 1989). At the common and handy builder's scale of 1"=1' the model would represent a 26 foot (7.92 m) gillnetter, a size not too large to have been built for the Columbia River, but also compatible with the smaller sizes sent to Alaska.44

As no date can be ascribed to this model, and size is not diagnostic assuming a 1"=1' scale, the boat this model represents has been arbitrarily dated to around 1900 and included in both Table 4 (see page

44 The next commonly used builder's scale is 1 1/2" = 1'0" (Taylor, 1988:91), which would produce a 39 foot (11.9 m) boat.
132) with other Columbia River gillnetters and Table 6 (see page 249) to contrast it with Bristol Bay boats. The centre of flotation is slightly aft of centre. The boat has three outstanding characteristics in shape, all of which lean towards proportions which became increasingly popular with Bristol Bay boats. Its flat deadrise of 1:8 helps give the boat the fullest midship section among Columbia River boats. The flare in the bow is very dramatic; the angle of entrance at the waterline is the finest of any of the gillnetters sampled, yet the lines at the gunwale are the fullest, with no less than 40 degrees separating the two. The model is now on display at the Columbia River Maritime Museum in Astoria. Bruce Weilepp took detailed offsets from the model in 1989 and the resulting lines drawing is shown in Figure 20.

Another sailing gillnetter, represented by two lines in Table 4 (see page 132), is a boat constructed by fisherman Victor Carlson around the turn of the century. Carlson had worked at the Leather brother's Astoria boat shop in the 1890s, and produced a partial lines drawing for his own fishing boat. He probably lifted his lines from another boat. Carlson's original drawings remained in the possession of his descendants until brought to light by naval architect Fredryck Barfuet in 1988 (Weilepp, 1991b:47). Carlson's drawing served Barfuet as a loose basis for plans he produced for a replica Columbia River sailing gillnetter launched in 1991. This boat now sails out of the Columbia River Maritime Museum, but the reconstruction differs somewhat from Carlson's plan, particularly in midsection form. The two forms are represented as Barfuet and Carlson, respectively in Table 4.

Carlson's boat is one of the larger boats which seem to have become more prevalent in the late days of sail on the Columbia River. It fits well with two noticeable trends towards broader and shallower boats as the century's end approached. The floor is moderately raised. Barfuet's reconstruction, however, is given a very hard turn of the bilge which contributes to this boats "firm" sectional area. Bilges this hard were seen on some Bristol Bay boats, but Carlson's original drawing provides for a moderate bilge curvature more typical of the Columbia River sailing gillnetter (Figs. 21 and 22).
Figure 20. Builder’s model of a sailing gillnetter produced by John Riswick. Date uncertain (based on half model at the Columbia River Maritime Museum, Accession # 70-85).
Figure 22. Reconstruction drawing for Carlson boat, by Freddryck Barfuet
(Courtesy of the Columbia River Maritime Museum).
The remains of one sailing gillnetter lie in the lower intertidal zone off Puget Island, and are exposed only on a - .2 foot tide. Only the inverted midsection and aft portions of the hull remain. This wreck was photographed and quickly measured in June, 1987, by Bruce Weilepp as it lay partially exposed on an unusually low tide (Weilepp, 1987). The broad plank keel and centerboard slot immediately identified the hull as that of a sail boat, although the slot had been filled when the boat had been converted to power. This boat had been bought as a power boat by the family whose property still fronts the site, around 1914, after the boat’s presumed career of uncertain duration as first a sail and then a powered gillnetter. The boat then spent the remaining 25 years of its working life as a powered seine skiff before being abandoned around 1940. The keel measures 8 1/2 inches (216 mm) sided and 2 1/4 inches (57 mm) moulded, at its widest point in way of the centreboard. Frames are spaced 11 inches (0.28 m) apart, measure at the heel 1 1/2 inches (38 mm) square, and are secured atop the keel with rivets on either side of the centreboard slot. Deadrise is 1:4 on the starboard and 1:3 on the port side. Without more information it is not possible to determine which side (if not both) has been distorted by the forces which broke the boat apart; 1:3.5 is the figure for floor rise included in Table 4 (see page 132) for the Puget Island boat.

A second Columbia River sailing gillnetter is said to rest in Bernie’s Cove, also on Puget Island. Though the boat had for some time sat upright in the intertidal zone, today only weed tufts, 22 feet (6.7 m) apart, mark the boat’s extremities (Weilepp, pers. comm. 1993). This overall length is low for a Columbia River sailing gillnetter, indicating that the boat may well have been a flat-bottomed trap tending boat or another boat rather than a sailing gillnetter, but without excavation it is not possible to determine more.

A smaller boat, not used in the commercial salmon fishery, but interesting nevertheless, is a 14 foot (4.26 m) double-end boat, built by James Laurence Reeder, of Sauvie Island, in 1882. The boat remains in the Reeder family, who still reside on the island, and was displayed at the Paddle Oar and Sail exhibit at the Oregon Historical Society Museum. With a beam of 3 foot 9 inches (1.14 m) and a depth of 12 inches (0.30 m) the Reeder boat seems to be a relatively shallow, smaller version of the Columbia River sailing gillnetter. It is "carvel-planked with Port Orford cedar fastened with galvanized nails to steam-bent oak ribs" and was used on the lower Columbia River for trapping otter and beaver, as well as salmon fishing and general recreation in the family (Oregon Historical Society, 1989). It is also included in Table 4 (see page 132) for comparison with the larger commercial boats.
Barfuet's lines and reconstruction drawings for the replica are reproduced in Figures 22 and 23. The most noticeable discrepancy between Carlson's and Barfuet's lines is the very hard turn of the bilge chosen by Barfuet. While bilges this hard were used on Bristol Bay boats, there is no indication from the Columbia River sample presented here that bilges harder than those shown in Carlson's original drawing were employed on the Columbia River. Barfuet's construction details are primarily interpolated from surviving Bristol Bay boat construction details and scantlings. Nothing from photographic evidence indicates that twentieth century Bristol Bay boats differed substantially from earlier Columbia River sailing gillnetters, though certain scantling details are available. The mast was stepped on the keel and was unstayed. Support came from a mast clamp which facilitated the rapid stepping or striking of the mast; this hasp was mounted on the after-most beam of the foredeck. Partially covered by the foredeck was the forepeak area. Fishermen would sleep here, usually during daylight hours, with the added protection of the sail rigged over the sprit which served as a ridgepole. Aft of the forepeak a bulkhead performed the dual function of anchoring the forward end of the centreboard case and separating the forepeak from the fish lockers which straddled and ran the length of the centreboard case. The puller usually manned his oars while straddling the centreboard in the forward part of the fish locker as his partner handled the nets (see Figure 18, page 128). Another bulkhead crossed the hull at the aft end of the centreboard case. A third bulkhead divided the area astern into a standing space in the way of the after pair of rowlocks, and a net locker. The helmsman's position, used when the boat was under sail, was atop a small raised sole at the stern.

Based on plans for Bristol Bay boats and the National Museum models Chapelle has described the construction of Columbia river boats as "sound... without frills... quite conventional in all respects and... moderately heavy" (1951:188). Columbia River sailing gillnetters were typically planked with Port Orford cedar (Chamaecyparis lawsoniana) or select fir (Abies amabilis or grandis) on oak frames. Oak was also most commonly used for the keel, stem, and stern posts. Oregon white oak (Quercus garryana) is available in the middle Columbia River valley, so that Oregon boat-builders had the opportunity to utilize this local species while Californian builders relied on imported oak (Hittel, 1882:371; Yates & Eriksen, 1978:27). Larch (Larix occidentalis) sometimes substituted for oak (Chapelle, 1951:188), probably serving as the best local wood for the purpose when straight timber of Oregon white oak with sufficient length proved difficult to procure. Later boats had frames steam bent over molds, then placed cold into the boat (Chapelle,
1951:188), but the vintage of this technique on the West Coast is uncertain. Bristol Bay boats built on the Columbia River had all their plank seams caulked (Wellepp, 1991b:46), and had frames set up and planked while the boat was upright (Fig. 40, see page 250). The boats were then inverted for caulking before being turned back upright for detailing.55 It is not certain when tight seams were abandoned on the Columbia River, or to what extent the construction sequence employed for the Alaskan boats was anticipated by earlier Columbia River boat builders. Fastenings were conventional. Typically, galvanized nails were used, although the Leathers' shop, for one, would optionally employ copper rivets for a higher price (Hankel, 1988:20). Stem and stern post assemblages were through-bolted. Ring bolts were, in lifeboat fashion, placed at either end in the way of navel holes which penetrated the end decks; these facilitated the lifting of cannery boats onto the docks for off-season storage and were installed at least as early as 1885 (USNM 285033), continuing as standard fittings on Bristol Bay boats where they also assisted the handling of boats being shipped north.

While the sample seems to represent a good cross-section of hull sizes and proportions, Captain Tanner of the U.S. Fish Commission steamer Albatross claims that Columbia River gillnetters ranged from "20 to 35 feet long, [and] 7 to 10 feet wide." He further notes that while most of the boats were carvel-built, "a few are clinker" (Tanner, 1890:68). As there is no confirmation of the large sizes Tanner observes these have not been included in the table; no other source mentions clinker-built boats with the gillnetter's form on the Columbia River either.

Another variant of the Columbia River sailing gillnetter is featured in Figure 23.56 The boat bears a two-masted gaff rig, with a tall jib tacked to the stem, on what is essentially a gillnetter hull enlarged to something well over 30 feet in length. Two shrouds secured with external chain-plates support each mast. The fore-deck area is proportionally enlarged, and the fore mast penetrates this deck. There appears also to be a centreboard trunk. This type of boat was not common, and it was

55 The photograph of the Holland Brother's shop (O.Hi.82487) demonstrates that at least some Columbia River sailing gillnetters were planked upright, a method which continued with powered gillnetters.

56 That both boat and crew shown in Figure 19 are clearly "dressed" for an outing does not mean the boat was built for recreational use. Several photographs of Columbia River sailing gillnetters show the fishing boats scrubbed clean of the week's accumulation of gurry, with men, women and children aboard dressed in their Sunday best obviously bound for a picnic site rather than the fishing grounds.

Two other photographs of the type include one of the Alice, 63.209d in the Columbia River Maritime Museum collection; and Clatsop County Historical Society photograph 4990-315.
probably not used to fish salmon, although the undated photograph's caption reads "2-masted gillnetter". A small number of these boats were likely used as cannery tenders rather than fishing boats (Bruce Weilepp, pers. comm. 1993). The boat bears a name-plate reading "TRITON of", with its port of call or cannery name, unfortunately, hidden from view; gillnetters were almost never were named.

Figure 23. "Two-masted gillnetter", Columbia River (after a photo in the Oregon Historical Society collection, OHi 83356).

The sprit rig was used on the usual single-masted Columbia River sailing gillnetters consistently. Hittel says that boats on the Columbia used "triangular" sails (1882:371), but, rather than leg-of-mutton sails, he probably saw scalloped sails, that is, with their sprits removed for the purpose of shortening sail area. This was the usual method of reefing this rig on the West Coast. Some Columbia River sailing gillnetters show one row of reef points as well. Sails were secured to the mast with hoops, made of either wood or metal (Weilepp, 1991b:45). All later boats
carried a boom secured to the mast with a snottar like the sprit. The rig was generally struck while the net was out, to improve seaworthiness and stability (Weilepp, 1991a:46).

Several photographs showing gillnetters of the Columbia show them in a racing configuration with two sprit sails set wing-on-wing. This arrangement was employed by the "unlimited" class. The "working" class sometimes flew a club headed stunsail (Weilepp, 1991b:45). These additional sails were not part of the normal sail configuration for fishing. As can be imagined, unlimited the racing rig, which required the handling of no less than four snotters, and excessive sail area would be too challenging for day to day use. Nevertheless, the races, held Sundays when the river's fishery was closed, were important local events, particularly the annual Java Cup regatta where the "king of the fleet" was determined. The sight of boats racing under two sprit sails made a sufficient impression on observers that the appellation "butterfly fleet", based on their appearance while racing, came to be applied generally to gillnetters sailing on the Columbia (Yates, 1979). Boats such as the Sanborn boat were known for their performances on race day, and it seems likely that race results had some influence on the design choices of builders.

The first boat with an internal combustion engine was the naphtha-powered Winn built in 1884. The boat was used by a cannery owner for transportation, but the engine proved very unreliable (Pacific Fisherman, January, 1919). A gasoline engine was first installed in a fishing boat in 1893, but reliability remained a problem, and the transition was further retarded on the Columbia River by a prevailing belief that engines frightened the fish; it was 22 years (1915) before the last sail propelled craft disappeared from the fishing fleet, despite the fact that power boats spent less time between drifts, delivered fish more efficiently, and, when properly set up, could be operated by only one man instead of two (Bumble Bee, 1952 5.3:4; Craig & Hacker, 1940:185). The first power boats were Columbia River sailing gillnetters modified only slightly to take power plant and propeller (Fig. 24). These boats did not long survive the weight and strain of the engines and tended to squat at speed owing to their fine lines aft. Yet the Columbia River sailing

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57 The gaff-rigged, horseshoe-sterned boats often seen sharing the course with gillnetters in these race-day photographs are oyster sloops, also known as "plungers", (Weilepp, 1989a:9) which sailed down from Shoalwater (Willapa) Bay for the events.

58 Fisherman Conrad Koski says the large extra 'Sunday' sail was carried in his boat while fishing, but only because it served as a comfortable mattress (cited in Weilepp, 1991b:45).
gillnetter's ancestral influence was apparent for many years in powered wooden fishing boats of the Columbia, particularly in double-ended trolling boats. In Oregon, these trollers branched into two traditions defined by form as well as detail, called "Norwegian-style trollers" or "Finn-style trollers", those belonging to the latter category staying closest in form and proportion to the original sail boats. Most of these boats were built in backyards and small yards utilizing a variety of wood species according to individual or local preference. Yew became a popular framing material in Astoria. Port Orford cedar also became popular as a rot-resistant wood which bent easily for use as frames, though well-cured oak continued to be used in some places for this purpose. As Port Orford cedar became scarce, fir became increasingly popular for planking, particularly on the bottom, as well as at times for framing. Red cedar was often used for waterline strakes (Gilmore, 1981:102-103). This great variability in use of wood by species may well have pre-dated the introduction of engines to a certain extent, but data are not available to confirm this.

Figure 24. Early powered Columbia River gillnetter (after Hanson, 1954).
Haul seine boats

In addition to gillnets, seine nets were extensively used on the Columbia River. Though purse seines were used near the river’s mouth for a brief period around the turn of the century, the predominant method was haul, drag, or beach seining from gradually sloping shore lines, and from sandbars found in along the lower Columbia (Fig. 16, see page 122). The seining season was shorter than that for gill nets, sometimes lasting only through the months of July and August (Washington State Oral/Aural History Program, 1976 WRM 76-24dm:50).

The seine nets used by Natives have been described (see page 112-113). Fisherman Jack Petit claims that his grandfather, Amable Petit, was the first caucasian to make his own seine net on the Columbia, using a "ton" of twine from San Francisco shipped from San Francisco, but he provides no date (Washington State Oral/Aural History Program, 1976 PAC 75-25dm:5). Early seines used by caucasian crews working Chinook Beach were similar in size to the Native seines, 40-60 fathoms (73-108 m) long and 20-30 feet (6-9 m) deep, hauled entirely by hand with a crew of five to ten men. In the early 1880s all the available sites were bought from the state for nominal sums, though subsequently these properties grew very valuable, ensuring that individual fishermen could not afford them and haul seining on the forty-odd suitable Columbia River sites became the sole preserve of not more than a half dozen canning companies (Smith, 1895:251; Collins, 1892a:203). Nets grew much larger, up to 400 fathoms long, requiring horses to haul them.99

With larger nets came the requirement for larger boats. Columbia River sailing gillnetters were occasionally pressed into service to shoot seines, but usually only in the small rivers where comparatively short nets were operated (eg Oregon Historical Society, photographs 86693, and 36637). "As a rule these boats can not be profitably employed for seining on the Columbia River, since their draft is too great for working satisfactorily on the shallow bars of this river, where the seines are commonly landed, and also because, being sharp aft, they can not so well support a seine as the broad-stermed, shallow sharpy" (Collins, 1892b:40). Collins also describes the typical seine skiff (1892b:40):

It is an open, flat-bottomed boat, with moderate sheer, sharp bow, wide, square stern, and a good deal of camber to the bottom, particularly in the after section, where it curves

99 Horses used for hauling seines on mid-river sandbars were housed along with gear and men in scow barns which floated through high tides and dried out at low tide when the horses were let out for work. The horses, along with equipment and supplies were delivered by scow schooners. R.D. Hume patented the horse-windlass for beach seines in 1895 (Dodds, 1959:16).
up sharply. Boats of this type are roughly and heavily built, the main object being, apparently, to get a craft that will stand a gooddeal of rough usage, that will float on a light draft, that will easily support the seine at the stern, and which is otherwise well adapted to the fishery.

Captain Tanner adds to the description (cited in Collins, 1892b:40):

The [seine] boats used in the salmon fishery are about 25 feet long and 7 feet wide, the greatest width being at the stern, which is square. The bottom is flat, but turns up slightly at the stern. These boats have three thwarts adapted for two men rowing at each. About 8 feet of the after part of the boat is decked over and upon this deck the seine is stowed.

Craig and Hacker list the dimensions of slightly larger seine skiffs at 30 feet (9.1 m) long with an 11 foot (3.4 m) beam (1940:187), probably an eight-oared version. Seine skiffs sizes were usually distinguished by the number of oars used. The six-oar skiff described by Tanner was the most common size, while some eight- and four-oar skiffs were also employed, with overall size varying accordingly.

Inventories of the R.D. Hume's operations on the Rogue River around the turn of the century recognize three sizes of seine boat. One of the ordinary size cost $175 in 1905 (R.D. Hume & Co. Inventory, 1905 61:23). The earliest inventory in the collection (1881) indicates that earlier seine boats were much less standardized. Each of the five "flat bottom" seine boats listed is unique in size: 27 x 8 1/2 ft. (8.2 x 2.6 m); 22 1/2 x 7 1/2 ft. (6.9 x 2.3 m); 21 x 7 ft. (6.4 x 2.1 m); 14 x 4 ft. (4.3 x 1.2 m); and, 16 x 4 ft. (4.9 x 1.2 m). Values of the three larger boats, of uncertain vintage, range from $10 to $50. The two smallest boats are described as "old"; if not actually derelict, these were clearly considered of little value to the fishery as they are assessed at $1.00 and $2.50 respectively. These old boats are surprisingly narrow and would only be of use setting the small seines used in the early fishery. They are proportioned little differently than the skiffs also listed (R.D. Hume & Co. Inventory, 1881 48:23).

The technique for setting a large haul seine is as follows (Spurlock, 1940:95-96):

The most successful time for dragging a seine was slightly after the tide started to flood, bringing in the salmon. Two boats, a seine boat and a dory were employed. The first carried the net and both took station together some distance off shore. The shore or shallow end of the net was attached to the dory and at a signal the two boats parted, the dory heading toward the shore while the larger boat circled around against the tidal current paying overboard the deep end of the net to form a barrier against the migrant fish. The salmon were not gilled and all the work was accomplished as swiftly as possible to prevent the catch from finding an outlet below the lead line. The boat crews would jump into waist-deep water to rush the ends ashore where horses were hitched to haul the heavy net. While one team pulled another
was driven into the water and hitched farther back so that the movement would be continuous; always the net was worked against the tide as much as possible.

Seines large and small, hauled by men alone or in combination with horses, were operated in this manner from the Eel River, California, to Kodiak Island, Alaska, wherever conditions were suitable and the method legal. The dories employed were of medium size and were sometimes imported from the East. Those built on the West Coast could be built on the East Coast model, but were often somewhat modified with widened sterns and bottoms (Collins, 1892b:45).

Figure 25. Eight-oared seine skiff with net flaked on platform, Columbia River (after photograph in the Oregon Historical Society collection, 0.Hi.7847)

Ethnicity of Oregon's fishermen and boatbuilders

The manpower requirements of the early canning industry on the Columbia River could not be met with local labour alone. Native fishermen had virtually disappeared by 1879: "There are very few Indian fishermen on the lower Columbia, none of them of pure blood" (Goode & Collins, 1887:42). Astoria became the principal abode in the most productive fishing season, spring to late summer, of many seasonal workers. Of 2,500 fishermen engaged in gill-netting on the lower Columbia River in 1879, about half lived in Astoria and most of these were only seasonal residents, only one-tenth of the fishermen lived permanently in the towns where they were employed (Goode & Collins, 1887:42; Jordan & Gilbert,
Their ethnic background was varied, although southern European immigrants, brought each season from California to the Columbia, were the largest single group" (Damron, 1975:22). Greeks and Italians usually fished through the winter in San Francisco (Goode & Collins, 1887:42), while most fishermen working year-round on the Columbia were Norwegian and Finnish (Damron, 1975:22). Most transient fishermen were ethnically and socially quite distinct from resident fishermen. Transient fishermen were generally illiterate, young, more than two-thirds of them were unmarried, and were seen as "rough, tough, and lawless group" both on the water and off (Carstensen, 1971:67). The Oregonian (Sept. 8, 1881) declared Astoria "the most wicked place on earth for its population," while the Post-Intelligencer (April 30, 1890) described the fishermen of the lower Columbia as a "bunch of 'piratical dagoes' who were trying to terrorize the peaceful upriver American fishermen. The "Americans", according to the Post-Intelligencer, consisted of "Scandinavians and others" (cited in Carstensen, 1971:67).

Research is hampered by the disinterest and sometimes disdain expressed in the local newspapers towards fishermen in general, but particularly towards transient gillnetters of southern European descent. It is impossible, for instance, to gauge accurately the number of annual casualties. It was primarily the transient fishermen who played roulette with the breakers, and those who were lost were often without name or family in the eyes of canners and the local community at large. Newspapers seemed startlingly unconcerned about accurately reporting grisly facts. For example, in the great storm of May 3 and 4, 1880, reports of the number of gillnetters who lost their lives on the bar ranged between 60 and 350 (Carstensen, 1971:68).60

While the successful organization of labour activities among gillnet fishermen, who often scarcely shared a common language, belies some newspaper reports of ethnic antipathy,61 clearly there was a difference in

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60 This storm had swept in from the Pacific without warning and with tragic timing. It was the first day of fishing that season, as gillnetters had been striking for higher fish prices. Every boat was out trying to make up for lost time. The interest of the press quickly passed beneath overtones that somehow justice had been meted out to the fishermen. The canners and local newspapers generally cited lower casualty figures, while the gillnetters' union and, perhaps not surprisingly, San Francisco newspapers published the higher figures.

61 The chief divisions among fishermen hinged far more on gear type than ethnicity, although sometimes these divisions overlapped. For instance, there was great strife leading not infrequently to bloodshed between gillnetters and trap net fishermen; the gillnetters were an ethnically mixed group, many of whom were not residents, while the trap net fisherman were almost entirely residents of American or Scandinavian birth. The Columbia River Fishermen's Protective Union position on pound,
life style between transient fishermen and those who were residents. Contributions in terms of personal innovations in fishing gear, fish processing, and boat building, can reasonably be expected to be far lower among transient fishermen; Slocum’s exertions to build a fishing boat while visiting the area as a fisherman are clearly exceptional.

By the late 1880s the numbers of southern European-born fishermen had decreased considerably. Though many fishermen still did not live on the Columbia River year-round, most of these were now farmers and loggers of Scandinavian descent based in the interiors of Oregon and Washington who looked to fishing as part of a balanced economy (Bjork, 1958:554).62

Though they are often overlooked, fishermen did make considerable contributions to fishing technology on the West Coast. For example, the Danish-born Mathias Jensen, who fished many years in the late nineteenth century on the Columbia, is credited with the inventions of a net-knitting contrivance, a can-filling machine, a topping machine, and a can-making machine (Spurlock, 1940:123). The influence of individual fishermen may have had on boat design is less clear, although it was “not too unusual for fishermen to moonlight as boatbuilders in the off-season” (Weilepp, 1991b:45). The fishermen most likely to moonlight as boatbuilders, in some cases turning to boat-building as a year-round occupation, would, of course, be residents. In 1888, Scandinavian-born fishermen (principally Swedes and Finns) comprised 50 percent of the 3,538 working the Columbia River, 27 percent were Caucasians of North American birth, while only 14 percent had been born in southern Europe (Collins, 1892a:224).

For yards producing often hundreds of stock boats to an identical design for canneries, there seems, at first consideration, not much room for input by fishermen once the design had been established. Yet, while their numbers were small, fishermen who owned their own boats and tackle could earn much more than fishermen who rented their equipment (Bjork,

or trap nets was hostile: “The reason why our gillnet fishermen were compelled to fish at or on the bar, and brave the dangers of the breakers at the mouth of the Columbia River, was mainly owing to the fish traps taking up all the best fishing grounds, and left to a fisherman with a gill-net no space over which to float of drift his net and it is, alas too true, that many were caught in the breakers and drowned” (cited in Smith, 1979:30).

Seasonal fishermen of southern European descent, travelling a considerable distance from an urban residence (San Francisco), were replaced by Scandinavian fishermen, whose often nearby rural residences make sharp definition of transient versus resident labour difficult. This pattern reflects one notable throughout the continent where Norwegians, Danes and Finns, settled overwhelmingly in rural settings as opposed to urban, a characteristic they shared with only those immigrants from Mexico and Luxembourg in the nineteenth century (Schofer, 1975:17).
1958:319), and, though many boat-owning fishermen used boats bought second-hand from canneries, an individual fisherman might also commission a boat-builder for a custom-built boat to meet his own particular ideas or criteria (Weilepp, 1991a:46). These custom designs, if successful, could then be reproduced by the boat-builder for other clients. Small yards, such as Kola’s (see page 131), would probably offer the greatest flexibility with respect to design. Although nearly all the boats were yard-built, a certain number of the individually-owned boats were probably built by fishermen. Joshua Slocum is one example of a fisherman.builder; while he may not have been a typical fisherman, it is possible that he diverged from the norm farther by committing his experiences to paper than he did in his building and experimentation with a boat of his own. As resident fishermen were the ones most likely to own or perhaps build their own boats, they are the ones most likely to have contributed to the evolution of Columbia River sailing gillnetter design; as most resident fishermen from the early days of canning were of Scandinavian descent, the imprint of northern European boat-building traditions might be expected to show up.

The effects of Scandinavian influence might have shown up as early as 1874, because "many Scandinavians" owned their own boats and nets at that time (Bjork, 1958:552). This may indeed have been the time of greatest influence for fishermen because they were then relatively more affluent and able to afford boats, whether stock or custom, than they were nearer the end of the century. While the typically Scandinavian lap-strake construction is largely, if not entirely absent in the history of gillnetters, the simple fact that Columbia River sailing gillnetters were double-ended with no obvious extra-regional ancestry has led some to speculate that they were a combination of the concepts of Clatsop Indians and of Scandinavian fishermen (Anon., 1939:25; Spurlock, 1940:80). While it is clear that the design originated on the Sacramento with no input whatsoever from Scandinavian or Clatsop traditions, as is often the case, there may be some truth in local oral traditions if they are not taken too literally. For example, the considerable flare to the topsides near the bow and stern of Columbia River gillnetters was a very unusual feature on sailboats of the nineteenth century, yet we have no way of knowing if this flare was nearly as marked on early boats. Perhaps early gillnetters had less flare, having more upright ends like feluccas and Whitehalls, and only developed the characteristic flare on the Columbia River in conditions which had inspired the Clatsop and other Chinookan groups to

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43 In 1895, despite considerable increases in price for fish, the catch was so low that many fishermen ended the season in debt, with an average of $151 owed to the canneries by each (Smith, 1979:47).
build flare into the gunwales of their canoes (Craig & Hacker, 1940:147) for untold centuries before contact. The most obvious stylistic characteristic of Scandinavian boat-building tradition is perhaps distinctively up-swept ends. This is more easily measured than flare with data at hand, and indeed there is a trend through the nineteenth century for Columbia River sailing gillnetters to have increasingly pronounced sheers (Table 4, see page 132), possibly a consequence of Scandinavian influence on the Columbia.

Just as fishermen may have had the financial wherewithal to influence design in the 1870s, another period of increased influence on the part of fishermen may have been forced upon them as a part of cannery policy, despite the decreased financial capability of fishermen to afford their own boats. After 1888, canneries increasingly encouraged fishermen to buy their own nets, and boats as well to a lesser extent, because this equipment represented a capital expenditure the canneries wished to be relieved of, and one they justified with the philosophy that rented equipment was not as well cared for as that owned by the fishermen (Collins, 1892a:206; Spurlock, 1940:80).

While the cannery lines were manned primarily by Chinese workers, the same rough rule which applied to the salmon fishery of the Sacramento was enforced on the Columbia River in the 1870s: "It is... the unwritten law of the Columbia that any Chinaman daring to fish for salmon is to be killed on sight" (Jordan & Gilbert, 1887:748). This policy may have lapsed for a time, as Collins lists 13 Chinese fishermen active on the river in 1888 (1892a:224). However, these men may have been catching sturgeon near Portland for the market fishery where the "Chinese trawl" was reported in use (Collins, 1892a:219). Yet, "Older fishermen recall that in the [last] days of sail there were varying numbers of Chinese gillnetters on the Columbia, but declare that they disappeared with advent of power boats" (Spurlock, 1940:77). Wilcox (1895) makes no mention of Chinese fishermen on the river in 1892. No influence on gear, apart from use of the Chinese trawl, or boat design can be expected of the brief period of Chinese participation in the Columbia River fishery.

Somewhere in Oregon a Chinese fishing community was said to exist (Armentrout-Ma, 1981:142), but exactly on what stream is uncertain. It may have suffered the same fate as the Humboldt Bay Chinese fishing community as Collins makes no mention of it in his detailed report for

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"George Hume was first to use a Chinese crew for fish cleaning and canning in 1872. Chinese workers were considered quicker and more reliable than caucasian workers. A skilled worker could clean 1,700 fish in an 11 hour day. By 1888, the wage for a cannery worker on the Columbia was roughly the same as the average earnings of a gillnetter, $40-50 a month (Smith, 1979:23)."
1888 (1892a). The fishery was probably similar to the Humboldt Bay fishery in species sought, gear and boats used, and probably was located on a similar water body, Coos or Tillamook Bay for example. Chinese dugouts canoes would have been the craft most likely used in the capture of groundfish there (Chapelle, 1976:301).

Away from the commercial fishing hub of the lower Columbia River, fishermen worked smaller streams for outlying canneries under different conditions than did their fellow gillnetters who filled the boarding houses of Astoria. The canneries were generally smaller, often operating singly without direct competition, and the fishermen’s ranks were filled to greater extent by residents. The ethnic mix of the outport fishermen was very different also; fishermen born in southern Europe were rare, Native fishermen appeared in some numbers, while the number of North American-born caucasian fishermen were proportionally more numerous than in any other salmon fishing area in the Pacific. For outlying streams, the Columbia River sailing gillnetter was not the boat most frequently used to set gill nets, and like the northern streams of California a variety of skiff types, generally very poorly defined are found in different areas.

Oregon coastal streams

Oregon’s coastal streams may be roughly divided into northern and southern sections. In the southern portion, within the counties of Curry, Coos, and Douglas, are the Windchuck, Chetco, Rogue, Elk, Sikhs, Coquille, Coos, and Umpqua Rivers, all rivers exploited by the commercial salmon fishing in the 1890s. By 1860, both the Rogue and Coquille rivers had salteries. These two rivers, as well as the Coos and Umpqua, supported canneries starting in the years 1877, 1883, 1887, and 1878, respectively (Cobb, 1930:568-570). In 1888, there were a total of 495 fishermen on these eight streams, 54 percent of these were born in Scandinavia, 35 percent were caucasians born in North America, 5 percent were Native, 4 percent born in central and western Europe, and only 2 percent born in southern Europe (Collins, 1892a:178-179, 181-189). By 1892, the number of fishermen in this area had decreased drastically to 275; of these the most numerous remaining group were caucasians of North American birth at 51 percent, Scandinavians 34 percent, Natives 7 percent, those from central and western Europe 5 percent, and those of southern European birth 3 percent (Wilcox, 1895:216).

Only Collins, among Commission on Fish and Fisheries contributors, gives even a scanty description of what sort of boats were used on the coastal streams of Oregon. On the Windchuck and Chetco Rivers only three seines were used between the two rivers, two boats were employed for each
net, and these boats Collins values at $50 each (1892a:178-179). The Elk and Sihks Rivers, in the northern part of Curry County, also had very small fisheries; the Elk could boast only one boat, valued at $25 which alternately set seine and gill net, while boats similarly alternated between seine and gill nets on the Sihks, though Collins values these boats at $87 each.

The most significant salmon stream of Curry County, and indeed in Oregon after the Columbia River, was the Rogue River. L.S. Meyers was first to locate a salt fishery on Rogue in 1857 (Dodds, 1961:34). In 1877, a cannery was built, which in the following year was purchased by R.D. Hume. Hume essentially built the town of Ellensburgh, later named Gold Beach, to serve his cannery operation, located as it was then in the wilderness. In addition to building residences, he established his own newspaper, general store, medical dispensary, race track, the coast’s first fish hatchery, and a small shipyard (Collins, 1892a:280; Carstensen 1971:64-65). In the shipyard he had built small vessels to transport his pack to the Columbia River, and the boats and sails used by fishermen on the Rogue River. Small (60-75 fathom) gill nets were set from boats described by Collins as of the "flat-bottomed sharp type"; 2 seines were set by "large flat-bottomed seine boats" (1892a:181).\(^45\) The 25 boats used on the river had an average value of $52 each (Collins, 1892a:182). Wilcox assesses the value of boats used in the fishery as well, but averages values by county rather than by stream; the average value for the 57 boats in Curry county in 1892 was $45 (1895:626).

On the Coquille River, in Coos County, Collins describes the boats used for setting gill nets, which were "partially owned by the fishermen", as "all flat-bottomed 'skiffs' with a sharp bow and square stern, and average from 18 to 20 feet in length having about 5 foot beam." The gill nets were 70 fathoms (128 m) long and about 17 feet (5.2 m) deep. Nine seines were used. The 64 boats were valued at $42 each. 55 of the 222 fishermen on the river in 1888 had come down to work the small stream at the end of the Columbia River season (Collins, 1892a:184-185). On Coos Bay and River about one third of the fishermen came down at the end of the Columbia River season. Larger gill nets could be employed here (150-250 fathoms long, 3 fathoms deep). Collins’ evaluation of the 39 boats at an average of $75 reflects the use of some Columbia River Sailing gillnetters: "Two kinds of boats are in use on the bay and river, one type being the Columbia River salmon boat and the other a sharp-bow and square-stern, flat-bottomed craft, much like the bateau or sharpy. The two types

\(^{45}\) Owing to the seasonally changing character of the Rogue river with respect to salinity and outflow levels, seines were only productive during the fall run (Jordan & Gilbert, 1887:739).
are about evenly distributed among the fishermen" (1892a:186). The photograph described (see page 130) indicates that both these types were built in a local boat shop. The names of five types of Coos Bay boats and their approximate sizes have been revealed by oral histories. At the turn of the century, Columbia River boats used there were 26 feet (7.9 m) in length; seine boats were 26 feet long as well, with an 8 foot (2.4 m) beam; boats descriptively named "dory sterns" ranged from 18 to 24 feet (5.5 - 7.3 m) in length; boats known as "Joe McGees" were 16 to 18 feet (4.9 - 5.5 m) long; and, finally, small scows, only 8 to 10 feet (2.4 - 3.1 m) long (Gilmore, 1981:41). Wilcox estimates the average value of the 31 boats in all of Coos County in 1892 at $48 (1895:218).

On the Umpqua River, in Douglas County, where a "large portion of the fishermen [were] non-residents", 39 boats were assigned by Collins an average value of $75. Here gill nets averaged about 175 fathoms in length, and boats were "mostly of the Columbia River type" (Collins, 1892a:188-189). Only 2 boats were active on the Umpqua River in 1892, and these are also valued at $75 each (Wilcox, 1895:218).

Fortunately, inventories of Hume's Rogue River operations have survived, and more detailed snap-shots of the boats used on the Rogue River are possible from records spanning 24 years between 1881 and 1905. Unfortunately, only for 1881 are details of size supplied. That year the company owned 12 boats directly used in the fishery. The seine boats have been described (see page 148), and two 22 1/2 x 5 1/2 x 5 foot (6.9 x 1.7 x 1.5 m) skiffs, valued at $30 each, were used to haul salmon from the seine boats. Two skiffs of next to no value, one "small", 12 x 4 feet (3.7 x 1.2 m) and the other "old", 14 x 3 feet (4.3 x 0.9 m) may or may not have been used to set gill nets. Three "round bottom Fishing Boats" certainly were: each was valued at $150, two measured 21 x 6 x 5 feet (6.4 x 1.8 x 1.5 m), and the third 21 x 6 x 5 feet 10 inches (6.4 x 1.8 x 1.78 m). It seems these last three boats were the only boats equipped to sail; sails and rigging are tallied separately (R.D. Hume & Co. Inventory, 1881 48:23).

By the next inventory, ten years had elapsed and precise dimensions are no longer forthcoming. However, some boat purchases in the preceding four years are listed, including: a "Large Seine Boat" for $150 in 1887; three "Drift Boats" for $186 each in 1889; one "Small Seine Boat" for $100 in 1889; and three more "Seine Boats" for $100 each in 1891. Four "Large

"It is not clear precisely what the second and third numbers represent in this and some of the following specifications. Probably the second is maximum breadth, but the third, which cannot represent depth, could also be maximum beam, beam on the floor, waterline breadth, or transom breadth. A guess, given the nature of the source, that it represents length of the fish locker.
Columbia River Boats" are also valued at $116 each, though, presumably, these were at least five years old at the time (R.D. Hume & Co. Inventory, 1891 51:1).

It is interesting to note the longevity of these Columbia River boats; all four were still listed in 1905, about 20 years after their construction, although their value had depreciated to $50 each. All but one of the seine boats listed in 1891 were still in service in 1905 as were the three drift boats purchased in 1888. There is no further description offered of these "drift boats", but it is interesting that they remain throughout the documented period valued about 25 percent more highly than the Columbia River boats, though certainly they performed the same function, setting "drift" gill nets. Apparently new drift boats were not decked as one drift boat was distinguished from those purchased in 1888 as an "old decked Drift Boat." For eight years after 1891 no new boats were purchased, but in 1899 the company spent $1051 on six new drift boats. An odd assortment of low-valued skiffs identified by paint colour, and a dugout, have disappeared by 1899, but new boats begin to appear. In addition to three gas boats purchased in 1903, a $35 "Up River Fish Skiff" and two $45 "Otter Boats" join the fleet. In 1904, 2 used skiffs arrived from the Coquille River, and in the next year six "new" skiffs from the Coquille valued at $42 (R.D. Hume & Co. Inventories 1891 51:1-2; 1892 52:3-4; 1893 53:42; 1895 54:12; 1899 55:6; 1900 56:3-4; 1901 57:4; 1902 58:47; 1903 59:10; 1904 60:10; 1905 61:22-23).

Whether they are Coquille skiffs, otter boats, up-river fishing skiffs, or drift boats, two types of gill net boats used on Oregon coastal streams are illustrated by photographs taken on the Rogue River. Figure 26 shows boats used perhaps above the lower reaches of the river. The date is 1920. The boats pictured are flat-bottomed, double-ended boats, with crudely dory-like proportions. They are sprit-rigged, with steering provided under sail with a stern-mounted oar, and appear to be smooth-planked. Length may be 18 feet (5.5 m), or less. Another photograph, from the Oregon Historical Society collection (O.Hi.22046), shows a similar boat which is identified as a Rogue River dory. There are no frames within perhaps four feet of the stern, but frame spacing towards midships seems to be about 18 inches (0.45 m). A gill net is visible in the boat, which has clearly been fishing a relatively narrow, upstream portion of the river. Modern Rogue river dorries, used on the upper portions of the river now have square sterns, but are said to have derived from the double-ended bateaux, synonymous possibly with the inventory description of up river fishing skiff. When maneuvering in a current, the Rogue River dory "is positioned on the river with the pointed end downstream [as opposed to a more inland Oregon dory] the McKenzie River
dory [which] evolved from flat-iron skiffs [and] ...moves downstream square end first" (Oregon Historical Society, 1989). The use of oar steering was popular with West Coast surf dories as well as river dories, proving more effective in rough water than a tiller (Oregon Historical Society, 1989). ⁶⁷

Figure 26. Rogue River fishing boats under sail, 1920 (after a photo in the private collection of H.J. Newhouse, Wedderburn, OR.).

Another photograph taken at the mouth of the Rogue also in 1920 shows a different sort of gillnetter (Fig. 27). It is a lap-planked double-ender, with a flat-bottom of generous rocker. Sheer and flare in the sides are also considerable. A photograph in the Curry County Historical Society archives (F74.119) dated to 1917 shows about a dozen of this type of boat also near the mouth of the river. Some of these boats show even greater sheer and rocker than the boats in Figure 27. None of these boats, which might properly be called batteaux, have sails up, though one boat sports a short, bare mast. The boats are perhaps a little longer than 20 feet (6 m). In another Curry County Historical Society photograph, unnumbered but bearing the caption "Ferry Slip, Gold Beach Ore", a bateau is shown pulled up on a dock. Futtocks visible inside are widely spaced, perhaps 3-4 feet (0.9 - 1.2 m) apart. A smaller dory-like skiff is nearby, as are two Columbia River sailing gillnetters. The photo

⁶⁷ Oar steering was also popular on East Coast dories where using an oar instead of a rudder and tiller saved space on board (Gardner, 1952).
is not dated. The numbers of these boats leads one to think they might be
drift boats, yet while they are clearly of more expensive build than the
skiffs seen up river, it is difficult to imagine them costing more than a
Columbia River boat.

Figure 27. Bateaux near the Rogue River mouth (after a photo in the

Included in the northern division of Oregon's coastal salmon streams
are the Suislaw, Alsea, Yaquina, Siletz, Nestucca, Tillamook, and Nehalem
Rivers, in Lane, Benton, and Tillamook Counties. These streams had their
first canneries erected in the years 1878, 1886, 1887, 1896, 1887, 1886,
and 1887, respectively (Cobb, 1930:565-568). In 1888, 498 fishermen were
fishing for those canneries in existence. 47 percent of these fishermen
were caucasians of North American birth, 31 percent had been born in
Scandinavia, 14 percent from southern Europe, 5 percent from central and
western Europe, and 3 percent were Native (Collins, 1892a:190-197). By
1892, the total number of fishermen had dropped to 248, comprised by
nativity of 51 percent North American caucasians, 35 percent
Scandinavians, 8 percent southern European, and 6 percent Native (Wilcox,
1895:153).
The Suislaw River fishing boats and nets escaped comment by Collins except that he estimated the 68 boats used there in 1888 to be worth $35 each (1892a:190). By 1892 there were only 21 boats in Lane County, in which the Suislaw is the only significant coastal salmon stream, and the estimated value of these boats had dropped slightly to $25 (Wilcox, 1895:218). Suislaw River commercial fishermen were among the first on the Oregon coast to troll, this fishery starting with handlines as early as 1895 (Cobb, 1917:88).

On the Alsea (Alseya) River in Lincoln County (formerly Benton), 43 boats were used in 1888 to handle gill nets of 100 fathom length, and two haul seines. Collins describes the boats used on the Alseya as the "flat-bottomed bateau type, sharp at the bow and having a square stern. They average 20 to 22 feet in length and have about 5 1/2 feet beam" (1892a:191). $30 was the average value assessed to these boats (Collins, 1892a:192). On the Yaquina River Collins notes that many of the fishermen owned their own boats. Gill nets of 100 to 125 fathom (183 - 229 m) length were employed along with two seines. This river was unusual among the coastal streams in that "during pleasant weather, and when the sea [was] not too rough, the fishermen venture out to sea and set their nets to intercept the salmon on their way to the river" (Collins, 1892a:193). Both the Columbia River sailing gillnetter as well as the "flat-bottomed bateau" were used. The average value for 75 boats, however, was $48 each (Collins, 1892a:194-195). On the Siletz River a cannery would not be built until 1896, and at the time of Collins' report an exclusively Native fishery existed on the river for which no figures regarding boats and gear are provided. These three rivers are included within what was still Benton County in Wilcox' report, which estimated a $27 average value for the 50 boats remaining in 1892 (1895:218).

In the collection of the Oregon Historical Society is a "flat iron dory skiff". This boat was built in Yaquina in 1904 with fir lapstrake planks and batten-and-seam bottom planking running fore and aft. Length is 17 feet (5.2 m), beam 50 inches (1.27 m) and depth 16 inches (0.41 m). The bow is slightly raked and the transom is also, but slightly. This boat was not used for commercial fishing, but rather recreational fishing and clamming, and is said to be "typical of early bay boats that were built from a mail order plan" (Oregon Historical Society, 1989).

On the Nestucca (Nestuggah) River gill nets only were used. The 15 boats employed were valued in 1888 at $30 each (Collins, 1892a:196). On the Tillamook Bay and River gill nets were 100 fathoms (183 m) long, and

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"Inside" fishing grounds predominated in Oregon until the 1930s, when reliable gas boats with cabins were common, and many smaller streams were closed to commercial fishing (Gilmore, 1981:30).
two seines were employed in 1888. The boats were "mostly of the Columbia River type, but a few bateaux are also employed"; Collins averaged the price of 76 boats on the Tillamook at $160 (1892a:197). The Nehalem River cannery was shut down in 1888, so Collins provides no separate details for this stream. Wilcox averages the value of the 26 boats used in Tillamook County in 1891, that is the boats used on the Nestucca, Tillamook and Nehalem Rivers, at $99 each (1895:218).

The plywood surf dory now popular all along the coasts of Oregon and Washington appears to have made the transformation from river boat to ocean-going craft near Pacific City, near the mouth of the Nestucca River. Salmon fishermen on this river were said to have used plank-sided double-end dories similar to those used on the Rogue River. When the commercial fishery on the river was closed, fishermen looked to offshore trolling. Nestucca Bar was too shallow and treacherous to run out over, but a cove in the lee of nearby Cape Kiwanda offered a passable launching point, although the boats had to be dragged by horses or oxen to this point at the start of every season until a road to the cape was built in 1957. Known as Cape Kiwanda surf dories, or Pacific City dories, these boats differed from bank dories in their pointed sterns, their more robust framing, great sheer and rocker, and broader bottoms. They also lacked the graceful curved stem of the East Coast dories, inheriting a more utilitarian look from river dories. A typical Cape Kiwanda dory had a length of about 20 feet (6.1 m), a chine beam of just under 4 feet (1.2 m), a sheer beam of about 6 foot 8 inches (2.03 m), and a depth of about 2 feet (0.61 m) (Neilson, 1957:9; 1959:8). These dories were used by both commercial and sport fishermen, but they did not remain propelled by oar and sail for long. In the 1930s outboards were added, mounted in motor wells, though to this day oars are used for leaving and returning to the beach (Oregon Historical Society, 1989).

Though not properly defined as a coastal stream, the Columbia River above its estuary may properly be treated in this section because it shared many characteristics with fisheries on true coastal streams. It was removed from the canning and boat-building hub, most fishermen were residents, and the reaches were narrow and protected where small nets could be set from boats not unduly challenged by the elements. One difference is that the banks of the upper Columbia River and its tributary, the Willamette, were among the first areas settled by Americans in Oregon; it seems a potentially fertile area for relict boat types. There is already some evidence that Whitehalls persisted in the salmon fishery at least a decade longer than they did farther downstream.

That few fishermen were newly brought in to this area by the railroad, or for seasonal work is well illustrated by Wilcox's 1892 census
of fishermen by county. In Multnomah County, at the junction of the Willamette and Columbia rivers, 70 of the 157 fishermen were American-born caucasians, 4 were German-born, and the remainder from Scandinavia. Farther up the Willamette all 40 fishermen in Clackamas County were American-born caucasians, as were 100 percent of the fishermen in Cowlitz and Clark Counties on the Washington side of the river. In Skamania, the majority of fishermen were Scandinavian, but only 22 fished there. In Wasco and Wahkiakum counties, which straddle The Dalles and Celilo Falls, area, Native fishermen were in the majority (Wilcox, 1895:216, 258).

Collins values the boats used on the Willamette at only $20 each (1892a:232), but offers no description. Wilcox, values them at $24 (1895:217). The boats used in the counties bordering the upper portions of the Columbia vary greatly in value. For counties on the Oregon side Wilcox assigns values of $77 and $84, on the Washington side values of boats from Cowlitz County, farthest downstream were valued at $46, while those from Skamania were $20, and Klickitat only $15 (Wilcox, 1895:217, 261).

Figure 28. Two skiffs near The Dalles (after a photograph in the Oregon Historical Society collection, O.Hi.82979).
Clearly, the values ascribed by Collins and Wilcox reflect three factors: type, size, and age or condition of boats. Still, it seems impossible to gain a more than a rough idea of what the boats were like, given the surprising range in values. For comparison it is worth noting that the average value of all the Columbia River sailing gillnetters and seine skiffs used on the Columbia in 1888 according to Collins was $163 (1892a:224). Wilcox places the value of boats used in Clatsop County in 1892, a county where virtually all boats were Columbia River sailing gillnetters, at $139 (1895:217). These were about the most valuable boats used; at the other end of the value scale were small Native canoes which probably account for the majority of craft in Klickitat County. In between are mixtures of boat types and sizes, many of which, upper Columbia were not used for gillnetting but for seining, and tending fishwheels or traps. Another confusing element lies in Collins' flat-bottomed boats, all of which are described as square-stered where details are offered at all, while photographic evidence for coastal streams shows boats which are exclusively double-ended. It may be inferred from these data that the double-ended form was becoming increasingly popular in the decades bracketing the turn of the century. However, at least for the upper Columbia River a square-stered craft is represented repeatedly in photographs.

Figure 28 shows two skiffs used by the Seuferts, who operated on the Columbia River near The Dalles. These are flat-bottomed boats showing moderate sheer and rocker, but generous flare, a beam of perhaps 6 feet (1.8 m), and a length somewhat exceeding 20 feet (6 m). Might they be survivals of the type of boat which Collins witnessed in many coastal streams in 1888?

Originals and replicas in Oregon

The recent Paddle Oar and Sail exhibition brought to light a few turn of the century boats which had survived, overlooked in rural locations throughout Oregon. While the positive response garnered during the exhibit’s preparation illustrates how a high-profile organization like the Oregon Historical Society can turn up boats which might otherwise escape researchers' attention, none were boats built specifically for the commercial fishery. The three boats of some interest in the context of this study are: the Sauvie Island double-ender, which remains in the possession of the Reeder family of Sauvie Island; the strip-planked Whitehall owned by James Schmidt of Lakeview; and the flat-iron skiff built in Yaquina, which is now part of the Oregon Historical Society collection.
In the Columbia River Maritime Museum are the Riswick builder's model and the loaned National Museum model, 285033. Full-size boats include a Bristol Bay gillnetter (see page 247), and an early powered Columbia River gillnetter which is generally believed to have been converted from a sailing gillnetter. This boat was operated by the Obland family of South Bend, Washington, from 1930 to 1981, and is one source for sailing gillnetter scantling data, although the boat has been so thoroughly rebuilt over the years that even the original keel with its plugged centreboard slot has been replaced.

The Columbia River Maritime Museum is also the permanent location of the sailing gillnetter reconstruction, designed by Barfuet, and built by Dave Green between March and October, 1989. This boat is sailed on the river, but as data of Table 4 (see page 132) have demonstrated, while its general dimensions are accurate, the hard bilges of the reconstruction were not found on Columbia River sailing gillnetters, and the scantlings are, of necessity, speculative.

The two boat remains found off Puget Island demonstrate that the conditions in West Coast estuaries are, not surprisingly, favourable to small craft preservation. They also suggest parameters of site formation simultaneously favourable to site preservation, and later, site location, that is, the boats were abandoned in the intertidal zone, where they became waterlogged and settled, being subjected to some siltation and exposed only on unusually low tides. It would be interesting to test a magnetometer and a sub-bottom profiler over these remains to learn what signature small craft in this environment leave for remote sensing. Another type of potential site is where canneries are known to have burned. West Coast canneries were, and are, notoriously vulnerable to fire, and boats are known to have been burned and sunk in some fires (Washington State Oral/Aural History Program 1976 PAC 75-28dm:9).

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Washington

Washington salmon fisheries, apart from those on the Columbia River, were relatively late in developing. Although the Hudson’s Bay trading post at Nisqually traded for Native-caught salmon from the time of its establishment in 1833, only for a couple of years in the latter half of the 1840s was salmon packed at Fort Nisqually for export. An English settler at Steilacoom reported that "hundreds of salmon were traded from the Indians, salted, packed in barrels, and shipped away on company vessels" (McDonald, 1981:119). These would have been taken from the waters surrounding the fort with troll lines, gill nets, and drag seines. Each season from 1851 until the international border was finally established in Haro Straits, the Hudson’s Bay Company sent a small crew from Vancouver Island to Eagle Cove on San Juan Island to run a saltery there which annually produced between 2,000 and 3,000 barrels of salmon. Fish were supplied by Natives working reef nets on Salmon Bank, off Cattle Point (McDonald, 1981:119).

Advertisements looking for cooper's in the newspaper Columbian, of Olympia, in 1853 and 1854 show that salt-curing outfits were being established at this time, but little is known about the success or extent of these early American operations. Many salmon pickled by operators based in Puget Sound in these early years were not caught or processed locally; the Columbian reported on July 15, 1953 that "The schooners Mary Taylor, Franklin, Damariscove, Cynosure, and others have been engaged in the traffic of what [dogfish] oil and salmon the Queen Charlotte, Vancouver Island and Cape Flattery Indians have had to dispose of, completing their cargoes in that way, and they have marketed several thousand barrels each in San Francisco in the past year...." Known locations of early saltery structures include the south end of Whidbey Island, the north end of the same island, and Seattle. In the 1860s salteries appeared at Point Roberts and Port Madison, while the 1870s saw establishments at Mukilteo, Tacoma, and Salmon Bay (Arestad, 1943:5; McDonald, 1981:120). Destinations for the American salters' product included the eastern United States, Australia, the Hawaiian Islands, China, and Japan (Rathbun, 1899:316).

The first salmon canery in Washington Territory was built in 1877 at Mukilteo. But chinook salmon, so numerous and popular with canners on the Columbia, Sacramento, and other important streams to the south, are found in limited numbers in Puget Sound, while the great Fraser River sockeye run is intercepted only from the relatively remote northern islands of the Haro Archipelago and mainland near the border. Unlike California, there was no urban development to justify a significant market
fishery until the late nineteenth century. Yet, unlike Oregon, the waters of Washington provided several other commercial fish species besides salmon; once a fishing industry was established, distribution systems, processing plants, and boats were sometimes not designed solely for salmon fishing.

While western Washington's coastal streams resemble those of Oregon, the geography of Puget Sound, with its myriad channels of deep soundings fed by streams of relatively small size, is quite different than any area so far considered in this study. As a consequence of geography and different salmon species, fishing methods of Puget Sound differ from those used farther south. Gill nets were relatively less important in the Sound. Purse seines, however, were ideally suited to the area, and the characteristics of the West Coast purse seine were largely developed in Puget Sound. Pound net traps, introduced by a Great Lakes fisherman in 1888 (Tanner, 1890:55), had, around the turn of the century, come to dominate salmon fishing to a degree not seen elsewhere on the coast.

As in British Columbia and Alaska, the Native population in Washington continued to play a prominent role in the commercial fishery throughout the development of the canning industry. Gill-netting, drag seining, and trolling were all methods employed traditionally in the area, and Native fishermen passed easily from gear made with traditional materials to that of American and European manufacture when this was seen as superior. Reef-netting was a Native form of fishing unique to the area; it is unique also because it provides the one indisputable case of a Native fishing method which has come to be adopted by non-Native fishermen in the commercial fishery.

Salmon canning in the Puget Sound area became important following the arrival in 1893 of the Great Northern Railway into Seattle. In 1899, the Puget Sound salmon pack, from its 19 canneries, exceeded the total on the Columbia River for the first time, and, by 1908, Washington's fisheries were the most valuable on the West Coast (Cobb, 1930:427, 556; Johansen & Gates, 1957:476). The state's fisheries were soon eclipsed by Alaska's, but Seattle would join San Francisco and Astoria, as an important base for salmon canning operations in Alaska, supplying capital, manpower, and equipment, including fishing boats.

Washington coastal streams

In Pacific County, 25 miles north of the Columbia River, lies Willapa Bay, formerly Shoalwater Bay, an area much more closely affiliated with the Columbia River than Puget Sound. Willapa Bay had the most extensive natural oyster beds on the West Coast; a significant oyster fishery predated the emergence of the salmon canning industry on the
Columbia River and enjoyed a considerable, though brief, prosperity through the 1860s and 1870s. Out of this fishery came some boat building traditions which had a distinctive local flavour. The gaff-rigged oyster sloops, or "plungers", which have been briefly mentioned (see page 145), were built locally, as were the oyster bateaux (Weilepp, 1989a:9). The early flat-iron bateaux were interesting in that they were one of the very few work boats in North America which employed a lug rig (Collins, 1892b:44).69

No salmon was fished on Willapa Bay, except for local consumption, until the late 1880s. Pound nets, of which there were already 42 by 1888, quickly became the most important means of catching fish for the three canneries established on the Bay (Collins, 1892a:234-235). Gillnets were used also, although Collins simply states that "gillnets..., boats, etc., are essentially the same as those already described for other localities" (1892a:238). Given the proximity of Willapa Bay to the Columbia River, probably all gill-net boats supplying canneries in the Willapa Bay fishery were of the round-bottomed Columbia River type. Boats photographed near the turn of the century are, indeed, Columbia River sailing gillnetters (eg University of Washington, Special Collections, Tollman #12) with typical sprit rigs. Yet, Yates and Erikson claim some gillnetters had gaff rigs (1978:27); if there is no misidentification of the gaff-rigged plungers behind this statement, it represents the only instance of gillnetters being so rigged south of the Canadian border. Most gill nets were set in the Bay, particularly at the entrance, for although eight rivers feed the basin, all are quite small (Collins, 1892a:236-237). Collins assigns an average value to the 187 boats used on Willapa Bay of $104 (1892a:234). However, as the oyster sloops, bateaux and row boats used in the oyster fishery far out-numbered gill-net boats and are included without distinction in value, this information, and that supplied by Wilcox for later years, is not useful for assessing gillnetters.

Gray’s Harbor, 12 miles north of the entrance to Willapa Bay, has a salmon stream of some size entering it, the Chehalis River. A small cannery was built at Aberdeen in 1877. This establishment was owned by interests in Astoria who shipped everything necessary for the running of the cannery to the site, including "building materials, boats, nets, provisions, men, etc." Nothing, "except a little beef" was purchased locally, and no local men were hired (Anon. 1879:165). Grievances aired by locals included the company’s failure to pay taxes. This case shows

69 Oyster bateaux described by Collins were very beamy, 11 to 12 feet (3.4 - 3.7 m) on 24 to 30 foot (7.5 - 9 m) length, and of the flat-iron form (1892b:44). Later models were of narrower proportions and often double-ended.
that canning practices generally associated with remote cannery sites in Alaska were sometimes employed at earlier dates at sites far less remote. Until the mid-1880s the area attracted little further attention in terms of fisheries or settlement. In 1888, four canneries on the river were supplied by 37 pound nets and 85 gillnet boats with a rather high average value of $119 (Collins, 1892a:242). Nets could be used with good effect on the river from August to November, and about a third of the gill-net fishermen were from the Columbia River, coming to the area in the fall for the late run (Wilcox, 1895:287). Two kinds of gill-net boats were employed: "The majority are of the flat-bottomed sharpie type; a few of the Columbia river salmon-boat type are also used" (Collins, 1892a:241). With the drop in salmon prices in 1889 the number of boats decreased rapidly to only 15 valued at $100 each; as the numbers of boats began to increase again, however, their average value dropped further until in 1895 the 99 gill-net boats used exclusively in the salmon fishery were valued at only $31 each (Wilcox, 1895:260; 1898:606). As only 153 fishermen worked 99 boats, it seems that about one-third of these boats were handled by fishermen working alone in new boats of a much less costly variety than those described by Collins.

About two percent of the salmon processed or sold at Gray's Harbour in 1895 came from the Native fishery on the Quinault River (Wilcox, 1898:601). Prior to this date, though considerable quantities were taken from this river, it was for local consumption. Farther north, the Quillayute River also had a Native fishery prosecuted exclusively for local use in the nineteenth century. The persistence of Native traditions in these somewhat isolated areas is illustrated by photographs taken in the 1920s off the Quillayute River showing dugouts still trolling for salmon on the open Pacific amid a fleet of powered trolling boats.

Strait of Juan de Fuca and Puget Sound

Despite good farming land and an influx of gold-seekers in the 1860s, an urban population requiring market fish was not established in Washington until the arrival of the railroads, the Northern Pacific into Tacoma in 1888, and the Great Northern into Seattle in 1890. These years transformed the Puget Sound fishery. With Northern Pacific agents seeking immigrants in Europe, the state's population had risen 375 percent by 1890. In its first year of operation, Northern Pacific began shipping Pacific halibut, salmon, and other fish, on ice across the continent. Salmon canning developed quickly in the 1890s requiring a manifold increase in the fishermen and gear needed to supply it. The local markets were meanwhile served by an increasing number of fishermen.
From as far away as Neah bay, near the entrance of the Straits of Juan de Fuca, small catches were shipped to Puget Sound markets. Native fishermen using hooks and lines were important suppliers of halibut taken from banks which lie close to shore near Cape Flattery and Neah Bay, but they also took salmon for the fresh market. The number of fishermen working from the Neah Bay reservation increased dramatically in the last decades of the nineteenth century: in 1879, only about twenty fishermen were there dividing their efforts between local fishing and sealing (Goode & Collins, 1887:43). By 1888, there were 200 fishing canoes based at Neah Bay (Collins, 1892a:245). In 1895, in Clallam County, which includes Port Angeles where a small cannery was built in 1892, 112 fishermen still worked with spears, 97 were trolling, 48 were on haul seines, 36 worked purse seines, and 24 were gillnetters. The $66 average value ascribed to the county’s fishing boats is high in contrast with Oregon values for an area where dugouts were so numerous—(Wilcox, 1898:606). Intensive salmon fishing at Cape Flattery and the off-lying Swiftpure Bank began only in 1911 with extensive the use of powerboats (Canada, Department of Fisheries, 1915:114).

Port Townsend, at the junction of the Strait of Juan de Fuca and Puget Sound, was an important port while sailing ships were still common. The 1880s and 1890s saw a market fishing fleet emerge to supply the town’s needs, as well as for Seattle and Tacoma. In 1879, however, only "Three Italians fish at Port Townsend for halibut and dogfish. They have a boat (Italian) of about 1 ton burden" (Jordan, 1887:628-629). This reference to what may be a felucca comes as a surprise in such a northern location; although Italians as well as Greeks were not infrequent market fishermen in Puget Sound and Georgia Strait, in no other instance is a boat used by them distinguished from the local norm. By 1888, Port Townsend was "at most seasons fairly well supplied with fresh fish by a small fleet of sloop-rigged boats manned by about 40 persons" (Collins, 1892a:249). These boats delivered salmon as well as halibut, rock-fish, black cod, and other species caught by gill nets and lines in both Sound and Strait (Collins, 1892a:249, 257). In 1895, the boats of Port Townsend were described by Wilcox as "Quite a little fleet of cat, sloop, and schooner rigged boats... engaged in the general fisheries. Of these boats, 44 in number, ...7 were over 5 tons.... Their aggregate catch amounted to

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70 These purse seine crews in 1895 were the first to set this rig in the Straits of Juan de Fuca (Rathbun, 1899:311).

71 Port Townsend is one location where large boats and even vessels engaged in the troll fishery at an early date. For example, the Mary Parker, a vessel usually engaged in sealing, "took 330 barrels of salt salmon, worth $2,660, in 1888, using trolling lines" (Collins, 1892a:257).
912,435 pounds of fish, ...all of which was sold fresh, mostly at Seattle" (1898:600). A Smithsonian Institution photograph shows one of these boats lying at anchor (National Trust for Historic Preservation, 1976:12). It is a gaff-rigged sloop something over 30 feet (10 m.) in length, with a cabin, a bowsprit, and seemingly generous sail area (Fig. 29). In length and details of deck layout it resembles Chapelle's "Large double-ended sharpie for open-water use" (1951:126-127):

The sharpie also appeared on the West Coast.... This was a type of boat once used at San Juan Island, working in the halibut fishery in Juan de Fuca Strait and neighboring waters. The boat was a double-ended gaff-schooner sharpie of rather good model, but heavily built and ballasted and not intended for great speed. These boats were used during the 80's and into the 90's and are shown in a few photographs of the period and mentioned in Fish Commission papers. Nothing has been found concerning their origin; the type has been extinct for a generation at least.

The boat in Figure 29 is also double-ended, but as near as can be determined is round-bottomed and, judging by the narrow rudder, has quite a deep hull. The sweep of the sheer is largely limited to the ends of the boat; the middle third of the sheer is relatively flat, while the sides show little curvature over the same length. A net is stowed on the cabin top. This form is remarkably like the famous built-up dugout, Tilikum, in topside profile and plan, but there is no firm evidence that this hull was so constructed. In 1892, the boats of Port Townsend had an average value of $120 (Wilcox, 1895:260). Some Port Townsend boats may have been built there by a professional builder; the 1878 directory for Seattle lists under "Boatbuilders" a Mr. "H.D. Tobey -- Shipwright & Caulker, Water St., Port Townsend" (Choir, 1878:52). What characteristics these market boats may have commonly shared given the diversity of rig suggested by Wilcox, is not certain, but 2-man sloops with a capacity of about 3,000 pounds were the most numerous of Port Townsend boats, and similar boats were recognized in the market fisheries of other Puget Sound points, as well as Victoria, Nanaimo, and Vancouver, British Columbia (Andrews & Larssen, 1959:95).

On the western side of Puget Sound, Hood Canal was a popular location for troll-caught salmon. Port Madison became an early home for immigrant fishermen. J.P. Hammond established a saltery there for herring and salmon in 1869 (McDonald, 1981:120). He was supplied with salmon by Native fishermen working the bay, though a 13-person caucasian fishing crew was hired for seining herring in winter. A colony of about 15 Chinese fishermen also worked in Port Madison in 1879; they also bought
fish from native fishermen. Salmon as well as groundfish were dried or salted at the colony before being shipped to San Francisco (Jordan, 1887:628; Wynne, 1964:41-42).\footnote{Nearby Poulsbo lent its name to a small transom-sterned boat often used for trolling. These "kelpers", as they were locally called, became a well-known type in Puget Sound by the middle of the twentieth century, but spent the briefest of times as rowboats before tiny inboard gasoline engines became standard (Dick Wagner, pers. Comm. 1991), and so will not be examined further here.}

Naturally, many early fishing sites were located in the upper reaches of Puget Sound around early settlement centres such Nisqually, Steilacoom, and Tacoma. The first non-Native fishermen in Puget Sound may have been two fishermen who ran the following add in the Columbian for several issues between November 12, 1853, and August 5, 1854: "Puyallup Salmon Fishery.... The undersigned are now prepared to enter into contract with persons desirous of packing salmon - deliverable on the beach from the net in any quantity to suit. Riley & Swan, or Philip Leach." Leach was a local grocer and probably not directly involved with the fishing. A beach seine may have been utilized; if only two men fished, then a gill net is the more likely implement, though the water was later considered too clear in the Puyallup River and Commencement Bay for gill nets (Jordan, 1887:626). By 1866, a salmon-curing establishment was located on a barge in the Puyallup River, but "does not pay" as the pack...
was "carelessly put up" (Lord, 1866:51). By 1879, a more successful operation had been undertaken in the waters near Tacoma as "two young fishermen from Maine" and their employees took about 200 tons of salmon per year, most of which they sent to Portland after the end of the Columbia River season (Jordan, 1887:626). Following the arrival of the railroad, Tacoma became a popular residence for fishermen in "small sloops and open boats" (Collins, 1892a:249) whose catches of groundfish and salmon went to markets east of the Rockies, delivered on ice in rail cars starting in 1891. In 1895, 42 Tacoma fishermen operated haul seines, 40 used gill nets, 16 manned purse seines, while 14 fished with hook and line; their 91 boats were valued at an average $48 (Wilcox, 1899:605-606).

Across East Passage from Tacoma, sometime after 1860, Chinese fishermen had established a community known locally as "Hong Kong" on Maury Island, near Manzanita (Wynne, 1964:79-80). No mention is made of this settlement in the 1879 survey, but near Quartermaster Harbor on Vashon Island was a fishing colony called "Kanaka Town", where "four or five Chinese, a negro, and several Sandwich Islanders" were fishing (Jordan, 1887:627). No Chinese fishermen, save a handful in the Mason county Oyster fishery, were listed among Washington State fishermen in 1888 or after. In Gig Harbour, three Austrian (Dalmatian) fishermen had established themselves before 1879 (Jordan, 1887:627).

By 1879, the market fishery of Seattle was beginning to achieve some importance (Jordan, 1887:627):

A company of three Italians fish with seines along the shore, obtaining young salmon, flounders, &c., which are sold in a stall in town. A company of three Greeks fish the same way, but are absent at the Columbia during the salmon season. Several Austrians fish with hook and line in the deeper waters of the bay, obtaining halibut, black bass, [etc.]... Many Indians in the neighborhood bring in, almost daily, boat-loads of salmon-trout, young salmon, and the various flounders, &c.

There are no fishing boats at Seattle, except small skiffs.

Nets used in Duwamish Bay (Elliott Bay) at this time seem to have been all drag seines. By 1890, it seems from Tanner's description that market salmon was still primarily supplied with drag seines, though with larger nets and more substantial skiffs (1890:55):

Salmon [are]... taken daily in the channels opposite the town by the Greek and Italian fishermen. There are several squads of these men who go out in large unwieldy, broad-sterned boats, which they laboriously but patiently propel from the landings to the seining grounds at each high tide, whether in the day or night.

Most of the 300 fishermen in Seattle at this time were fishing for the three canneries located within a radius of five miles of the city (Tanner, 1890:55). Wilcox values the 107 boats in King County quite highly at a price of $103 in 1892, but, by 1895, the value has dropped
dramatically to an average of $61 for 222 boats (1895:260; 1898:606). Most fishermen in the Seattle area, 547 in 1895, were engaged in purse seining, 234 worked gill nets, and 130 set haul seines (Wilcox, 1895:605). No hook and line fishermen are mentioned in the area at this time. Perhaps local groundfish stocks tapped by Austrian fishermen a decade earlier had been depleted, but salmon trolling had for a decade been a "favorite amusement" among the city-dwellers, though troll-caught salmon for commercial use in Puget Sound would remain largely in Native hands until 1905 (Arestad, 1943:10).

There is a notable trend in Puget Sound for grounds closer to the inlet's head to have been exploited commercially by shore fisheries first, and then for new grounds to become developed as the area's salmon fishery matured. That the first fisheries and canneries should be near the largest settlements is natural for reasons of labour requirements and transportation costs. But fishing in Puget Sound suffered because the species of salmon most commonly caught there were the least marketable (Doyle, 1957:236-237), and because from an early period the inlet's fish stocks suffered owing to pollution from the area's many saw mills (Collins, 1892a:247; McDonald, 1981:120). Yet, these sawmills, as well as Seattle's increasing importance as a busy port and an urban centre of some size, seemed to ensure that Seattle became the region's boat-building centre. However, the lack of hardwood framing timber was even more severe in northern Washington than it was in more southerly locations of the West Coast: "...oak [is] scarce, or rather the oak of this coast has generally been found worthless for these purposes, while only the laurel has been found suitable for it" (McDonald, 1871:68).

Few of Seattle's early boatwrights seemed to last long. In the city's first directory, among many ship's carpenter's, are listed two boatbuilders: John Yarno, at the "foot of Second", and W.W. Robinson "between Seneca and University" (Ward, 1876). In 1878, Yarno and Robinson seem to have moved on, but C. Etheridge offered himself as a "Practical Boatbuilder, first class rowboat to a steamboat"; and an advertisement run by J.S. Church reads "Signs Lettered, Boats Built and Repaired, Wood Turning, and General Jobbing Done to Order" (Choir, 1878:68-84). Apparently none of these builders was active at the turn of the century, but builders advertising in the Pacific Fisherman Year Book still offered a broad variety of craft. South Seattle Boat Works, C.H. Newman and J. McKay proprietors, for example, built "steamers, scows, fish boats, dories, tugs, launches, yachts, [and] metallic life boats; C.E. Lake, a boat builder in Ballard (North Seattle), offered "Launches, fish boats, dories, scows, tugs, standard stationary and gas engines"; while G.H. Proctor and F. Tregoning of Procter Boat Co. had an advertisement which
read, "Launches, Yachts and small boats in wood and steel - Life boats and Rafts - Columbia River Boats, scows and dories" (Pacific Fisherman Year Book, 1903:39, 46). One of the first yards to specialize in building fishing craft was Ballard Boat Works, established in 1905 on Shilshole Bay, Seattle. The owner, Sivert Sagstad, set up shop just four months after arriving from Norway at age 25. Later renamed Sagstad Shipyard, his operation would build, in the succeeding years, more than 300 fishing boats of various sizes, many of which are still in use. His arrival was too late for him to have made any contributions to sailing fish boat design, but an interesting photograph of his yard in its early years shows a Norwegian-style open boat, rigged for sail, with sharply up-swept ends, decorative stem, narrow lap-strake planks, and many small frames (over 40); length is difficult to determine, but the boat was probably at least 30 feet (10 m) long, representing considerable effort towards a rather mysterious end (Andrews and Larssen, 1959:32).

The first salmon cannery in Puget Sound was built in 1877 at Mukilteo in Snohomish County by Jackson & Myers, formerly of the Columbia River. At Utsaladdy, three Italian fishermen were working independently about this time (Goode & Collins, 1887:31). The cannery was built opposite the south end of Whidbey Island, the site of an early saltery dating to 1853 (Columbian, June 11, 1853:4). But commercial salmon fishing virtually disappeared from the area after Jackson & Myers moved their cannery in the 1880s to Port Blakely, near Seattle, and only reappeared in 1893 as a fishery for fresh salmon shipped by rail to Seattle. These fish were supplied with set and drift gill nets on the lower 20 miles of the Snohomish River. In 1895, 54 gill-net boats valued at a mere $14 each, were worked by 65 fishermen (Wilcox, 1898:605).

It is clear from the numbers of boats and fishermen that Snohomish River gill net boats, like many of those on the Chehalis River, were operated by only one man. This saving in manpower is usually attributed to the advent, in later years, of well-designed power boats with reversing gear boxes. Recovering a net from a Columbia River sailing gillnetter without the puller backing the boat, besides making the task more back-breaking for the fisherman, would tend to distort the net, releasing some fish. The challenge for one man to shoot the net while rowing the boat across the stream keeping the net taut and square is obvious. The gill-net boats used in the Skagit Bay and River may offer some answers.

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73 Illustrating the marketing difficulties of the time posed by canned salmon species besides Sockeye or Spring, Myers promoted his pack of pink-fleshed humpback salmon as "Warranted not to turn red in the can".
Figure 30. One-man gill-net boats on the Skagit River (after Cobb Collection photograph, 6812, University of Washington).

The Skagit River fishery was of little account before 1893. By 1898, it was the most important river fishery in northwestern Washington with 124 active gill-net boats. These boats were valued by Wilcox at only about $13 each (1898:605). Photographs taken in the first decade of the twentieth century show boats used out of La Conner, the fishing center of the Skagit River (Pacific Fisherman Year Book, 1910:cover plate; University of Washington, Cobb Collection, 6812). They are small, flat-bottomed craft, less than 18 feet (5.5 m) in length with about a 5 foot (1.5 m) beam, and clearly manned by only one fisherman (Fig.30). Some boats set small sprit sails, but the most noticeable feature are net rollers built onto the transoms. Like the boats, nets used on the Skagit River and Bay were small, only 50 fathoms (91 m) long and 15 feet (4.5 m) deep on the river, and 125 fathoms (230 m) long and 18 feet (5.5 m) deep on the bay (Rathbun, 1899:310). Although removable net rollers were sometimes mounted on gillnetters at this time, much heavier gill nets than those used on the Skagit were still quite normally being set from boats.
without rollers. The rollers, which appear standard at such an early time in the La Conner fleet, responded to the need for innovation in setting a gill net from a one-man boat. With the light, shallow boats used on the Skagit River it seems that small nets could also be recovered without excessive distortion.

A clue to why the one-man boat appears on the Skagit River is provided by Rathbun (1899:310):

Since 1895 there has been a large increase in this fishery, which has mainly been brought about by the establishment of new canneries, especially at Anacortes. The gill-netters, however have difficulty in competing with the trap nets, which afford the cheaper means of taking salmon here, as at Point Roberts, and in 1897 a strong but futile effort was made to secure a bill prohibiting the latter class of apparatus.

Pound-nets were very expensive to install, requiring capital only large canning operations could muster. The greatest advantage pound nets offered packers was the minimal need for labour once they were installed. The one-man salmon boats of Washington, exemplified by the boats on the Skagit fishery, halved the labour required to handle gill nets, probably in response to competition from pound nets. Neither Collins, Wilcox, or Rathbun is explicit, but, though the Skagit River boats supplied canneries as well as the fresh fish market, they appear to have been individually owned. Commonly, the introduction of both permanent net rollers and one-man gillnetters is credited to the era of power boats, but for areas where the use of small nets made the diminutive one-man sailing gillnetter practical, these developments may be more properly ascribed to the early years of the Puget Sound pound net.

Apart from Pacific County, where the open bay fishery at Willapa seems to have ensured the place of the Columbia River sailing gillnetter, Point Roberts in Whatcom County was where pound nets were most heavily used in 1898. That year, 268 Whatcom county fishermen were engaged in gill-netting (primarily in streams between Bellingham and Boundary Bays), 152 worked reef nets, 93 manned the pound nets, 89 set purse seines, 16 worked haul seines, and 10 trolled; average value of fishing boats was $46 (Wilcox, 1898:605). As pound nets increased at Point Roberts and in other areas, particularly in the path of the Fraser-bound sockeye run, manually set purse seines, haul seines, reef nets, and to a lesser extent gill nets were displaced from the fishing grounds.

Native fishermen in Washington

The Native fisheries in Washington were far more resilient in the face of American settlement than any Native fishery to the south. Native canoes are the only inshore fishing craft in Puget Sound noted by Hall (1884:42). In 1879, 180 Native fishermen were listed in Washington
Territory (Goode & Collins, 1887:43), but this number grew in the succeeding decades. Forty percent of commercial fishermen in Washington State were Native in 1889 (Collins, 1892a:232). By 1895, there were over 700 Natives active as fishermen in the inshore fisheries (Wilcox, 1898:258). A variety of Native craft were used in Puget Sound fisheries. Both shovel-nose and Salish canoes were built and used in the area, while the historic period saw the introduction of canoes of the Nootkan form, which were both imported and, latterly, built locally (Roberts & Shackleton, 1983).

The last Salish canoe made by a traditionally-trained Puget Sound canoe-maker was an 18-footer made in 1938 by Henry Allen (Holm, 1991:238). One canoe of the Nootkan form, measuring 16 feet (4.9 m) long, with a beam of 29 inches (0.73 m) and a depth of 16 inches (0.40 m), was used to fish salmon on the Shoalwater river as recently as 1970; this canoe had an extraordinarily long working life, having been built by John Haydin of Chamus Creek in 1873. This canoe, like most other Native canoes built in the late nineteenth century, was carved in part with metal tools, although the traditional tools and reduction methods, including stone and bone implements, as well as fire, were still utilized in particular aspects of canoe-making (Oregon Historical Society, 1989).

Trolling was a popular means of procuring fish in Puget Sound because silver and chinook salmon could be taken in deep but protected waters throughout the winter months when and where nets were ineffective; until 1905, the troll fishery was prosecuted almost exclusively by Native fishermen in dugout canoes, whose most favored trolling grounds included off Point Roberts, Port Gamble, Port Townsend, in Hood Canal, and among the San Juan Islands (Rathbun, 1899:280-281, 315). Fifty to 100 fish was considered an average daily catch for trollers in the 1880s (McDonald, 1981:121). Herring or perch bait was usually utilized, traditionally hooked on the end of a single strand line of stretched and dried bladder kelp (Curtis, 1913a:50). Out of Neah Bay, the Makah, a Nootkan group, used bone or spoon lures at least through the 1890s (Wilcox, 1898:289); their preference at this locale for Native-made hooks and lures, despite readily available and inexpensive manufactured equivalents, highlights the long period of transition in which indigenous fishing gear and boats coexisted with gear and boats of the European tradition, both serving the growing commercial fishery. Small variants of Salish canoe were built specifically for trolling. They shared general features with most other Salish canoes in that they were light, fast and seaworthy, had deep "V" sections in the ends with hollow lines, and had pegged gunwale bands, but were distinguished by a "slanting, rounded cutwater" (Holm, 1991:238-239). The basic form for trolling canoes is defined by Waterman and Coffin as
"Type C" (1920:18). The largest variety could carry up to two or three men, was narrow and swift, and doubled as a hunting canoe for porpoise and otter (Waterman & Coffin, 1920:18). A small version, strictly a one-man canoe, was notably light, portable, fast, and narrow enough to be notoriously prone to capsizes in the hands of an unskilled operator (Waterman & Coffin, 1920:21). A one-man trolling canoe is described by Collins, who says they were typically 10 feet long, with a fairly generous beam of 2 1/2 to 3 feet (0.75 - 0.9 m), and had a value of $10 (1892b:21).

Native gill nets were relatively unimportant in the Native fishing repertoire. Coast Salish drifting gill nets, used up to the northern end of the Georgia Strait, were usually only one fathom deep and about 10 feet long, were made of swamp willow withes, and utilized wooden stick floats set upright, with long narrow stone weights to keep them standing (Curtis, 1913a:50; Sutliff, 1951:136). Set nets were also used commercially by Natives in some locations up to the twentieth century (Rathbun, 1899:310). On the Quileute River, where gill nets were used for smelt fishing, canoes setting gill nets were distinguished from other river fishing canoes, (those used for salmon trolling), by their greater beam, stability and carrying capacity (Wright, 1991:251). Canoes of Salish or Nootkan form would have been used in most salt-water settings, while in some upriver fishing areas of western Washington and upper Puget Sound, nets might be set from shovel-nose canoes. Square-ended canoes were also used for spearing chinook salmon in rivers (Waterman & Coffin, 1920:12).

Haul seines similar to those used by Natives on the Columbia were also employed in areas where there were shelving shorelines, but Native fishermen adapted very rapidly to the purse seine. Collins credits the introduction of the purse seine to the Chinese in 1886 (1892a:254). Yet this date is certainly late, for Natives were using purse seines as a principal means of supplying salmon to commercial packers in Puget Sound before 1882 (Swan, 1894:376):

The salmon-fisheries on Puget Sound are carried on almost entirely by Indians, using seines from 50 to 80 fathoms long, from 4 to 8 fathoms deep....

A large canoe is anchored in 2 or 3 fathoms of water, and the seine-boat is held near at hand until the indications are favorable, when the seine is cast, and the men in the canoe hand in as quickly as possible. In the meantime, a number of small canoes are paddled about the net, and their occupants beat the water with their paddles, in order to prevent the fish from jumping out of the seine.

These early small seines were always set in salt water with a crew numbering from 8 to 12 (Swan, 1894:376). Up to five thousand fish could be taken in a single haul (Spurlock, 1940:49). Chinese fishermen may still have introduced the purse seine, but at an earlier date than that suggested by Collins. In 1881, Natives had protested the use by Chinese
fishermen in Elliot Bay at Seattle of a huge seine net 150 fathoms (275 m) long and 40 fathoms (73 m) deep (Wynne, 1964:79). The Port Madison colony was shipping salmon to San Francisco by 1877,74 while the Chinese fishing settlement near the south-west end of Maury Island had been established even earlier (Wynne, 1964:41-42, 79-80). Periodically, from September to December, 1854, the Pioneer-Democrat ran the following advertisement: "Fishermen Ahoy. Just received on consignment per brig Cyclops a first rate Cod or Salmon Seine 600 by 60 feet, corked and leaded, and ready for use...."75 Unfortunately there is no way of knowing if this net ever sold or was used in Washington waters. Whether the Chinese introduced the net, whether it was introduced by American merchants and salmon salters, by Dalmatian fishermen (McDonald, 1981:121), or whether it was a Native fishing device,76 the purse seine became the most productive form of gear for Native fishermen who were its principal users in Puget Sound until larger nets (200 by 25 fathoms, or 365 by 45 m), set from skiffs working in combination with scows, began to be employed around 1890 (Spurlock, 1940:51). These nets became the principal source of fish for early American canning operations in Puget Sound. But early salt-curing operations which became established following the Hudson's Bay Company's withdrawal relied on fish caught by natives employing a full range of methods including reef-nets, gill nets, and hooks and lines in salt water, and spears, dip nets and weirs in rivers.

Reef nets

Reef-nets were employed exclusively by Natives until the turn of the century after which time they passed largely into disuse before being revived in the late 1930s. They take their name from the kelp reefs to which this fishing method is specifically adapted. Though these reefs are many in the region, only a very few are in the way of the migration path

74 Chinese fishing boats used at Port Madison before 1889 (Collins, 1892b:48; see page 51) were almost certainly seine boats.

75 It is not definite that this net was a purse, and not a drag seine, but the depth of the net, and the statement that it could also be used for cod favours a purse seine.


Austrian, or Dalmatian, fishermen were very numerous among purse seine fishermen by 1892, but Collins does not acknowledge any Austrian fishermen in Puget Sound in 1888, and those few tallied in 1879 seem to have been engaged in a hook and line fishery for groundfish. Native introduction of the purse seine seems a possibility not considered by sources consulted by this author, yet deserving of further examination.
of the sockeye, the primary targets for reef nets.” This fishing method was traditionally practiced only by the "aboriginal inhabitants of southern Vancouver Island, the Gulf and San Juan Islands, and the adjacent shores of Washington State. These people are collectively known to us as the Straits Salish and include speakers of Sooke, Songish, Saanich, Samish, Lummi, and Semiahmoo" (Easton, 1985:9). Most reef-net sites were at temporary summer camps occupied in July and August (Suttles, 1954:248). Nets, 35 to 40 feet (11 - 12 m) long and 25 to 30 feet (8 - 9 m) wide, were traditionally made of willow sapling bark, and saplings, bark and roots of cedar (Rathbun, 1899:314; Stern, 1934:54). But by the late 1880s these labour-intensive materials had been replaced by cotton, at least by those reef net crews delivering to Point Roberts canneries (Collins, 1892a:259).

Reef-netting may not be a fishing method of great antiquity, though Collins’ suggestion (1892a:260) that it was introduced by the Hudson’s Bay Company is certainly incorrect. Easton has speculated that reef nets may have first been used near the end of the seventeenth century, an hypothesis supported by his underwater examinations of reef net sites in the Gulf Islands (1985). George Vancouver probably witnessed reef-nets when he passed about 500 Natives encamped at the popular reef-net site at Point Roberts, but his description of their gear goes no further than to say theyfished "for salmon with crude nets made of the bark of young willow" (cited in Kerr, 1917:60). Reef nets were first documented with clarity by Coast Surveyors visiting the Lummi Island fishing sites in 1853, though the fishing method had been utilized in a commercial fishery supplying the Hudson’s Bay Company fishing station on San Juan Island five years before (McDonald, 1981:119). Reef nets in the next decade were the principal suppliers of American salteries established on Point Roberts (McDonald, 1981:120). Other reef-net sites in Washington waters include Iceberg Point at the southern end of Lopez Island, off the east and west sides of Stuart Island, Point Doughty on Orcas Island, Reid Harbor, Cherry Point and Deception Pass (Rathbun, 1899:315; Rounsefell & Kelez, 1938:714; Lowman, 1939:45).

Collins (1892a:259), Rathbun (1899:314-315), Kerr (1917), and Lowman (1939) give detailed accounts of reef-net operations. In summary, reef-nets were set horizontally about four feet below the water’s surface between two well-anchored canoes. Wherever possible the rig was set where the natural obstructions of kelp and shallow water would direct fish brought on the flood tide towards the net. The fish were further funneled

77 Pink salmon comprised a small part of the reef-nets catch; cohoes were caught also, but tended to be wary of the nets (Rathbun, 1899:315; Cobb, 1914:32; Easton, 1985:9)
by artificial walls or leads made of kelp kept in place by rope and weights. An elder, or the owner of the rig and/or fishing site, known as "the watcher" would stand at the up-current end of one canoe waiting for a school of fish to pass over the surface of the net. On his signal, the crew, consisting of 6 to 15 men on both canoes, would quickly haul on the lines bringing the net out of the water and the two canoes together simultaneously, so that the catch could be deposited in one of the canoes. The net could be emptied and reset by an experienced crew in two or three minutes. 2,000 fish per day could be taken with one rig and a tender. Fish caught this way are not gilled or gaffed, and fetch a premium price where the fresh fish market is accessible. The rig's disadvantages are that it is best worked only on a flood tide of sufficient, but not excessive, velocity, and, in windy conditions, the roughened water surface obscures the view of the fish. It was also labour intensive.

Canoes used to deploy reef nets before the late-nineteenth century were not described in detail by observers. However, Native informants interviewed in the middle years of this century identified a change of canoe type for the reef net fishery occurring in the 1880s or 1890s (Suttles, 1951:249-250). Introduced at this time were imported canoes of Nootkan origin, corresponding to the type defined by Waterman as a "type A" war canoe (Waterman & Coffin, 1920:12). The built-up stern structure of this type provided a suitable perch for "watchers" to observe the approach of schools.

Earlier canoes had been locally manufactured specifically for reef-netting in protected waters. According to informants who had heard of, but not seen, the early type, it had a low, wide bow, and a vertical, notched stern which served as an observation platform. On the reefs they were anchored with the stern into the current, and the bulk of the crew stationed on the flat bow counter-balancing the man sitting or standing on the stern. The name used for the early reef-net canoe was the same as that used by fresh water groups for the shovel-nose, though Straits people lacked this vessel type (Suttles, 1951:249-250).

Suttles has suggested that Nootkan canoes were more practical than the specialized reef-net canoes because the Nootkan type was a seaworthy, multi-purpose craft which could be put to other uses when not fishing the reefs (Suttles, 1951:251). However, imported canoes which might be described as "Mercedes" among aboriginal canoes⁷⁸ were prestigious craft for fishing; along with the use of cotton nets, their use reflects the

⁷⁸ Whaling canoes of similar size and proportion made by the Makah (a Nootkan group whose canoes were regarded more highly than the Salish, though not so highly as those of the Vancouver Island canoe-builders) were valued at about $250 in 1889 (Collins, 1892b:21).
prosperity achieved by Natives supplying canneries through traditional fishing methods, as long as they remained a significant suppliers of fish.

There are no accurate figures as to the numbers of fish caught by the reef-net fishery at Point Roberts prior to 1891, though large numbers of surplus sockeye were purchased by Fraser River canneries. In 1891, the first cannery was built at Point Roberts and with it began construction of pound nets, and the end of the traditional reef-net fishery. These massive traps, employing the longest leaders then used in any North American fishery, directly obstructed reef-net sites (Wilcox, 1895:592). In the first year of the cannery’s operation, 20 reef nets were in operation, by the second year half that number, as purse seines and pound nets provided 80 percent of the Point Roberts area catch (Wilcox, 1895:294). As the use of pound nets spread throughout the San Juan Islands reef-net sites were gradually blocked so that between 1900 and 1932 there were no more than 9 reef nets used in all of Puget Sound (Lowman, 1939:45).

Pound nets were outlawed in 1934, largely as a consequence of the purse seiners’ lobby, but the reef nets began an unexpected and remarkable resurgence. There were 32 reef nets in Puget Sound by 1936, the majority of these run by non-Native fishermen. Synthetic fibres are now used for the nets, anchor and lead lines, while polaroid sun-glasses have proven a great asset in seeing the fish. Battery-powered electric winches introduced since World War II, have reduced man-power requirements (Philips, 1970:21). Observation "poles" became tall structures made of aluminum tubing, but most reef-net boats hulls have retained the proportions of the canoe, though they were framed and planked conventionally. Boats used in the 1930s ranged from 25 to 40 feet (8 - 12 m) long, the larger boats being most common, with a beam of less than six feet (2.5 - 3 m) (Lowman, 1939:46) (Fig. 31). The boats are usually double-ended, and though some boats new in 1939 were built with transoms,

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79 About two-thirds of the reef-net fishermen at Point Roberts and the outer San Juan Island fishing camps were Natives whose winter residences were on the Canadian side of the boundary (Collins, 1892a:259).

80 In certain instances caucasian fishermen not only adopted the ancient fishing technique but hereditary privileges accompanying it. J. Conrad Graham explains: "The reef-netters didn’t get busy in there until after they’d taken away the traps so that the fish could get into that area. ...there were some of ‘em who were married to Indian girls and they in turn were fishing these, their wife’s rights, and they were puttin’ in these reef nets." (Washington State Oral/Aural History Program, 1976 WCT 76-29mr:21-22)
the double-ended form remained predominant into the 1970s. Shallow bins for storing salmon are built under the sole. The fore-and-aft planked bottoms have no rocker; the sheer is quite flat also. Modern reef-net boats are not self-propelled, but are towed out to the reef where they remain anchored for the season, tended by flat-bottomed skiffs (Lowman, 1939:45). Derelict reef-net boats have been recently reported, notably on Shaw and Lummi Islands (Smith, Grebmeier, Green & Duskin 1981:360; Tom Beard, pers. comm. 1993; John Crosse, pers. comm. 1993), but this author was unable to observe these.

**Purse seines**

Although the origin of the purse seine in Puget Sound remains uncertain, a change in net size and equipment used for its deployment clearly occurred in the late 1880s. Some seines witnessed by Tanner in 1888 were 200 fathoms (365 m) long, and 25 fathoms (150 m) deep, and seemed to differ from eastern mackerel seines only in the addition of an apron below the bunt (1890:55). The seine described by Swan in 1882 was
only one quarter the size of this net (1894:376), and was obviously small enough to be deployed from canoes. Larger purse seine nets were set from four- and six-oared skiffs identical to those employed in setting haul seines (Collins, 1892b:40; McKee, 1975:91); that is, in the case of the six-oared version, a boat about 25 feet (7.6 m) long, with a 7 foot (2.1 m) beam, an 8 foot (2.4 m) decked portion aft for carrying the net, and a flat bottom turned up at the stern (Tanner, 1890:55-56). These big skiffs were sometimes called dorries in Puget Sound (McKee, 1975:91). Working with the skiff was a square-ended scow which measured 20 by 8 feet (6 x 2.5 m), with a manually operated winch at each end (Fig. 32). "Eleven to fourteen men are required to set the seine -- six at the oars, two at the seine, and two on the scow. Of these, one throws the corks, the other the twine" (Tanner, 1890:56).

Commencing on a fishing expedition, the seine crew in the skiff would take the scow in tow and row to likely fishing locale. If the fishing ground was some distance from the cannery, the crew would establish a camp on the beach, rowing out to fish each morning, with cannery tenders collecting their catch (Spurlock, 1940:53; McKee, 1975:91). Single seine hauls frequently exceeded 1,500 fish, although sockeye salmon were rarely caught with this method (Rathbun, 1899:311).

Most purse seiners were based near Seattle. In 1897 there were 46 purse seines operating in Puget Sound (Rathbun, 1899:311), though their numbers dropped in the last years of the century owing to the proliferation of pound nets. The introduction of power boats gave the purse seine mobility which ensured its long-term success. The first powered purse seiner was built in 1902 (McDonald, 1981:121), and by 1907 power was "universal in the purse-seine fleet" (Spurlock, 1940:53).

Ethnicity of Washington fishermen

In the survey of Washington fisheries in 1879, the total number of fishermen for Washington is 729, but this number is composed primarily of Columbia River fishermen and Shoalwater Bay oyster fishermen without

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81 Although purse seines were often 250 fathoms (460 m) long by 1895 (Spurlock, 1940:52), there is no mention of an eight-oared skiff being used to set purse seines.

82 All boats, seines, and associated gear were furnished by canneries (Tanner, 1890:57).
Figure 32. Purse seine crew with scow and skiff.

differentiation. For Puget Sound, 180 Native fishermen, 33 Chinese fishermen, 25 fishermen of southern European birth,\textsuperscript{3} and a single French fishermen are specifically noted (Goode & Collins, 1887:30-43).

Collins does not make the localized break-down of nativity by fishery in Washington that he does for Oregon in his 1892 report. However, he separates those fishermen working the Columbia River from those working in Puget Sound, the Strait of Juan de Fuca and the coastal streams. The total number of Washington fishermen excluding those on the Columbia River in 1888 was 1420. Of these Natives remained the largest group representing 40 percent, caucasians of North American birth represented 28 percent, Scandinavians 25 percent, and southern Europeans 7 percent (Collins, 1892a:232-234).\textsuperscript{4} Of these fishermen, 270 were fishing in vessels engaged in fishing offshore; as this offshore fishery was comprised almost exclusively of Norwegians, Swedes and caucasian Americans, the percentages for Natives and southern Europeans in the inshore salmon and market fisheries would have been considerably higher than indicated by these figures.

\textsuperscript{3} These southern European fishermen consisted of 11 Austrians, 9 Italians, 3 Portuguese, and 2 Greeks.

\textsuperscript{4} Scandinavian fishermen consisted of 182 Swedes, 96 Finns, and 73 Norwegians; southern European fishermen consisted of 63 Italians, 26 Portuguese, and 7 Greeks.
In Wilcox's report for 1892, inshore boat fishermen are tallied separately from fishermen working offshore in vessels, and, as figures are totalled for counties, it is possible to calculate coastal streams and Puget Sound separately. The total number of Washington boat fishermen, excluding those fishing the Columbia River in 1892 was 2002. Coastal streams were worked by 792 fishermen; 44 percent of these men were caucasians of North American birth, 30 percent were born in Scandinavia, 23 percent were Native, 3 percent were from southern Europe, and one percent were German. In Puget Sound and the Straits of Juan de Fuca, boat fishermen were 43 percent Native, 20 percent were Scandinavian, 19 percent were caucasians of North American birth, and 17 percent were from southern Europe (Wilcox, 1895:258).

Wilcox provides no birth-place record for fishermen in his report for 1895. He does, however, provide the numbers of fishermen involved with the various fishing methods, by county. By matching these numbers with nativity records of two years previous it is possible to infer what forms of gear different groups were primarily involved with. Generalizations provided by fisheries reports are confirmed: most dramatically, Greeks, Italians and Austrians worked exclusively in the Seattle where purse seines were most heavily used; it is evident that pound-nets were handled primarily by Americans. Somewhat surprising is the number of American fishermen who were gillnetters. In Chehalis, Clarke and Whatcom counties, where at least twice as many fishermen worked gill nets as any other gear, American-born caucasians are substantially in the majority. In no other area on the coast in the nineteenth century were gill net boats in substantial numbers run predominantly by caucasians of North American birth.

Originals and replicas in Washington

None of the planked boats used in nineteenth-century Washington salmon fishing has survived or has been identified archaeologically. The Chehalis fishing canoe built by John Haydin in 1873 has survived and is now an acquisition the Washington State Historical Society Museum, at Tacoma. Other dugouts exist in various collections in Washington;

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Scandinavian-born fishermen included 90 Finns, 90 Swedes, and 54 Norwegians; fishermen born in southern Europe included 18 Austrians and 2 Italians.

Scandinavian-born fishermen consisted of 140 Swedes and 109 Norwegians; of southern European fishermen 102 were born in Austria, 55 were Greek, 45 Italian, and 7 were Portuguese. All the Mediterranean-born fishermen were based in King County (Seattle) save the 7 Portuguese fishermen and 5 Italians, who were located in Tacoma.
however, the fishing uses to which they may have been put is not
documented. At the Seattle Center for Wooden Boats two Bristol Bay
gillnetters have been collected. One of these is floating and is
regularly sailed; this boat is the only one of its class accessible in
original working condition to the public. The Seattle Center for Wooden
Boats also has a 14-foot Davis boat, used for hand-lining salmon in
Southeast Alaska, and two display models of Bristol Bay boats.

British Columbia

...the day will soon come when the wise men from the far
east will stop wasting their time on the toy fisheries of the
Great lakes and the Atlantic seaboard, and will come West
where they can splash in a real puddle and take their part in
a real grown man's game (Henry Doyle: cited in Newell,
1989:x1).

The Fraser River, flowing into the Georgia Strait just north of the
forty-ninth parallel, is the largest and most southerly of many salmon
streams in British Columbia and Alaska which boast runs primarily composed
of Onchorhynchus nerka. Marketed as sockeye salmon by British Columbia
and Puget Sound packers, and Alaska red salmon by Alaska packers, these
fish provided the bulk of the canned salmon catch provided by gillnetters
from the Fraser River northwards.

Though only about 400 miles separate the southern tip of Vancouver
Island from the end of the Alaskan panhandle, this section of coast is so
indented and punctuataed with islands that the British Columbia ocean front
crosses over 17,000 miles. The torturous geography of the "iron bound"
coast kept Captain George Vancouver and his crew busy with its charting
for three years, yet they still missed identifying the mouths of the
Fraser, Skeena, and Nass, the area's three largest rivers, though they
passed close by each one. Fraser River salmon were taken by fur-traders
at Fort St. James and other interior locations at least two years before
Simon Fraser discovered the mouth by successfully passing through the
coastal range to the coast in 1808 on the river which would be given his
name.

The Hudson's Bay Company established its presence on the Lower
Fraser by building Fort Langley in 1827, but for over 20 years this fort
remained a somewhat isolated outpost. Until 1848, the annual Brigade,
carrying out the year's collection of furs from the interior, was carried
by bateau down the Fraser only as far as Fort Alexandria, then overland by
horse to Okanagan, from which point bateaux could navigate down stream to
the Columbia River mouth with only two short portages. Fort Langley's
principal value to the Hudson's Bay Company was as a farming plantation
and fishing station supplying those trading posts in the region which
lacked suitable planting or fishing grounds. That the Fraser River's salmon had potential value as an export was recognized as early as 1827. Its subsequent importance is underlined by Company Governor Simpson's admonition: "Remember that the salmon trade must not be sacrificed. It will always yield a more valuable return and at less trouble, risk and expense than the farm" (cited in Lyons, 1969:59).

The Hudson's Bay Company's export of salmon from British Columbia, a trade which lasted into the 1870s, seems to have been almost entirely supplied by aboriginal fishermen. Perhaps because the Hudson's Bay Company persisted in salting salmon in British Columbia some 20 years longer than in Washington and Oregon, independent salting operations were both fewer and slower getting established in the colonies than they were to the south. Because of light settlement and the slight impact of the Hudson's Bay Company export fishery, the native fishery and attendant economy of southern British Columbia remained essentially intact into the second half of the nineteenth century (Gladstone, 1953:22; Muszyński, 1986:89). In 1859, the region was transformed by the Caribou gold rush which brought in tens of thousands of gold-seekers through Victoria and the Lower Fraser Valley. Yet, Native fishermen remained important suppliers of fish to the emergent urban communities in the area, though the extent and full nature of their activities in this line, as well as those of the immigrant fishermen who also supplied the markets, is very hazy.

The beginning of British Columbia's canning enterprises are equally obscure. James Symes, a painter and architect, is usually credited with canning the first salmon in British Columbia on his kitchen stove in 1867; this experimental product attracted favourable attention at the New Westminster Agricultural Exhibit that year, and two dozen 2-pound tins were even sent to Australia, where an important market for British Columbian canned sockeye would later develop (Howay, 1914:583; Stacey, 1977:5). Yet, Doyle says two unnamed Scots first canned salmon in 1863 at New Westminster (1957:9). And Forbes could write in 1861, "Salmon and Halibut are both put up, and preserved in hermetically sealed tins by parties in Victoria" (1862:55).

Whatever date is assigned to the first experimental canning in the colonies, only in 1871 was the British Columbia canning industry established in earnest with Alexander Loggie & Company's cannery at Annieville, across the river from New Westminster. After unsuccessful experiments with Scotch trap-nets, and later with drag seines, it became

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7 From 1858 to 1866 Vancouver Island and British Columbia were distinct crown colonies. In 1866, they merged becoming one colony before entering Canadian Confederation as a province in 1871.
apparent that gill nets were the only practical method of capture for the Lower Fraser River. Legislation would follow, banning or limiting the use of drag seines, purse seines, and pound nets throughout the province, so that gill nets, well into the twentieth century, contributed a much greater portion of the province's salmon catch than in the states to the south.

The Fraser River was disadvantaged in three respects from the outset. The size of sockeye runs fluctuated widely according to a four-year cycle which sees a "big" year every fourth season, with two lesser runs and a "poor" year in between. This inconsistency caused investors some concern. Little capital was forthcoming from eastern banks in Canada, and British investment in the early years favoured the more established fishery on the Columbia River (Stacey, 1977:6), so that most of the initial investment came from limited financial resources within the province. Finally, transportation was difficult as there was no railroad linking British Columbia to eastern Canada until 1886, nor was there a city on the Fraser River attracting international shipping.

By the late 1880's, however, the railroad had been put through, investment by British and eastern interests was extensive, and, in 1889, Cutty Sark's sister-ship the Titania made the first direct shipment of salmon from the fishing village of Steveston to Britain. Five years later, 14 ships crowded the narrow channel in front of Steveston's docks awaiting the fishing season's end (Lyons, 1969:212), and, in the "big" year in 1901, 55 percent of the sockeye salmon and 41 percent of all salmon species canned everywhere came from the Fraser River (Tomasevich, 1943:238).

The inconsistency of the Fraser's runs remained troublesome, however, and the development of northern streams was desirable for packing companies to stabilize their catches; the first cannery on the Skeena River was built in 1876, on the Nass River in 1879, and in River's Inlet in 1882 (Lyons, 1969:149, 158; Peterson, 1975:21). By 1900, salmon canned in 69 canneries over the length of the coast had become British Columbia's most valuable export, and by 1905, salmon from British Columbia outranked Canada-wide catches of lobster, herring, and cod combined (Cobb, 1930:579; Newell, 1989:4). Capital investment in cannery sites alone for this fishery was considerable: "By undertaking a major analysis of pack statistics, the cartographic record, and archival documents, it has been

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"Many of the first canners were successful miners who had decided to stay in the region and were seeking ways to invest their new fortunes. Financial backing beyond individual investment came largely from Victoria, a financial centre of far more limited resources than San Francisco, where most financing for American canning operations from Monterey to Bristol Bay originated."
possible to identify and locate 223 individual sites at which salmon was
canned in British Columbia from 1871, the year that the first successful
cannery site was established, until 1966, the year that the last of the
cannery sites was developed" (Newell, 1988:23).

After 1913, the Fraser River fleet was essentially motorized, but as
a consequence of destroyed spawning grounds, dams, over-fishing, and, most
dramatically, the partial blockage of Hell's Gate canyon by debris from
railroad construction, the yield from this river fell drastically and
would remain far below pre-war levels. Northern streams constituted an
increasing share of British Columbia's salmon pack, but owing to
legislation, cannery policy, and remoteness, sailboats continued to be
used at some northern locations until 1939.

Statistics regarding ethnicity of fishermen in British Columbia were
kept from 1877 to well into the twentieth century initially reflected pay
scales defined by race, and continued to provide data for racially based
legislation and licencing policies. Three groups of fishermen were
defined: Indian, white, and Japanese. Natives were the most numerous
fishermen on the Fraser River until 1894; from 1897 until 1926 when their
licenses were restricted, Japanese fishermen were in the majority.
Natives, including native women, comprised the greatest number of fishers
for a longer period on northern streams. Place of birth among "white"
fishermen was not recorded, so that nativity within this group can only be
inferred through anecdotal evidence. On the other hand, biographies of
several of British Columbia's pioneer boat builders are better known than
those in the United States.

The Hudson's Bay Company and the Native fishery of the Fraser River

While there are some fleeting references to Hudson's Bay Company
employees engaging in fishing themselves, fish preserved by the North West
and Hudson's Bay companies were provided almost entirely by Native
fishers. From 1806, there are records of salmon from the Fraser River
being purchased by the North West Company between Fort St. James and the
confluence of the Thompson River (Doyle, 1957:7). Following amalgamation
of the two trading companies, the established system of dependency on
Native fishermen came under some criticism. In the fall of 1824, William
Connolly at Fort St. James noted that, "From what little I have seen and
heard, I am convinced that one third of the yearly Outfits are expended in
purchasing Salmon or other Fish and paying Indians for their services [as
fishermen].... It is no less singular that in a country such as this which
abounds with fish not one Fisherman should be found at any of the
Perhaps in response to Connolly's criticism, it is learned from the Stuart Lake Journal that James Douglas, a newly arrived clerk in 1827 who would later become first Governor in the colony of British Columbia, was made "head fisherman" for Fort St. James. Some sort of fishery already existed, for in November, 1827, he took "two fishermen, Bichon and Clermont, and two men to assist them" from the "old fishery" to a new one at Yokogh. It seems their intended catch was whitefish and that the results after a month and a half "entirely disappointed" those at the fort. Nevertheless, the Company possessed the means for net fishing as the fishermen were "well provided with nets, having eight of small thread, three of willow, and four of Holland twine...." (cited in Lyons, 1969:58).

It is not known if the nets at Yokogh were set by boat. In 1824, an expedition under McMillan set out in "light batteaux" to locate by sea the mouth of the Fraser (Howay, 1914:583). Fort Langley was established in 1827 by 26 men who ascended the Cowlitz River in two boats, abandoned them to walk overland, and then on Puget Sound traded for two Native canoes in which they paddled the remaining distance to the site of the future fort (McDonald, 1827:1-2). They were soon trading for salmon, "which were only to be had at the rapids above...." (McDonald, 1827:16). It seems that efforts were made over the first winter at the fort by Company employees to catch fish in the fort's vicinity. Men were set to making a net for catching sturgeon, but its history of use merits only one journal entry in February, 1828, in which it is stated that sturgeon had broken three meshes, while canoes brought in some 70 fish, presumably caught by natives with spears (McDonald, 1828:74-75).

A cooper was brought in to make casks for exporting salmon in 1829. Salmon were purchased at the fort or by company employees sent to the "falls" to procure fish for a cost of a little less than one cent per fish (Clarke, 1905:197). By 1835, and continuing to 1858, 3,000 to 4,000 barrels were exported annually to the Sandwich Islands, and from there on to other destinations in the Pacific (Howay, 1914:583). Even after the Hudson's Bay Company's monopoly was discontinued in 1858 a "not so prosperous" salmon trade persisted at the Fort which was still sending "several hundred casks" of salmon to Hawaii and China at least until 1865 (McDonald, 1862:192; Lord, 1866:61).

The Native salmon fishery was generally prosecuted upstream from Fort Langley, where the Fraser River was narrower and its waters ran swiftly. There, dip nets, cast nets, spears and weirs were used. Gill nets seem not to have been used on the Fraser although the lower valley of the river was an important source for native hemp used in gill nets employed elsewhere (Lord, 1866:62). In one distinctive method used on the Fraser River, "the sockeye salmon were caught in a tubular net spread in
the prong of a long pole, which was held by the bow-man in a canoe, the
mouth being directed down stream as the stern-man paddled with the
current" (Curtis, 1913a:50). Apart from being used to deploy this net,
canoes seem only to have been used occasionally in a fishing capacity by
Fraser River natives as platforms for spear-fishing.
"Canoes" and "boats" are often mentioned in use by Company employees
over the first 20 years of the fort's existence, but only one craft built
at the fort in this period is described in more detail. This was a
"barge", "well sailed", 25 feet (7.6 m) long and 12 feet (3.7 m) wide,
with two "portholes" (presumably ports for small arms) and a swivel gun
mount, was finished in September of 1829 (McDonald, 1829:146). It seems
that company transportation on the river was primarily provided by native
canoes. In 1846, a canoe with "13 paddles" was sent upstream to
"establish a salmon fishery" near Chilliwak (Anderson, 1878:138). It is
not clear whether this "salmon fishery" represented another attempt by
employees to catch their own fish, or whether they were establishing a
buying or processing station, but the canoe was a fairly large one and
almost certainly of native manufacture.

Salish canoes native to the river were low in profile and generally
lacked adornment. As Fort Langley was being built in 1827, heavily carved
canoes up to 50 feet (15 m) long and six or seven feet (1.8 - 2.1 m) in
breadth carrying "furniture and baggage" were seen heading to the fishing
grounds. "On the Top of the Stern which is flattish there is in general
carefully carved out the resemblance of the face of a human being; and the
Bow or Stem stands twice the height of the rest of the Canoe out of the
water, which gives it an imposing appearance." (McMillan cited in Lyons,
1969:43). McMillan credits the "Yucletaws" with building these canoes,
and clearly, they belong to either the Nootka or northern canoe-building
tradition. It is noteworthy that Salish groups fishing the Fraser River
had the wealth and trade connections to acquire prestigious canoes of
distant manufacture before their catches were being purchased by
Europeans, whereas the Lummi bands, at least for use in the reef-net
fishery (see pages 181-182), acquired these canoes at a much later date.
It follows that the Hudson's Bay Company could potentially have acquired
a variety of canoe types through trade with local Natives although, as
McMillan discovered in 1827 and Fraser before him, good quality canoes
were acquired only with difficulty."

"One of the canoes McMillan had acquired in Puget Sound was leaky,
misshaped, and was of dubious seaworthiness, but he could not induce the
natives there to part with any of the many better canoes they had on hand
(McDonald, 1827:2).

Simon Fraser, faced with a similar refusal to trade, had felt it
necessary at one point on his descent of the river to steal a canoe. The
With the loss of territory in Oregon in 1848, the Hudson’s Bay Company was forced to reroute their annual Brigade from the interior via the Fraser River and Fort Langley. Chief Trader Anderson suggested in 1847, "it will be necessary to get an adequate number of boats, similar in all respects to those used upon the Columbia, made either at Langley or Kequeloose, during the winter" (Anderson, 1878). Apparently, a boat builder was not available at the fort, because shortly, "Samuel Robertson, a boatbuilder, is sent by the schooner Cadboro to build four large bateaux for the use of Fort Langley and he might afterwards be employed in building a large keel boat of about 50 feet overall which might in a pressure be sent to Fort Victoria for supplies of goods" (Ogden & Douglas, 1847). The "bateaux" were substantial craft. For the transport of provisions for 60 men and officers up river to Douglas Portage in 1848 "three of the large bateaux" were recommended in a letter from Fort Victoria, though note was made of expected difficulties in manning these. "Four bateaux at least will be required for the return of the interior parties, but you will of course have more ready if wanted for the upward transport" (Douglas & Ogden, 1848). On the fourth of July in the same year, a party started out from Fort Langley with "5 Batteaux and two river Boats" (Peers, 1848).

This last statement, with its distinction between "bateaux" and "river boats", confirms that at least two types of planked boat were built and used by the Hudson’s Bay Company on the Lower Fraser. Statements referring to "large", and small or "light" bateaux may refer to differentiation in type, but may, just as easily, simply refer to size variations among boats of the same type. An assumption may be made that at least one class of boat used on the Fraser River matched those used on the Columbia River for which we have some descriptions (see pages 117-118).

Fraser River gillnetters

The introduction of the drift gill net to British Columbia is as obscure as the first canning operation. Credit is usually given to a Scot, Alexander Ewen, who arrived in British Columbia in 1864. But the Hudson’s Bay Company net employed in 1829 may have been a gill net, and there is the vague possibility that nets of some sort were employed again by the company at Chilliwak in 1846. An American report of 1860 claims that 13,860 fish were taken in one month the previous season by one boat on the Fraser River (Kirkpatrick, 1860:5). This boat may be the one

news of this act, passing rapidly among the groups along the Fraser, was probably responsible for the great hostility he faced on his return journey (Lyons, 1969:32-33).
reported in a 1859 issue of the Victoria newspaper, British Colonist: "The Sloop Leonede cleared today for the Fraser River carrying a party who intend to engage in salmon fishing at the mouth of the river" (cited in Forester & Forester, 1975:18). If the American report is given credence, this impressive number of fish could only have been taken at the river's mouth by net(s), and probably a gill net, given the failures noted later of other capture methods on the Fraser River.90 There is no reference to the size of the Leonede, but if she carried more than one net with attendant small boats, then the figure provided by Kirkpatrick becomes a more reasonable one. Interestingly, the same issue which announced the sloop's departure from Victoria contained advertisements for "salmon and herring twine, cod fish hooks, [and] salmon and herring nets."

Despite the apparent availability of gill nets in the colonies, attempts in the early 1860s at salting and perhaps even canning salmon at New Westminster had mixed success due to continued reliance on the Native fishery which provided a poor supply of fish owing to the considerable distance between traditional fishing sites and the new processing establishments (Doyle, 1957:9). Pleas for fishermen in British Columbia enticed Alexander Ewen from Aberdeenshire, Scotland, where his family had long fished salmon. Ewen delivered salmon fresh out of the river with his gill net, and, after 1865, the gill net became the principal source of fish for new processors on the river (Doyle, 1957:10). Native fishermen were quickly recruited to set gill nets in reaches near New Westminster, and the migration of Native families great distances to the Fraser in huge travelling dugouts was an impressive event marking the beginning of the salmon fishing season to the end of the nineteenth century. Indeed, by some accounts, which do not predate 1877, gillnetters were exclusively native until 1883 (Roussell & Kelez, 1938:706). Due to the Fraser's muddy waters, gill nets could be used day and night. Canneries, in later years, would hire two crews working for daily wages, so that boats and nets could be operated 24 hours a day (Rathburn, 1899:307), limited only by ebb tides which could sometimes be too strong for drifting.91 By 1884,

90 Most of the Caribou miners recently arrived to Vancouver Island and British Columbia were veterans of the California gold fields and therefore witnesses to if not participants in the Sacramento gill net fishery, then nearly a decade old. That the results of this fishing expedition appear in an American article summarizing the Sacramento River salmon fishery suggests that fishermen on the Leonede may have been Americans.

91 "You can't fish Fraser River on a strong run out; it's too strong. The tides are swift. You'd get in trouble, because the direction of the river doesn't always go on schedule. You know, straight out, it goes out over the flats and you get high and dry and wait for the tide to get out. You have to wait for the tide gets down low, then start again" (Edward Sparrow, Sr., cited in Bannister & Clayton, 1992:54).
1,000 gill nets were in use in the province (Forester & Forester, 1975:55).

No eye-witness accounts seem to exist which describe the earliest craft from which gill nets were set on the Fraser River. Later accounts say that canoes and skiffs were used at first. The only established tradition for plank-built boats or skiffs on the river were those of the Hudson’s Bay Company. There is no record of any independent full-time boat builder active in the Lower Mainland area before the 1880s, although there were certainly part-time builders in an area so dependant on water transport. In Victoria, however, formal yards already existed by 1861: “Sound ship building yards have been established in the harbour, and many small river steamers have been launched”, and “Wherries and Skiffs” were present in sufficient numbers to warrant licencing regulations for their hiring (Forbes, 1862:30, Appendix 10).

By 1880, most gillnetters on the Fraser River were flat-bottomed boats of the type known as the "Fraser River skiff" which appear in photographs taken in the last two decades of the century (Fig. 33). These were typically double-ended boats, longitudinally planked on a bottom showing some rocker, with clench-planked sides three strakes deep, and often, though not always, sported a sprit rig and a centreboard. These relatively narrow skiffs were usually about 20 feet (6 m) in length, although a length range from 18 to 26 feet (5.5 - 7.9 m) has been attributed to them (Rathbun, 1899:306-307). At least one skiff, built by a fisherman, considerably surpassed this range, but seems not to have been imitated: "[He] ...built this 33 foot skiff and rigged it up as a sailboat, you know. You know, like the dories they use on the east coast, you know, a little different shape, that’s all. Had a mast, sail and centreboard" (Marlatt, 1977:12).

As has been noted elsewhere on the coast, a river’s lower reaches tend to be fished by more substantial and seaworthy craft than those used upstream, while the more protected upriver waters also often foster the continued use of types no longer seen downstream. A dugout canoe, for example, was still being used as a fishing boat above New Westminster in 1902, long after dugouts had disappeared from the principal gill-net grounds near the river’s mouth (Easthope, 1975:19). Canning pioneer T.E. Ladner notes that skiffs could be "square sterned or double ended" (Ladner & Ladner, 1979:98), yet photographic evidence, limited to the lower
Figure 33. Fraser River skiffs unloading on the Fraser River in the 1880s (City of Vancouver Archives 256-23).

estuary, shows double-ended boats almost exclusively.\textsuperscript{92} Analogous to distribution of forms on the Columbia River, a greater frequency of transom-stered skiffs might be expected upstream. Greater use of centreboards and sail rigs would also be expected nearer the mouth of the river. A familiar pattern of upper and lower stream usage in chronological terms is also evident on the Fraser River. Like the Columbia River, Native fisheries on the Fraser were concentrated at areas of high current activity above the estuary, where fish were collected by

\textsuperscript{92} An exceptional transom-stered skiff is seen in Vancouver Public Library photograph ED965 (see Meggs & Stacey, 1992:34–35). Transom-stered skiffs are also seen at Deas Island cannery (Forester & Forester, 1975:112).
the earliest exporters of fish. The first canneries were located in the middle of the lower river area, on the Fraser River in the vicinity of New Westminster, or about 20 miles above the river's mouth. In 1873, a cannery was constructed at Deas Island, about 12 miles downstream from New Westminster, and another cannery was built at Ladner, a further five miles downstream in 1878. But, 1882 was the year in which cannery construction firmly reflected the new desirability of locations at the river mouth; new sites that year included two on Canoe Pass in the southwestern portion of the estuary, another on the North Arm, and the first cannery to be built in Steveston (Howay, 1914:586), on the largest arm of the river. From 1889, the Steveston waterfront became the focal point of heavy cannery construction on the Fraser River (Ross, 1979:199-203).

Steveston is situated as close as possible, within dyked land of the Fraser delta, to Georgia Strait. Practically however, the seaward terminus for the river's principal arm lies an additional five miles to the west where the deltaic tidal flats end and the channel enters deep water at a point known as the Sandheads. Fishing boats had preceded the cannery's downstream migration; by 1881, the principal fishing grounds had already moved to the waters off Steveston, with steam-powered towboats and floating fish camps facilitating access to grounds distant from cannery sites (Stacey, 1977:46-47). By 1885, boats had resorted to the Sandheads, and in 1887, with 935 boats on the river, serious overcrowding was reported, despite the expanded grounds (Rathbun, 1899:306; Rounsefell & Kelez, 1938:706; Stacey, 1979a:147).

The mouth of the Fraser is protected from open Pacific swells by Vancouver Island, but Georgia Strait is a large body of water some 20 miles wide in its southern portions. Waves produced by northwest winds prevailing during salmon fishing season can be substantial as they have a fetch of about one hundred miles before colliding with the Fraser River's outflow in rapidly shelving depths. These conditions were too challenging for the flat-bottom Fraser River skiffs which were known to actually split open in the short steep seas at the Sandheads (Daily Columbian, August 8, 1896:39). At least by 1892, and possibly as early as 1888, round-bottomed boats were introduced to the Fraser River which were better able to prosecute the fishery as it expanded into the Strait (Fig. 35). Usually referred to as Columbia River boats, or Columbia-built, these boats appeared almost 30 years after similar boats were first used on the Columbia and Sacramento Rivers. With fishing concentrated off the Sandheads, fatalities among fishermen on the river rose, although it is likely that most boats involved in fatal incidents were the more lightly built skiffs. In July of 1898 it was reported that, "...some two thousand gillnetters were fishing around the mouth of the Fraser when a storm
sprang up. Boats were hurled together and crunched like eggshells. Others were swamped with one crushing wave. Some were blown out to sea never to be seen again" (cited in Ross, 1979:112). Ten boats sank with the drowning of 7 fishermen in a bitter southeaster which blew up again in July four years later (Meggs, 1991:70).

These two types co-existed at least until 1905, by which time round-bottomed boats had largely replaced the skiffs and had expanded the fishing grounds as far as the river's silt served to shroud their nets93 (Rathbun, 1899:307):

...in 1895, the boats were observed to be also scattered elsewhere in all directions as far as one could see, to near the [international] boundary line, south of which they do not go. There were at least 400 or 500 boats outside on that occasion, and the scene presented was one of great animation.... in places [the nets] were so close together that the tug on which we were had difficulty in picking its way among them.

No original plans or models remain of either the skiff or the round-bottomed boats. Skiffs would typically have been built in small one- or two-man yards along the river. Homesteader William Woodward, located on Lulu Island opposite Ladner, who also established a small ferry service across the river, was one of the these. "He obtained his lumber from a sawmill at New Westminster and stored it his heated shop. He used it the following year after it had been thoroughly seasoned." Skiff-building operations were often more off-hand than this: "The Japanese built boats of boards made from cedar logs found drifting in the river. Their boards, made with a whipsaw and a draw plane, when painted, could not easily be distinguished from the better wood used by William Woodward" (Ladner & Ladner, 1979:98). John Davis, Sr., a Tsimshian who would later build Davis boats in Metlakatla (see pages 231-232), came down from the Prince

93 Hard-laid gillnets, which were less visible in clear water than nets used previously, were introduced to the Fraser River fishery in 1892, just as boats capable of setting these nets in open water were becoming available (Stacey, 1979a:148).

In contrast to Sacramento and Columbia fisheries, dramatically increasing net sizes was not a contributing factor to the need for a new type of boat. Net sizes were limited by regulation on the Fraser River to 150 fathoms (275 m) in length until 1905 when 300 fathoms (550 m) became the maximum length (Rounsefell & Kelez, 1938:708). This change in regulation was justified, however, by the new boats and expanded fishing grounds: "...now fishermen in the Gulf of Georgia are permitted to use nets of 300 fathoms. This alteration was necessitated by the general use outside rivers of the large Columbia River boats which will hold twice the quantity of fish" (Pacific Fisherman, 1905 3.6:21).

Silt from the Fraser outflow sometimes stains waters across the Georgia Strait as far as the Gulf Islands, into Burrard Inlet to the north and into Haro and Rosario Straits to the south. Fishermen sometimes sailed or rowed 20 miles from the mouth of the Fraser River to set their nets in these clouded waters (Gordon MacDonald, pers. comm. 1992).
Rupert area in the 1880s to build skiffs in the Vancouver area. He could only earn a part-time income from this work (Loken, 1981:5).

It was a common practice later for boat-building shops to be part of the cannery complex (Bannister & Clayton, 1992:19), but it is not certain when these amalgamations first occurred. Certainly, space was provided in early canneries for annual maintenance of cannery-owned skiffs, and for the sewing of sails (Ladner & Ladner, 1979:99):

Early each year, boats... were repaired and painted. The boats were built of cedar boards, and splitting was very common. When the cracks became so extensive that they did not close when soaked, repairing was necessary. A piece of sail canvas was immersed in white lead and boiled linseed oil and laid over the split and then covered with tin and fastened with copper tacks. The boat was then repainted with the cannery's colours. New boats were also painted.

Large boat-building shops in Vancouver were manufacturing skiffs by the late 1880s. One yard which produced skiffs as well as round-bottomed boats was Wallace Shipyards on False Creek. In 1908, a young man named Darrie Carter began an apprenticeship lasting two years at the yard. Mr. Carter, who lived into his nineties, spent most of his long working years building and repairing wooden boats of all sorts on the British Columbia coast, and, late in his life, sketched plans for the Fraser River skiff as he remembered them being built at the Wallace yard. After Carter's death, naval architect David Moore adapted his sketched description in plans which served for the building of two new boats by the Britannia Heritage Shipyards Society in the past four years. The larger boat (Fig. 34), is 20 feet two inches (6.14 m) long, has a beam at the sheer of 5 feet 5 inches (1.65 m), a beam across the bottom of 4 feet 1 inch (1.24 m), and the sides of 3/4 inch (19 mm) lapped plank flare consistently at 15 degrees. The stern incorporates a small tombstone transom 8 inches (203 mm) wide at the chine and 12 inches (305 mm) wide at the sheer. Bottom planks, 1 inch (25 mm) thick, are laid longitudinally with a rocker of 5 1/4 inches (133 mm). The depth amidships is 2 feet 1 3/4 inches (0.65 m), and forward 2 feet 4 3/4 inches (0.73 m), giving a sheer coefficient calculated to the baseline of 1.32, or just over 8 inches (200 mm) of sheer. The centreboard trunk, housing a galvanized steel plate, is about 4 feet (1.22 m) long secured by a thwart and a cross-beam. Floors are 3 inches (76 mm) molded and 1 3/4 inches (44 mm) sided; futtocks are the same size without taper, and are topped with narrow side-decks.

The Carter/Moore skiff does not fare particularly well in comparison with photographed skiffs. In no photographic image of the Fraser River skiff is a tombstone stern apparent; with the exception of one square-ended skiff all boats seem to be truly double-ended. In the Carter/Moore skiff a chock for a steering oar is provided which is another feature not
apparent in any photographs of skiffs. In a couple of images rudders are stowed aboard, but the method for securing these to the stern post is not evident.

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Figure 34. Fraser River skiff (after sketch by Darrie Carter).

Most skiffs shown on the Fraser River are not decked, that is they lack short decks both fore and aft as well as narrow side decks running the length of the boat. One photograph taken on the Steveston waterfront in 1897 does show decked skiffs (Vancouver Public Library 13470). Of 12 boats clearly visible in this photograph, 10 are skiffs and two are round-bottom boats, three skiffs are in distant profile so that it is not possible to say whether they are decked or not, three are not decked, two are decked with openings squared at the end, and two are decked with oval-shaped openings. Decked skiffs were clearly a late introduction, the decks being an improvement which undoubtedly imparted strength to the hulls in imitation of round-bottomed boats which were always decked. In Figure 33 (see page 196), typical skiffs of the 1880s, without decks, are shown. As the futtocks are not capped in any way, it is possible to see that they are tapered towards the head. In another photograph (Vancouver
Public Library ED965) it is possible to see that they are sawn to lap the floors in knee-like fashion. Where frames may be counted, their numbers vary from 9 to 13. A pair of small hanging knees top the three thwarts which placed one at either end of the centreboard trunk and another forward doubling as a mast partner. Thwarts rest atop the first plank lap, though a shelf sometimes reinforces this point. Planks are laid with the half-lap method, known as "dory lap", so that plank ends appear flush. According to Chapelle, this method was first employed on dories by the Higgins & Gifford Company in 1887 (1951:89), yet its use on Fraser River skiffs predates this.

The boats in Figure 33 show more sheer, greater flare, and finer lines than the Carter/Moore skiff. It is possible from this image and a couple of others, due to the fortuitous aligning of two boats, to scale the beam of one boat relative to the length of another where both boats are approximately the same distance from the camera. Naturally, the result is an approximation relying on the assumption that both boats are the same length, but boats grouped together, that is, in the same cannery stable, seem to share similar dimensions. In Figure 33, the beam of the boat on the left is about one-forth the length of the boat next to the dock and a little closer to one-fifth the length of the boat in the foreground. An average length to beam ratio of 4 to 4.5:1 is confirmed in other photographs (eg Vancouver Public Library 13470). It is also apparent that the sides slope to a considerable degree and that bottom beam is much less than beam at the sheer. The bottom beam on the left-hand boat in Figure 33 may be about 60 percent that at the sheer. This ratio is also suggested in other photographs. In Vancouver Public Library photograph ED965, a distant boat is photographed bow-on, from which a flare may be measured of about 60 degrees amidships. In a boat closer to the camera in this picture and in the left-hand boat in Figure 33, it is possible to see the angle of flare decreases considerably towards the ends, as indeed it would have to in order to fair with the relatively upright end posts. A natural consequence of this flare, which is far more dory-like than might be expected, is a greater sweep to the sheer in profile than is evident in the Carter/Moore boat with its constant flare combined with nearly constant strake width. It is, of course, nearly impossible to determine from a photograph the extent to which the width of a strake may vary over the curved length of the hull. It seems, however, that the width of the top strakes typically remain constant, while second strakes narrow amidships; bottom strakes are masked by the water, as is the degree rocker.

While the photographic record does not lend support to the form or several details represented in the Carter/Moore skiff, it must be
remembered that all photographs considered here pre-date Carter's apprenticeship with Wallace by 10 to 25 years. There is also a strong bias in the photographic record towards the Steveston waterfront, or lowest reaches of the river. By 1908-10, skiffs had virtually vanished from the lower river, and it seems certain that no new skiffs were being built at this time, by Wallace or anyone else, for use in this area. New skiffs may well have been finding employment, however, in those few canneries or independent fishermen still working the estuary's upper reaches for which a photographic record is lacking. Another possibility is that the boats Carter describes were being built for one of the northern canneries which continued to use sailing gillnetters, of both round-bottomed and skiff form, long after they had ceased to be used on the Fraser River.

The price of Fraser River skiffs seems to have gone down as the century progressed (Stacey, 1979a:146). This may have been due to lower prices charged by Japanese boat builders, or by larger yards. However, the large yards seem not to have used production-enhancing techniques such as the solid mold employed in round-bottom boat manufacture (Carter, 1973). Without outfit, the price of a new skiff in 1901 was $35 to 40, while a round-bottomed boat cost from $100 to 150 (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:356). The outfit would add an additional $20 to 30 to each boat; used skiffs and round-bottomed boats sold for an average of $35 and 90 respectively (Newell, 1989:34)." It is not known how much the addition of side-decks increased their price, but skiffs would clearly have still represented a considerable saving over the round-bottomed boats, and these decks, providing significant reinforcement, probably added to the skiff's longevity. Skiffs were generally built entirely of red cedar often cut from the Lake Harrison area (Jacobson, 1987), whereas round-bottomed boats sometimes used red cedar for planking, but used a variety of local and exotic woods for other structural components.

While the two types co-existed on the river, it seems that the skiffs remaining in use came to be manned almost exclusively by Native fishermen (Rounsefell & Kelez, 1938:708). It would be characteristic for cannery operators to simply avoid spending any more money on boats for Indians than they had to, as was the case in northern canneries, but Stacey suggests that native fishermendid not readily adopt the new round-

"A 150 fathom (275 m) net cost about $100 at the turn of the century. These could last up to three years but one year only was expected for a hired net (Rathbun 1899:307). Round-bottomed boats from large yards were built with the expectation of lasting eight years (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358). The expected life-span for skiffs is not known.
bottomed boats (1979a:149). Interestingly, the Fraser River skiffs' proportions, apparent from photographs, are remarkably like those of dugout canoes: the skiff's length to beam ratio is similar to that of medium to small sized dugouts; the flat-bottom form was familiar through some Nootkan and northern canoes; the flaring sides are reminiscent of the spread dugout; and, by the end of the century, oarlocks and sprit sails were not novel components of the dugout's outfit. There may be some credence to the idea that Natives, from more remote portions of the coast, where planked craft were relatively rare, found the skiffs much more like the canoes they were accustomed to, than were the beamier, deeper, and more heavily canvassed round-bottomed boats. The resemblance in form between the skiff and canoe also raises the possibility that the skiff was developed by Natives. Though it is not known if any Native boat builders were active in the area before John Davis, Sr., the Musqueum and other bands on the river would have been exposed to the bateaux of the Hudson's Bay Company for many years before the arrival of canner.55 With the entry of Natives into the commercial gill-net fishery there would have been incentive to use craft less fragile, and more quickly constructed than dugouts; the use of canoes as early gillnetters shows the canners were not, at first, providing boats for rent to fishermen, so that the initiative to build planked craft may have been left to Native fishermen.

The introduction of the round-bottomed boat on the Fraser River, on the other hand, is well documented, and may be traced to one boat-builder, Captain William Watts. Watts had trained as a boatwright in his father's shop in Collingwood, Ontario, on the south shore of Georgian Bay. His father had originated the Collingwood skiff, one of the best-known variants of Mackinaw boat, a loosely defined class of double-ended fishing boat, used throughout the western Great Lakes. Watts had already introduced the type to Lake Superior, and skiffs had been shipped by rail from Collingwood to Lake Winnipeg (Barry, 1940:37). He arrived in Vancouver in 1888, and for three years captained a ferry on a lake and tributary river of the Fraser (Watts, 1939). It is not clear when he and his associate from the Great Lakes, Edward Trott, built their first fishing boat in British Columbia. Watts & Trott Boatbuilders first appeared in the Vancouver City Directory in 1890. Their arrival was poorly timed with respect to the fish boat market, because from 1887 to 1892, inclusive, gill-net licenses on the Fraser River were limited to 500, reducing the number of boats previously fishing by nearly half; there can have been little market for new fishing boats. It is probably no

55 While the early builders of skiffs are unknown, until the 1880s all gillnets used on the Fraser River were hand-woven from imported flax twine by Native women (Meggs, 1991:22).
coincidence that his first big order for "25 small boats" was from a firm in Nanaimo (Watts, 1939). When orders came in for Fraser River canneries however, with the lifting of regulations, the orders were large. The canner Bell-Irving sent out a tender for 100 boats to be built in a little over three months. Watts' bid was successful, and he met the deadline by developing a "solid mold and method to plank a boat in 1 1/2 hours", finishing better than one boat per day, except for painting (Province, April 19, 1952). Watts described his boats as, "All Mackinaw type boats, after the type used on the Great Lakes, one sail and a jib, sloop rigged" (Watts, 1939). Among British Columbian fishermen the new boat was "well thought of" and recognized as "a good sea boat" (Templeton, 1977:18.42). Other boatbuilders built boats on Watt's model. These builders included: Andrew Linton, trained as a shipwright and boatbuilder in New Brunswick Maine, who, in 1884, became the first boatbuilder in Vancouver; Alfred Wallace, born in Devon, England, but with previous experience on the Great Lakes; Henry Mundon, who arrived in 1898; U. Morishima* in Vancouver, the Atagi, Nakade, and Hamada yards in Steveston, among several other Japanese builders working independently or in cannery shops whose names were not recorded.

All round-bottomed gillnetters used on the Fraser River include a gaff rig with jib set to a bow sprit." Unlike Columbia River sailing gillnetters, the masts of boats used on the Fraser River were "permanent" in that they did not rotate, a removable mast clamp was not employed, and shrouds were attached. Some boats were lap-straked. The ends of the Fraser River gillnetters were fine, most noticeably at the deck, in comparison with sailing gillnetters used in the United States. In these respects gillnetters of the Fraser differed from Columbia River boats, although even builders in the Vancouver area described their boats as Columbia River boats." The interior arrangement of gillnetters both sides

* Morishima may be the only Japanese boatbuilder to be recorded in Vancouver directories in the nineteenth century. His advertisement in the 1896 city directory reads: "JAPANESE BOAT BUILDER Skiffs, Fishing Boats, Keel Boats & Sloops for sale All kinds of Boats & Oars made to Order.

* In Vancouver Public Library Photograph #186 there is a double-ended boat with a sprit rig, but close examination of the under-exposed print seems to indicate it is not a round-bottomed boat but an exceptionally large flat-bottom skiff with general proportions resembling a round-bottomed boat; as far as the photographic record is concerned this boat appears to be one of a kind.

* In the Vancouver City Directory for 1900 Alfred Wallace ran the following advertisement: "A. Wallace: Ship & Boat Builder. Tugs, Stern-Wheelers, Steam Yachts & Launches, Scows & Lighters, Ship's Wood & Metallic Life Boats, Columbia River Garvel [sic] & Clinker Fishing boats...."
of the border, including the large central centreboard trunk, with bulkheads at either end forming fish lockers in the waist, and the oval-shaped deck, is identical, but is also found in the Great Lakes Mackinaw. Photographs show some variance in end post forms on the Fraser River: varying degrees of curvature in the stems range from plumb and very straight above the waterline, or slightly spooned, to a slight tumblehome; stern posts are raked in varying degrees, and rudders show that many, if not all, had a rounded transition from keel to post.

For more thorough analysis, insufficient data exists relating to even basic hull dimensions of boats built for the Fraser River. According to Watts, his first boats were 25 feet (7.62 m) long with 7 1/2 feet (2.29 m) of beam (Watts, 1939). In notes pertaining to round-bottomed boats intended for northern canneries in 1896, boats measuring 25 feet (7.62 m) long by 6 foot 10 inches (2.08) wide and 2 foot 2 inches (0.66 m) depth are compared with boats of the same length with a 6 foot 8 inch (2.03 m) beam and a depth of 2 feet 6 inches (0.76 m); on the Fraser River, fishermen were said to "prefer" the latter (Bell-Irving, 1896). In the 1905 Pacific Fisherman Yearbook, Fraser River boats were said to be 30 feet (9.14 m) long, with a 6 1/2 foot beam (1.98 m), a 6 foot (1.83 m) long centreboard, and a capacity of 2 1/2 tons (2270 kg) (cited in Stacey, 1979a:148). This length is surely too long relative to beam, and it may be assumed that the bowsprit was included, leaving a hull length somewhere between 25 and 27 feet (7.62 - 8.23 m). Photographs suggest that there was some variation in length. In Figure 35, for instance, perspective does not sufficiently explain the difference in length between the two boats in the foreground; in other examples of boats aligned head-on to the camera beam may vary as much as 10 percent and mast height by an even greater degree.

Both lap-strake and flush-planked versions were built for the Fraser River, the latter being the most numerous, but this element of construction cannot be used to distinguish between builders. Wallace, for one, offered boats planked in both ways, and Watts may have also (Barry, 1940:37). Darrie Carter notes that the Wallace construction method included placing the keelson over the frames to provide greater strength (Carter, 1973). It is not clear whether Wallace boats may be distinguished from other builders in British Columbia in this respect, but the technique is certainly different than that employed for Columbia River sailing gillnetters where the plank keel without a keelson seems

99 Collingwood skiffs also employed both methods of planking, though lap-strake boats were more numerous on the Great Lakes. Steam-bent frames were inserted after lap-strake planks were set up in Collingwood (Barry, 1940:74).
universal.\textsuperscript{100} Most likely, though it is unconfirmed, the scantling, or nearly square-sectioned keel used in the Collingwood skiff was preferred to the plank keel on the Fraser River.

Carter also notes that Wallace's lap-strake boats were constructed over a solid mold. This solid mold, over which the boat was built upside-down, was used by both Watts and Wallace, and both claim credit for its introduction (Watts, 1939; Marshall, 1963:17).\textsuperscript{101} It must have been used

\textsuperscript{100} A review of plans for Great Lakes boats shows that keelsons were generally beneath the frames, and functioned as covering boards for the keel.

\textsuperscript{101} At the turn of the century, Watts and Wallace were the two largest boat and ship building operations in Vancouver. Watts employed about 22 people, Wallace about 64 (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:359; Vancouver City Archives, photograph BO.P. 524 N 305).
for flush-planked boats as well as lap-straked, if not exclusively for the former, given the much greater number of these on the grounds. With the mold, Watts could plank a boat in an hour and a half (Province, April 19, 1952), and Wallace, whose yard became increasingly mechanized with overhead trolleys, etc., was able to turn out six or seven boats a day and five to six hundred annually in the early years of the century (Marshall, 1963:17). A description as to how this mold functioned is unavailable. However, a Vancouver Public Archives photograph, BO.N.305 P.524, of Captain Watts and his employees posing at the yard, shows what at first appears to be two inverted hulls in the background. On close examination, these "hulls" prove be molds. They are not literally "solid", but are composed of what appear to be wooden strips laid longitudinally like strakes, but with spaces between approximating widths of the strips. Spaces and strips narrow at the ends. The centreline of the mold is open to accept the keel and end posts. The form is held beneath by perhaps 12 frames. The photographed molds are on the ground, but if elevated when in use, a man may have worked beneath, to back rivets driven from the outside of lapped planks. More likely, however, the mold was used at ground level and served to form all the frames in boats built with flush-laid planks, these planks being secured from the outside without nailing through or clenching.

Although Watts had at least two molds which may or may not have been identical, a solid mold did not allow for the customized hull; only boats of absolutely uniform size and form could be produced with it. Yet, from photographic evidence, it is clear that round-bottomed boats of the Fraser River were not uniform. There were two reasons for this: the number of independent fishermen on the Fraser River, and the number of boat builders. Independent fishermen, that is fishermen who did not rent their boats from the canneries and often fished year round, had made up about 200 of 935 fishermen on the Fraser River in 1887 (Meggs, 1991:32), but their numbers shrank to 100 during the years of licence limitation from 1888 to 1991. During these years any one of the fortunate independent fishermen who had a licence would certainly have had many inexpensive used boats to choose from had he wished for another boat. In 1892, the number of independent licenses jumped to 270 against 417 cannery licenses, and the following year over half the licenses granted were to independent

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12 If these strips were metal, it is possible that it worked on the same principal as solid molds which had already been developed for the mass-production of canoes in shops in New England and on the Great Lakes; these molds were composite structures of wood with metal strips so situated as to automatically clench nails driven from the outside through both plank and rib, or frame (Alvord, 1988:32-33). Remains of boats constructed this way could be identified.
fishermen; 200 new licenses were granted in 1894, and most of these were to independents (Stacey, 1979a:149). These years which saw a dramatic growth in the number of independent fishermen were also years when round-bottomed boats became popular. Given the competitive need to fish farther out into the Strait, and the dubious safety of the skiff in these waters, any independent fishermen who could afford it, and doubtless many who could not, bought a round-bottom boat. A few of the more prosperous and discriminating of these men would want a boat which was not stock-built but reflected personal preference in light of experience on the Fraser River grounds.193 Part of their experience came from competition spawned by the new, generously canvassed boats. In the words of one fishermen: "They were fast sailors, very fast. I think one of the greatest sights that I ever remember seeing was 100 or 200 of these boats sailing in from the gulf in the mornings when they came in with their fish.... A lot of them had races coming in, and we'd have a lot of fun racing with some of the bigger boats" (Marlatt, 1977:13).

That these fishermen had close contact with builders such as Alfred Wallace is clear: "Many of his fishermen friends were Scotsmen and these were more than willing to take a man named 'Wallace' into the family of Scots. A Scot, of course, had to have a Scottish Christian name. 'Alfred' would not do at all. 'Andy' seemed to fit and 'Andy' it was...." (Marshall, 1963:18). This nick-name would stay with Wallace long after his dry dock and shipyard became the largest of its kind north of San Francisco and the building of small fishing boats a distant memory.

How many custom boats Wallace or Watts may have produced without using their molds is not certain, but most boats built to different lines would have been produced by Japanese yards. By the turn of the century perhaps 50 percent of new fishing boats were being delivered by Japanese builders (Stacey, 1979a:148). Their numbers and the low price of their products caused for great concern among established caucasian builders. Wallace described their small yards: "All round from Port Moody to the Fraser River, that is 35 or 40 miles, you will find shacks where boats are built by Japanese all along the shore. They cut the timber and rip-saw it to build boats wherever you see a shack" (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358-359). As canneries developed boat yards on their lots, it was often a Japanese builder who ran the

193 Some bought craft with which they had had experience before gill-netting on the Fraser. One east-coaster, for example, bought a dory from the Oscar and Katie shortly after the Gloucester schooner arrived to initiate an offshore Pacific halibut fishery in 1888 (Bell, 1981).
shop.\textsuperscript{104} There were perhaps seven or eight Japanese-run yards large enough to employ a number of people; these yards produced boats more cheaply than most established yards claimed that they could and still pay their employees the going rates of three to four dollars a day.\textsuperscript{105} Japanese workers, often without families, would work for half that salary and "all live[d] in same shack" (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358). Japanese yards had another advantage in that they often contracted to supply fishermen as well as the boats they delivered to northern canneries where fishermen were in demand. Mundon was squeezed out of the business, and Linton concentrated on building "higher class pleasure boats", a field Japanese builders did not compete in; "In the first place I used to build flat-bottom boats and boats used for logging work and around booms. The Japanese commenced on those first. I could not compete and had to quit.... I also built [round-bottom] fishing boats. The reduction in price drove me out" (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358). William Watts' company became Vancouver Shipyards and increasingly concentrated on building steamers and other larger vessels. Wallace, who could not induce his employees "to go fishing", continued to produce great numbers of fishing boats maintaining low prices due to his highly mechanized shop: "By machinery we can compete.... We can do the work about 15 per cent cheaper by machinery. No one building by hand can compete with machinery" (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358). With hindsight, one may wonder if Wallace's mechanization might not have had as much to do with driving other established boat-builders out of the fish boat market as did the Japanese builders.

Nevertheless, with lower salaries and perhaps with lower quality materials, Japanese yards did "compete with machinery". That smaller yards may not have had the proper facilities to cure wood has been mentioned, and Mundon criticized their use of poorer material such as maple ribs and lumber which had been whip-sawed, though he acknowledged that "The Japanese can build a boat as good as a white man can for

\textsuperscript{104} "The buildings that housed the boatworks were often privately owned by the Japanese boat builder but stood on company owned property" (Bannister & Clayton, 1992:62).

\textsuperscript{105} As an apprentice working for Wallace, Carter made only 80 cents a day (Carter 1973). Pay rates in the early 1880s are summarized by Anderson (1883): blacksmiths, $3-3.50/day; carpenters, $2.50-3.50/day; laborers $1.75-2/day; and fishermen working for canneries $50-60/month. In the 1890s, the daily rate for fishermen working for canneries was no higher than $2.50 (Meggs 1991:22). Independent fishermen might earn $350 to $500, though a very few may have earned up to $1,000 over a period of six weeks (Gowen, 1894:64).
fishing." Wallace thought Japanese boatwrights to be "very good mechanics, but very slow", although he had never hired one (Canada, Royal Commission on Chinese and Japanese Immigration, 1902:358). Probably a large part of their success was due to their ability to produce custom boats at approximately the same price as boats off Wallace's mold. In this way they must have appealed to the independent fishermen. Furthermore, many Japanese-run yards were on the riverbank, on the banks of the fishing grounds where most of the builders fished themselves in season, instead of 25 miles away by water in Vancouver.

All boats built by Japanese builders in British Columbia were based on types already established in the province, and, in terms of form, in no way reflected Japanese traditions.154 Structurally, there seem to be no elements to distinguish boats built in Japanese yards on the Fraser River; for example, scarfs, except perhaps for finishing work, seem to have been conventional. In traditional Japanese framing, frames were relatively few, futtocks do not touch the floors, and twists in planks are achieved by charring (Greenhill, 1959:5-7), but whether these techniques, most likely to show up in skiffs built by small yards, crossed the Pacific is unknown. One notable innovation of construction was employed by Japanese builders of powered fishing boats, but whether it was introduced early enough to have been used on sailing boats is uncertain. In the building system known as tanaita tsukuri, planks were set up first over molds, representing about four percent of the frames, and strapping, then steamed frames were inserted as one piece stretching from gunwale to gunwale (Haig-Brown, 1987:29; Miller, 1991:4). Traditional tools such as pull-cutting saws and planes were highly valued in tool kits of even second-generation Japanese boatbuilders who continued to specially order their tools from Japan until the Second World War. The apparently extensive use of the whip-saw in Japanese yards has been mentioned; where saw marks can still be discerned on planks, the whip-saw would leave marks easily distinguished from planks milled with radial saws, but it is unlikely that the use of smaller Japanese tools could be determined archaeologically.

In 1905, the number of gillnetters peaked at 2,774 (Rounsefell & Kelez, 1938:707). This number consisted almost entirely of round-bottom boats, the skiffs having almost disappeared, and power boats still very

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154 Japanese-built boats in the early days of power had distinctive looks and an excellent reputation among fishermen: "You could see the difference right away when you looked at the Japanese-built, you could see the difference. Different styles. They were good, and even the look to and the shape, you knew right away.... you couldn't beat them" (Jacobson, 1988). While Japanese builders were establishing their reputations for producing good fishing boats before the use of gas engines, it seems they may not have yet defined their own "look". 
few in number. The first Fraser River fishing boat to have an engine installed in it was, ironically, a dugout canoe used to fish the upper river. This occurred around 1903 (Easthope, 1975:19). After 1907, boats powered with engines of American and local manufacture were working the river in sufficient numbers to make a significant impact (Stacey, 1979a:149). The conversion to power was led largely by independent fishermen, who had also to bear its cost. Installing a motor could add $200 to $400 to the cost of a $200 boat, and this was an expense the canners ventured for their own rental fleets only after 1910 (Rounsefell & Kelez, 1938:708; Meggs, 1991:93). The last phase of conversion was rapid, however, cannery fleet conversion was complete in 1913, and, by 1915, sailing gillnetters had virtually vanished from the Fraser River.

Like gillnetters on the Columbia and the felucca in San Francisco, the round-bottomed sailing gillnetters of the Fraser River provided satisfactory, if not ideal, platforms for motors. Despite modifications to scantlings and sections, Watts' pedigree was obvious in powered gillnetters and powered trolling boats built in British Columbia for the next half century. Japanese boat-builders and fishermen were quick to adopt and adapt powered boats, and, until World War Two, the double-ended "Japanese" boats of British Columbia followed a distinct but parallel evolution to the "Finn" and "Norwegian" boats of Oregon, and the Monterey boat of California.

Northern streams of British Columbia

Due to the difficult geography of British Columbia's northern coast and poor access from the interior, the region largely escaped European settlement until late in the nineteenth and early twentieth century, and even then, the immigrant population remained in small, scattered communities. The Hudson's Bay Company outpost at Fort Simpson on the Skeena River was salting salmon on the model of Fort Langley operations in 1835 (Blyth, 1991:7), but otherwise, until canning operations became established, the area's salmon resources remained part of an exclusively Native fishery.

The greatest concentration of canneries in northern British Columbia was in the vicinity of the Skeena River, but several more were built at Rivers Inlet, on the Nass River, and at many other scattered locations such as Smiths Inlet and Alert Bay. The essential requirements for situating a new cannery, besides proximity to good fishing grounds, included a reliable source of fresh water, a relatively protected harbour for fishing boats, tenders and transport vessels, and sufficient beach and tidal foreshore in which to drive piles for the canning plant and associated buildings (Newell, 1987:5). These isolated sites became self-
contained industrial complexes comprising as many as 60 distinct structures which often operated for only 6 weeks a year (Newell, 1987:10). "The creation of such a competitive, highly seasonal, scattered industry with isolated locations along the coast, removed from the centers of industry, and faced with scarcities of labour, capital, and materials, was considered a great triumph of nineteenth century entrepreneurship" (Newell, 1989:3).

Sites were often located at aboriginal fishing camps. Selection of these sites was both a natural consequence of canners recognizing, as had aboriginal fishermen before them, locations where salmon were concentrated, and also a conscious decision on the part of canners to locate where labour would be provided by Natives whose patterns of summer settlement in the area was already established (Kew, 1990:163). Throughout the nineteenth and early twentieth century, all gill-net boats on the northern coast were part of cannery-owned fleets. This was also part of a strategy aimed at filling labour requirements: "The real reason that you want to have those boats of your own and get Indian fishermen is they bring their families around and you have Indian women and boys, and some of the men, not fishermen, to work in the canneries, and when this extra fishing comes on you can take off your own boats and get off to work in the cannery." (Alexander Ewen, cited in Muszynski, 1986:96-79).

Boats used on the northern streams included skiffs and round-bottom gillnetters which set nets which were typically 200 fathoms long. From the beginning, boats seem to have been supplied by boat builders in the south, so there is little likelihood that dugouts were ever used for gill-netting in cannery fleets. Skiffs would have been used exclusively in the early years, as the canneries were first established in 1876 on the Skeena River, in 1879 on the Nass River, and in 1882 at Rivers Inlet, prior to the introduction of the round-bottomed gillnetter to British Columbia. Round-bottomed boats were introduced on the Skeena River in 1897 (Bell-Irving, 16 Dec. 1, 1896; Blyth, 1991:9), or perhaps as early as

107 Though gill-net boats used on the northern British Columbian Coast, as elsewhere, may be fairly summarized as consisting exclusively of two types, skiffs and round-bottom boats, there was also a fishing boat noted in 1917 which employed a "compromise stern". A sketch which accompanies the Bell-Irving diary entry shows an oval stern in plan view, a feature generally associated with power gillnetters, but not with sail boats, yet the price listed is $145, much too low for a boat with motor installed (Bell-Irving, 50 April 14 1917). Nothing more is known of this "type".

108 Gill nets were set from dugout canoes owned by independant Native and caucasian fishermen as late as 1918 in some remote coastal locations (eg Edwards, 1987:15).
1893 (Wicks, 1976:15);\textsuperscript{109} these boats allowed for the fishery to extend far into the adjacent waters of Chatham Sound (Blyth, 1991:153), but skiffs were still employed on this river in the early 1900s (Bell-Irving, 29 1903), and continued to be used through the 1920s in locations where sea conditions were less demanding.

Canneries might be located near fishing grounds which were protected on a River or interior waterway, or be on, or near, a more exposed coast. Generally, as the fishing season progressed, boats tended to follow the main body of fish starting perhaps well outside an inlet and finishing weeks later up river, or at the stream mouth (Wicks, 1975:77-78). Boats were generally required to work in various conditions. On Rivers Inlet, for example, boats worked deep and somewhat exposed waters for part of the season, yet one desirable characteristic in the area was a short mast so that boats could work in close under the trees (Fish, 1982:1.125). Nevertheless, skiffs were used extensively in more protected fisheries, and also within a specific fishery by those canneries located in more protected waters. Ironically, while canneries located on more protected interior waters incurred lower fleet costs by utilizing skiffs, the canneries themselves had to be larger to withstand great numbers of fish delivered from narrow waters in a relatively shorter period of time, whereas operations located on or near open water needed a more expensive fleet to cope with local sea conditions, yet smaller, less costly, canneries were sufficient, as fish were delivered at a more constant rate through the season (Babcock & Williams, 1910:29).

The delay in the introduction of power boats to British Columbia's northern streams was essentially a result of canners not wishing to pay the cost of converting their enormous fleets. "In 1881, the capital cost of boats and nets accounted for only 25 percent of the industry's investment, but by 1905, [following the introduction of round-bottom boats to the fleets, but before power boats] the figure was 50 percent" (Meggs, 1991:71). When legislation was passed in 1911 banning power boats in the northern fishing district (shortly thereafter modified to apply only to gill-net boats in the region), the regulation was fully supported not only by canners, but also by most fishermen, because they felt cost of converting their own boats would not be justified by the results, and if

\textsuperscript{109} One of the earliest applications of round-bottomed boats in northern British Columbia was in halibut fishing. "The first attempt at this fishery, from which a permanent fishery developed, was a shore fishery on Porcher Island in Hecate Straits", offshore from the Skeena River. From 1893 to 1895, this winter fishery was carried out in boats of the "Columbia River" type. Following rapid depletion of inshore stocks halibut became a high seas fishery, the fish taken by dories working from schooners (Stacey, 1979b:21).
the fleets remained in cannery hands, there would be fewer boats and licenses. In succeeding years the policy was reviewed and positions gradually changed. For independent fishermen, primarily Japanese but also caucasians with power boats, the regulation kept them from using the increased mobility of their new craft to best advantage. However, local fishermen, primarily Native, supported the ban because of the reasons cited earlier, and also to limit the number non-local fishermen fishing in the north (Canada, Royal Commission on the salmon fisheries and canning industry in British Columbia, 1918; Newell, 1989:154). For the canners' part, owing to extensive mechanization of the canning lines, the need for Native labour diminished, and, correspondingly, the need for control of the labour force, provided indirectly through cannery-owned fleets, was also reduced; by 1916, canners were willing to see the ban lifted provided fishing was done by independent fishermen who bore the expense of their own powerboats. However, the continued ban suited their purposes as well, because with a "boat ratings" system of licencing limiting the number of boats allowed to fish each area, and with canneries possessing all available licenses for their fleets, competition from independents with modern powerboats was effectively removed. Thus, though the fleet system persisted, canners were able to avoid additional costs of conversion. Even after the ban on power boats was officially lifted in 1926, the canner's lock on the boat rating system allowed them to maintain sailing fleets with little or no competition until canners operating on specific streams agreed to release licenses to independent fishermen with powerboats. This occurred in 1928 on River's Inlet, but on more northern streams such as the Skeena River, owing to greater distances from the southern base for most powered gillnetters and the economic downturns of the 1930s, sailboats continued in use, latterly alongside powerboats, until 1939 when the government ceased granting licenses to boat pullers (Meggs, 1991:132). Depending on local boat rating regulations, size of cannery and local arrangements made among canners (eg Lyons, 1969:244), cannery fleet sizes could range from 10 to over 200 boats. The average was probably over 50 boats per cannery in the 1920s (Newell, 1989), though numbers had been greater in the two preceding decades (Lyons, 1969:244).

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120 The runs on northern streams came earlier than in the south so that it was feasible for powerboats to fish northern streams— as well as the Fraser River, an arrangement much desired by fishermen in the south faced with paying for expensive boats by working only the depleted and overcrowded Fraser River.

111 The greatest concentration of boats in the north was on the Skeena River, where between 850 and 900 boats were used in the first decade of the century (Perry, 1903:50; Babcock & Williams, 1910:86).
Depression in the 1930s led to fewer canneries, from 74 to 44 province-wide, a further decrease in the numbers of boat licenses, and a severe income cut for fishermen (Kew, 1990:164); among the few independent fishermen fortunate enough to gain access to northern streams were those who could not afford power boats, which further retarded conversion to power in the region.

The combined salmon pack from all British Columbian canneries not located on the Fraser River first exceeded the Fraser River pack in 1884, but in most years until 1913 the Fraser continued contribute over half of the provincial pack. After 1913, however, though the Fraser River in good years still had the most important individual run in the province, never again would it match the combined pack of outlying canneries. In 1928, despite the largest Fraser River pack in a decade of 280,041 cases, this represented less than a quarter of the total for the province. That year, the Skeena River pack amounted to 187,716 cases, Rivers and Smiths Inlets packed 98,331, the Nass River 39,828, and from other outlying canneries 754,718 cases. Cannery distribution reflected the shift of importance to more northern locations: in 1913, of 78 canneries in the province, 36 were situated on the Fraser River, 18 at various outlying locations, 12 on the Skeena River, 7 at Rivers and Smiths Inlets, and 4 on the Nass River; in 1928, of 80 canneries in the province, 42 were located at various outlying sites, 13 on the Skeena River, 12 at Rivers and Smith Inlets, 4 on the Nass River, and only 9 on the Fraser River (Cobb, 1930:579-583).

Many boats used in the last days of sail on the Skeena River had incorporated features common to power boats, such as cuddy cabins or "doghouses", and net rollers. A few round-bottom hulls seem, from photographs, to be true Columbia River sailing gillnetters with full ends and sprit rigs.\(^{112}\) However, most round-bottomed boats in northern British Columbia appear to have been based on the Watts model, with relatively

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\(^{112}\) One Skeena River cannery, British American Cannery, was established by interests in Astoria (Ross, 1967:37), but was sold in 1891 to Canadian packer Henry Bell-Irving (Blyth, 1991:147). If round-bottomed boats were not introduced to the Skeena River before 1893, then it seems unlikely that true Columbia River boats were introduced directly from Astoria.

Another potential source for the few Columbia River boats was the Wales Island Cannery which had been built by American interests on the Canadian side of the border between Alaska and British Columbia. When the boundary line was officially established the cannery and its equipment was abandoned (Blyth, 1991:87). However, most of the sprit-rigged boats appear in photographs taken in the 1930s.

The most likely sources for boats made on the model of the Columbia River boat, or Bristol Bay Boat, were builders in southern British Columbia, where boats on the Bristol Bay model were being produced for the Alaskan fishery at least by the 1940s (Harold Stove, pers. comm. 1991).
narrower ends, and stayed gaff rigs, though bowsprits and jibs were often deleted.

Despite the late use of round-bottomed gillnetters in northern British Columbia, none have been preserved in the province's museums. Both the British Columbia Maritime Museum, and the Vancouver Maritime Museum have models of sailboats used on the Skeena River, but neither is a builder's model, so their dimensions and proportions must be taken with caution. They appear to match in shape and proportion the dimensions generally ascribed to Fraser River fishing boats, that is, a length of about 26 feet (8 m) with a beam of about 7 feet (2.1 m). One original boat has survived in part at the Tallheo cannery, about a half-hour run by boat from Bella Coola. The middle portion has been crushed by a collapsed shed roof, but the bow and stern were still intact in 1990 (Gladys Blyth, pers. comm. 1993). Unfortunately, the author was unable to reach the site owing to its isolation.

From written descriptions, not much more in the way of specifics can be learned about round-bottom boats used on northern streams than their counterparts on the Fraser River. According to one source, however, ballast was used (Wicks, 1976:28). No round-bottom gillnetters with lapstrakes are mentioned. While fishermen on the Fraser River usually returned to shore when not working their nets, most boats in northern streams were towed out by powered tenders, with sometimes over 50 boats to a string, and stayed on the grounds for five days before making their way back to the cannery for the weekend closure. Tenders made daily rounds to pick up fish. Where Fraser River sailing gillnetters had only short foredecks for shelter, those on northern streams often provided somewhat more elaborate shelter. Occasionally a solid cuddy cabin was installed on a round-bottomed boat, but, more often, "pop-up" hinged decks with canvas sides were provided on both skiffs and round-bottomed boats. Still, living conditions for the fishermen were awful and cramped amid the clutter of fish, wet nets, net lights, oars, rigging, and other assorted gear. Complained one fisherman "Damn near every one of them [skiffs] leaked like basket. You'd be sleeping in wet blankets. We had a single burner kerosene stove and it stunk like heck" (cited in Meggs, 1991:144). Nor did either class of boat give the fishermen any rest when nets had to be reset: "Round-bottomed [boats] are almost impossible to row against wind and tide, but their keels permit a certain amount of tacking. Flat-bottomed skiffs, even though they were provided with centreboards, gain no way in a tack into the wind, but can, with an expenditure of almost superhuman energy, be rowed into it" (Peterson, 1975:27).

The relatively calm waters of Rivers Inlet were usually fished by fishermen working alone in skiffs, a unique circumstance in British
Columbia (Perry, 1903:50). Sometimes, solitary fishermen would sail out their nets, but at some peril, because they could sometimes be caught and dragged overboard by their nets (Meggs, 1991:144). Unlike diminutive one-man boats in Washington State, however, boats used on Rivers Inlet were typically skiffs about 27 feet (8.2 m) long.

Scandinavians who had settled on the central coast and off-lying islands within 100 miles of Rivers Inlet would fish there (Fish, 1982:1.30). By 1918, boats for the salmon fishery were also being built in the vicinity. Ole Anderson tells how is father began building boats that year at Sointula, a nearby Finnish community settled shortly after the turn of the century. John Anderson's first boat was a 50-foot (15 m) steam tug, then "...he started building these flat bottomed skiffs and they were taken out of there as far north as Low Inlet, now that's getting pretty close to Prince Rupert. A lot of them went to Smith's Inlet, River's Inlet, ABC [Anglo-British Columbia] and Todd and Beaver had a lot of skiffs that were built in Sointula too" (Anderson, 1981).

One of Anderson's skiffs has survived and now hangs from the roof of the British Columbia Maritime Museum (Acc. #955). Unfortunately, the ceiling display, while convenient for viewing, is not convenient for thorough measuring. However, essential dimensions were taken as accurately as possible. These are summarized in Table 7, as RIVERS BCM (see page 286). This skiff was supplied to the Good Hope cannery of Rivers Inlet at a cost of $125 in 1923. Anderson would build 606 of these skiffs which were rented to fishermen for $10 a season. He used all local materials: fir for the 1 inch (25 mm) bottom planks, red cedar for the 7/8 inch (22 mm) sides and frames of either spruce, yellow, or red cedar. Knees were naturally grown. The boat is decked.

Another Rivers Inlet skiff is currently in storage at the Gulf of Georgia cannery in Steveston, where it will someday be put on museum display.\footnote{The skiff is on loan from the Vancouver Maritime Museum (Cat. # 001). Skiff donated by H. Bell-Irving and Company.} This boat was measured. Its lines are presented as Figure 36, and its measurements are summarized in Table 7 (see page 286) as RIVERS VMM. This skiff has a "pop-up" shelter with canvas sides, an addition which obstructs the mast step, meaning that it finished its days strictly under oar power. The removable roller for setting the net has also survived. This skiff may well have been built by Anderson as well; the dimensions are very similar to those of the BCM skiff.

On what basis Anderson developed the design for his skiff is uncertain. One might expect his boats to have been derived from the earlier skiffs used on the Fraser River. The tombstone transom was
included by Carter in his sketch, but, as has been noted, photographs do not support the use of these sterns on the Fraser River. Further photographic comparison, shows that the boats on Rivers Inlet have greater freeboard than their earlier counterparts to the south, but otherwise follow essentially similar proportions and shape. Yet, a boat used at the Good Hope cannery in 1909, described as a "Bella Bella/Rivers Inlet boat", measured 22 feet 6 inches (6.19 m) long, 6 feet (1.83 m) wide, with side decks 6 inches (15 cm) wide and aft deck 2 feet (60 cm) long, seems to be a boat distinct in proportion and detail (Bell-Irving, 34 1909). In 1895, however, boats used in Rivers Inlet are remarkably similar to Anderson's in length, with an overall length of 27 feet (8.23 m) and a length on the keel of 24 1/2 feet (7.47 m) (Bell-Irving, 14 April 4, 1895), yet are narrower and less deep. In other words, the earlier boats were longer, but otherwise followed the proportions of the Fraser River skiffs, perhaps continuing a less than totally seaworthy tradition which, in the opinion of North Coast fisherman, Walter Wicks, descended from "the Hudson Bay 'long boats' used mainly on rivers and lakes...." (1976:15).

Cannery skiffs were stored over the winter in the same manner that dugout canoes had been stored on the coast for thousands of years; after rigging and removable boards had been carefully numbered and taken out for storage in the cannery's net loft, the boats were sunk. The fishermen's first job at the beginning of the new season was to recover his boat, replace the boards and rigging, and if his boat had a canvas-sided doghouse, secure new canvas (Fish, 1982:1.75-78). It's not certain whether round-bottomed boats were stored the same way, but boats with permanent cabins certainly were not.

Among the various buildings which made up a northern cannery complex, as recorded in plans made by fire insurance underwriters in the 1920s, are buildings variously labeled "boat hut", "boat house", "boat building" or "boat repairs". These special structures are not found at every cannery, and there is considerable variability among canneries which had them. At the Inverness cannery on the Skeena River, for instance, a boat house measuring approximately 40 by 60 feet (12 x 18 m) doubled as a net oiling facility (Blyth, 1991:117). Though generally just one structure is evident at each cannery, at Balmoral cannery, also on the Skeena River, seven small boat houses are indicated. These were generally about 15 feet (4.5 m) wide and ranged from 30 to 50 feet (9 - 15 m) long (Blyth, 1991:142): While most boat houses were larger than these, the "boat building" at Mill Bay cannery on the Nass River, measuring about 50 by 115 feet (15 x 35 m), was exceptionally large (Blyth, 1991:67). These
Figure 36. Rivers Inlet skiff, c. 1925. This boat is now stored at the Gulf of Georgia cannery, Steveston. Lines taken October, 1988.

buildings would have been used as shops for boat repair, storage for spare boat parts and materials, and, in some instances, for covered winter storage of the boats themselves. Though the practice was not common, as it was on the Fraser River, for canneries to have boats built on site, at least one builder, named Kobiashi, was active building a few round-bottom boats at a Rivers Inlet site (Anderson, 1981). Boats may have been built at other canneries also. As Prince Rupert developed into an urban area following the arrival of the railroad in 1914, canneries on the Skeena River could look to new establishments in that town for boat repair and boat building.

In addition to gill nets, drag seines were also used on British Columbia's central and northern coasts and western Vancouver Island. Until 1923 drag seine sites at the mouths of numerous and scattered small streams were preserved for Native fishers, though large portions of their catches were sold to canneries (Forester & Forester, 1975:11; Meggs, 1991:110). At Smiths Inlet, for instance, the catch was primarily supplied by drag seines (Lyons, 1969:174). With small seines, small skiffs or dugouts were used (eg Forester & Forester, 1975:42). For larger nets, broad flat-iron skiffs were used which, from photographs, are not
distinguishable from the seine skiffs used to set drag seines in Washington and Oregon.

Figure 37. Purse seine skiffs in northern British Columbia, 1912 (after photo in the Vancouver Maritime Museum).

After 1900, purse seines became legal in British Columbia, and for a time, until purse seine outfits became powered, these nets were set by skiffs operating with scows (Fig. 37). Unlike early purse seine outfits of Puget Sound, however, two skiffs operated in conjunction with each scow, and these skiffs, 30 to 40 feet (9 - 12 m) in length (Blyth, 1991:27), were of different form than any so far examined. Evidence is strictly photographic, but Canadian purse seine skiffs appear to have been relatively narrower and deeper aft than their American counterparts. They were rigged to row with four or six oars. The widest point may have been somewhat forward of the stern. While there may have been internal decking, or a sole, to support the net, there was no platform situated above the gunwale, so the area in the stern where the net was stored was enclosed by the form of the boat. No comment seems to have been made contrasting the boats and methods used in Puget Sound with those in British Columbia, but it would seem that two boats could work out a net more quickly than one. By placing the net inside the boat rather than
atop it, while the net might be more inclined to hang up, the lower center of gravity would allow for a narrower, more quickly maneuvered craft, which would again aid in quick sets, so important for the purse seine to be effective.

Handliners and the market fishery

As in locations to the south, hand-trolling for salmon began to emerge as a recognized component of the commercial fishery in British Columbia as refrigerated rail cars became available and mild-curing houses became established at the end of the nineteenth century. Though powered trollers began to appear in the 1910s, the protected "inside" waters of the British Columbia coast, the low volume of troll-caught salmon, the independence of the troll fishermen who often built their boats alone and without facilities, and, finally, the economy of the 1930s, ensured that the catching of salmon by individual fishermen with hand lines in small oar and sail-propelled boats continued until the Second World War. After 1939, fewer fishermen due to enlistment, higher fish prices, and the suspension of fish quotas, effectively spelled the end of commercial handling in British Columbia.

The mild-cure fishery was preceded by the market fishery. The first market fishermen, who sold their catches in Victoria from the 1850s, were Natives. They fished with traditional nets in season (Pemberton, 1860:28), but delivered salmon to market year-round using hooks and lines, a method with a long history in the area.114 By the 1860s, catching and selling salmon was "...one of the chief sources of Indian revenue. The natives are active in hawking it in the white settlements" (MacFie, 1865:166). Market fishermen sometimes sold their catches to shops, or sold directly to consumers, fetching between 12 1/2 to 25 cents for a good-sized fish in 1873 (Sproat, 1873:21).115

Many trollers worked their lines from dugout canoes. Unlike gillnetters, capaciousness was not a criteria for hand-trolling boats, so

114 Native trolling techniques of the region were first detailed in print by John Jewitt, a crew member of a fur trading ship held captive on the western coast of Vancouver Island from 1803 to 1805 (Stewart, 1977:41).

In the 1850s, even the large numbers of fish required by salters were supplied by Native trollers. In 1857, "...400 barrels from Vancouver's Island, now on the Lucy-Male bound for Australia, were taken by the Indians with hooks and lines" (Smith, 1857b:153).

115 That fishermen were receiving a fair rate for their catches at this time may be gauged by contemporary housing costs: a log house was worth $30, a three-bedroom cottage $500, or could be rented at a cost of from $5 to $25 per month (Sproat, 1873:21).
that canoes did not suffer a disadvantage in this respect to planked boats. Most Native fishermen preferred to ply their lines from dugouts, and a few continued to do so as late as the 1940s, even in southern areas close to major urban centres (Betty Johnson, pers. comm. 1992). In 1890, the construction of trolling dugouts in southern British Columbia was described as showing "great attention to symmetry of outline, and much care and ingenuity in workmanship. They cost, when new, from $5 to $20 each...." (Tanner, 1890:52). Traditionally, Natives trolled with a kelp line secured to their paddle, so that the paddling action transferred a swimming motion to the herring bait. With a completely Native fishing kit, eight to ten salmon could be taken in a morning (Gough, 1981:27). Around 1920, dugouts were often fitted with oarlocks (Assu & Inglis, 1989:60), and cotton fishing line was secured to the fisherman's leg.

The first non-Native market fishermen in the colonies were Chinese, though there is no record of them fishing salmon, nor any description of their equipment or boats. A report of 1861 mentions only Native and Chinese fishermen supplying the market in Victoria, which then had a population of about 3,000 (Pemberton, 1860:28), as well as the mainland. In addition to rock fish and "very plentiful deep sea perch.... Great quantities of small fish are caught and dried by Chinamen who exported them to British Columbia" (Forbes, 1862:55). Twenty years later, Chinese fishermen had established themselves near the future site of Vancouver, and at least one remote location (Hittell, 1882:353):

Inside of Cape Scott, the north-west extremity of Vancouver Island, there is an extensive bank, where rock-cod are taken in immense quantity, and of the largest size. On the shore, near to this bank, a Chinese colony is engaged in the systematic prosecution of the business. In the vicinity of Burrard Inlet, a productive fishing ground, immense quantities of smelt, ...are dried, packed, and shipped by Chinese fishermen to their fellow mongols in Victoria and San Francisco.

But there is no mention of Chinese fishermen working out of Victoria at this time, or later.

In 1879, ten fishermen, "chiefly Italian" were listed in Victoria as hook and line fishermen. Their catch consisted of halibut, rock-cod, dogfish and ground shark. One of these fishermen, an American citizen, was the principal supplier of halibut for the San Francisco market, the steamers Idaho and Dakota regularly taking his catch southward (Jordan,

Photographs show patent metal oarlocks fixed to dugouts. Native tholes consisting of "a short section of a young cedar, hemlock, or yew, from which a stout branch extended at an acute angle", may have been used as well, though pre-contact use had been limited to "double canoes", those operating temporarily in tandem with a platform laid over them to facilitate the transport of bulky cargo (Curtis, 1913b:14).
1887:629). By this time, most salmon in the Victoria market seems to have come from the Fraser River. In 1888 Tanner commented favourably about the Victoria market: "...the fish stalls at that place were superior in most respects to those of any other city on the Pacific coast, the superiority appearing to be due mainly to the manner of handling the fish" (Tanner, 1890:58). Species displayed consisted of halibut, flounders, two species rockfish, three species rock-trout, and two species salmon. "The fishing fleet consists of a few small vessels and boats, manned chiefly by Italians and Greeks" (Tanner, 1890:58-59).

In Nanaimo, market fishermen, again Italians and Greeks in addition to Natives, fished for spring salmon through the winter months within the harbour, and then after February, for both spring and coho salmon in deeper water. "The fishing boats used by the white men mostly range in length from 15 to 20 feet, and are both clinker and carvel built. Some are sloops, while others have a two-masted sprit-sail rig. They are all rudely constructed and are not neat in their appearance" (Tanner, 1890:52). No other contemporary description of market boats used in the nineteenth century seems to exist, although Andrews and Larsen claim that the market boats of Nanaimo, Victoria, and Vancouver, were 2-man sloops similar to those used in Port Townsend, Washington (1959:95).

The ethnic mix of market fishermen had changed by the time power boats began to impact the market fishery. Victoria was supplied chiefly by Japanese fishermen in 12 gas launches, another gas launch was manned by two Newfoundlanders, while seven Greeks still worked sailboats. In Vancouver at the same time, 137 Japanese fishermen worked 16 boats, and 43 caucasian fishermen, including 16 Scotsmen, worked 18 boats.

Before 1889, the independent, or "free fishermen", among the Fraser River gillnetters had made a significant impact in both the canned salmon industry and fresh salmon markets (Meggs, 1991:32-33):

Small cities now stood at New Westminster and Vancouver as well as Victoria, cities capable of absorbing substantial quantities of fresh salmon. Even more important was the rail connection with the east. Refrigerated cars could carry frozen spring salmon to the restaurant tables of Montreal and New York within ten days of the harvest. To feed these new markets, a new kind of fisherman had developed, a man with his own boat whose season began with the arrival of the spring salmon and ended when the snow flew. By the end of the 1880s, between a hundred and two hundred fishermen earned their living in this manner, selling to fresh fish dealers in the spring and fall, and delivering to the canneries when the sockeye ran.

For the first time, the canners saw part of the fishery move outside their control. The independent fishermen wanted to secure sales contracts and demanded improved prices. When fish were bountiful, the canneries could flood their floors with the production of their own boats. But when the fish were scarce, the production of the independent boats was
crucial. The existence of the 'free fishermen' created the first competitive price pressures among canners, who were used to paying only the absolute minimum cost for fishing labour to acquire raw product.

Of course, independent fishermen who worked the Fraser River gill-net fishery in July and August owned gill-net skiffs or boats. But the use of nets for which these boats were designed was restricted. Before April, the water of the Fraser River was too free of silt for gillnets to be used effectively by day (Rathbun, 1899:306). By 1899, the use of nets was prohibited between November 1 and March 1. Small-mesh gill nets, used for sockeye and coho salmon, were legal only from July 1 to August 25, and from September 25 to October 31, while larger mesh nets, needed to catch spring salmon, were permitted only March 1 to September 15. Meanwhile, independent fishermen were entitled to only one net (Rathbun, 1899:307-308). These regulations served to curtail the free fisherman's independence from canneries. Undoubtedly, attempts were made to troll through the months when fishermen could not use their nets, and by those who lost their gillnet licenses during the licence restrictions of 1887-1892, but round-bottomed sailing gillnetters and, to a lesser degree, skiffs would have proven cumbersome craft from which to troll. Around the turn of the century there emerged a class of fishermen who did not fish with nets and only very rarely sold their catch to canneries, but worked independently with specialized craft for trolling, delivering their catch to mild-curers, the local fresh market, or to be frozen and shipped by rail to eastern markets.

The ranks of the handliners were swollen successively by the increased costs of fishing with power boats, the rise in cost of nets during World War I, by returning soldiers kept out of the gill-net fishery by the boat-ratings, and finally by the Depression, during which time a broad spectrum of Canadian men, and sometimes women, chose the marginal but independent life of the handliner, though over a thousand miles might rowed in a season, in preference to the breadline or labour camp (Morley, 1958:141):

We swarmed from [Prince] Rupert to Race Rocks [on the southern tip of Vancouver Island], and many a one of us covered that stretch from end to end twice in a season. Up as far as Alaska as fast as one could get there -- forty miles a day at the oars, or wrangle a tow from a power-troller, or bum a lift from a tug -- and down again, tide after tide after tide, skirted the rocks, dodging through the rapids on the slack, following the bluebacks and the big springs. In those days the bluebacks -- or we thought they did -- came first to the north coast, and ran south into the maze of waterways behind Vancouver Island.

The handliner's kit was simple, usually comprising about 4 fathoms of cod line, a few fathoms of cuddyhunk, half a yard of piano wire, hooks, a
couple of brass spinners or spoons, a streamlined herring rake, a gaff, a fish knife, a couple of blankets, a frying pan, a coffee pot, and, of course, a pair of oars and a boat. Where and when fishing was good in a specific spot for an extended period of time, driftwood shacks were erected on a nearby beach, and skidways laid for the beaching and launching of boats. There might be 50 to 75 fishermen grouped together at a popular fishing location such as Cape Mudge (Templeton, 1977:1A.142-170). Cooperative efforts ranged from assistance in landing and launching boats, to the hiring of a packer with crew to take the catch to Puget Sound, where mild-curing operations were more numerous and sometimes paid higher prices (Templeton, 1977:1A.202; Hayward, 1981).

The mystique of the hand-line fisherman, however, remained the epitome of individualism. Recognizing this creed, and the diversity in ethnic backgrounds of the fishermen, one might expect some range in the types of boats used to answer the requirements of the handliner. But the criteria for the handliner's boat, that is, a one-man boat seaworthy around exposed headlands often worked in winter months, able to beach safely in light surf, and, above all, easy to row, resulted in only two popularly used types. The first was the dugout trolling canoe. Used primarily by Natives, but also by caucasian fishermen, particularly in the early years of the fishery, these canoes ranged from 12 to 20 feet (3.7 - 6 m) in length. Smaller canoes often belonged to boys who would later

117 The herring rake was a device, first developed by Natives, with which herring used as bait could be gathered when a passing school presented itself to the handliner.

In the mid-thirties the fishermen's kits were expanded somewhat when fishing poles, known as "poverty sticks" began to be used in place of lines tied around the fisherman's legs.

118 These skidways were 300 to 400 feet (90 - 120 m) long at Cape Mudge (Evans, 1975:220). Though the wooden skids have rotted away, the patterns of cleared stones are still visible.

On the west coast of Vancouver Island, efforts at making boat channels were such that government grants were offered for clearing boulders and anchoring logs for skids (Templeton, 1977:1A.273).

119 Cape Mudge and the surrounding area, from "Poverty" (April) Point to Dogfish Bay, was the most popular resort for handliners in summers through the 1920s and 1930s. The cape itself was too exposed for winter use, but Natives from nearby villages trolled in the area year-round.

Early hand-lining locations were closer to urban centres and included the waters off Nanaimo, Victoria, off the Fraser River estuary and Point Roberts, and in Howe Sound (Rathbun, 1899:281, 315). Specialized trolling boats working in cooperation with far-ranging powered packers, which collected and delivered the catch, made hand-lining on more distant grounds possible. Georgia Strait remained the area of most intense activity, though hand-lining was practiced throughout British Columbian coastal waters.
graduate to larger canoes in accordance with increased strength and body weight (Assu & Inglis, 1989:60). The second 'type' was a double-ended boat, usually of flush-plank construction, with fine ends, sprit-rigged when a sail was fitted, and about 15 feet (4.5 m) long. These boats closely resembled some peapods of Maine, though were more lightly constructed (Greg Foster, pers. comm. 1992).

In the early years many of the "kicker boats" of the handliners were built by professional builders in Vancouver, such as Linton, Lindsey, and Turner (Templeton, 1977:1A.272). As fish prices lowered, boats were increasingly built by the fishermen themselves, often on a beach in winter months. Boat-building materials might consist of a "found cedar log, split, dressed, and dried" on the spot (Templeton, 1977:1A.171-182), or "a few stolen planks and a two dollar investment in nails and gear" (Forester & Forester, 1975:75). The more skilled fishermen/builders might make two boats of a winter for sale in the spring.

Two hand-lining boats have been preserved in the Vancouver Maritime Museum (Cat. # .009 & .024). Both boats were used in the Strait of Georgia in the 1930s, where 500 to 700 handliners were concentrated in season (Evans, 1975:210). The simplified lines of one of these boats are reproduced in Figure 38A. This well-made boat is noteworthy in its quite sharply upturned sheer at the ends; based on photographic evidence, this characteristic was somewhat unusual, so the boat was probably not built by a professional builder. This boat is referenced as VMM 1 in Table 5 (see page 284). The length, at fourteen feet, 6 5/8 inches (4.43 m), was usual, as was the caulked, flush-planked construction. Two beads mark the top and bottom of the sheer strake. Decking is limited to about 18 inches (46 cm) forward. The frames, 1 x 1/2 inch (25 x 13 mm), are secured between gunwale and inwale with rivets, otherwise fastenings are all nails. Light floors, 1 x 1/4 inch (25 x 6 mm), top the keelson in conjunction with the middle 12 frames. Room and space is somewhat irregular, ranging from 4 3/4 to 7 3/4 inches (12 - 20 cm). A small sprit sail, has been preserved with sprit and mast, 7 1/2 feet (2.29 m) long, which is set through a hole in the forward thwart. There is no provision for a centreboard. On the stern post are signs that fittings for a rudder may have been attached, but neither these nor a rudder have survived. There are only two chocks for oars. The central thwart-seat has a unique feature to ease the discomfort of a day's rowing; strips of rubber tire are suspended over two wooden supports set fore and aft and elevated over the seat so that the rubber strips form a saddle, contour fitting and sprung.
Figure 38. Double-ended handliners. A: Boat used in Georgia Strait, now in the Vancouver Maritime Museum collection. B: Davis boat of Southeast Alaska, now at the Seattle Center for Wooden Boats (after Loken, 1981:16-17).

The second handliner at the Vancouver Maritime Museum, VMM 2 in Table 5 (see page 233), is strip planked. This boat was not fully measured, but was a somewhat smaller model, only 13 feet 3 inches (4.04 m) long, with a 3 foot 9 inch (1.14 m) beam. No sail was carried. Unlike at Monterey, where salmon was typically trolled for by sail, in British Columbia there was general agreement among fishermen that bait or lures had to be "worked" (Evans, 1975:212) as Natives had long worked their bait on lines attached to paddles. Lines set from light boats could be worked from boats propelled by cars, but not while under sail. Handliners also had an advantage over power trollers with whom they competed in that the small boats could work in close around reefs and headlands, which are areas where sails would not provide reliable control over the boat's movements. Sails were used strictly for travelling to and from fishing grounds. Because of the great importance placed on the rowing ability of
handliners in British Columbia, flat-bottomed boats, while used on occasion, were not popular because of their relatively poor rowing characteristics (Loken, 1981:11).

Dugout trolling canoes were more likely to have been built by specialized builders than planked handliners. Canoe builders had long been specialists within Native communities. They had to be well versed and skilled, not only with their tools, but also in ritual which attended all phases of traditional canoe manufacture from tree selection to launch. "Northwest Coast dugout canoes did not degenerate, but rather flourished during the first 100 years after white contacts were established. Their slow decline after 1880 became precipitate a generation later. Very few canoes were built after 1920..." (Durham, 1960:78). The time needed to produce a dugout was reduced by the introduction of metal tools. Canoe builders produced their craft under contract, and the trade of canoes, established prior to European contact, was much increased, with sea-going canoe production stimulated by increased travel and general coastal trade. Small trolling canoes and medium sized sealing canoes came into demand in the 1890s (Knight, 1978:57). An estimated 10,000 canoes were in use on the Northwest Coast any one time in the last half of the nineteenth century. A conservative estimate for the number of canoes built in the first century after contact is 50,000 (Durham, 1974:14c). Not all of these were used for fishing of course. The canning industry benefitted from the use of Native canoes as fishing craft only briefly on the Fraser River, but travelling canoes made the early canning industry possible by providing transport for entire families from locations scattered along the coast to seasonally fill the ranks of fishermen and cannery workers. Because trolling was a fishing method well suited to small dugouts, the market fishery and the mild-cure industry relied far more extensively on Native craft.

120 The pelagic sealing industry, between 1890 and 1911, made extensive use of Native sealing canoes as well as planked sealing boats. These were carried on the decks of schooners, from home ports such as Victoria, to seal hunting grounds off Alaska.

121 The extent of the annual migration to salmon canneries is well illustrated by observations made in Barclay Sound (on the western coast of Vancouver Island and more than 150 miles by sea from the nearest cannery) by the U.S. Fish Commission steamer Albatross, while travelling south from Alaska near the beginning of the sockeye salmon canning season: "The only evidence of civilization about the sound was the light house on Cape Beale, the Indian villages being mostly abandoned, and the occupants gone to the salmon canneries in the interior. Several canoe-loads were seen passing... and occasionally one was seen trolling for salmon" (Tanner, 1890:62).
Dugouts were often bought and used by white settlers, particularly in more remote parts of the coast, who used them for general transport as well as hand-lining. With the advent of gasoline engines, many dugouts were fitted with engines and operated as power trollers. These were typically built up with planks,\textsuperscript{122} decked, and provided with small cabins (eg Forester & Forester, 1975:74). The conversion of dugouts to power lasted at least until 1927 (Corbett, 1987:29). Though the working lives of these craft seem to have been relatively short, three built-up powered dugouts remain as hulks near Bamfield, on the west coast of Vancouver Island (Kevin Robinson, pers. comm. 1989).

However admirably suited to hand-lining, dugouts suffered under two major disadvantages: the time required to build them, and, although canoes could last for many years, special care was needed for maintenance. These canoes were thin, fragile, and prone to splitting and warping. Even while at sea, canoes sometimes had to be wetted down. When not in use, they were always carried up the beach into the shade or covered with brush, or, when out of use for extended periods, they were weighted with stones and sunk (Durham, 1960:79). For young Natives raised in the competitive milieu of the commercial salmon fishery, the dugout's appeal quickly faded. In the words of one fisherman of the Musqueum band: "...its a lot of work for nothing" (Sparrow, 1991:10).

Rarely recognized is the rapid pace with which some Native builders began to build plank boats. Some may have laboured in a Victoria shipyard building steam-driven vessels as early as 1858, and independent Native boat builders were active commercially by the 1880s, building craft as substantial as medium-sized schooners before 1900 (Knight, 1978:57-58). After the turn of the century, in the Cowichan District, comprising south-eastern Vancouver Island and the southern Gulf Islands, a considerable portion of Native income was generated by the building of both canoes and

\textsuperscript{122} These built-up dugouts have no bearing on the debate of whether or not some huge canoes of the Northwest Coast were utilizing built-up construction before contact with Europeans (Durham, 1960:57). No dugout intended for everyday use, before or after contact, had need for added freeboard, as trees of sufficient diameter were readily available, and the art of spreading, or expanding, canoes was highly developed. The necessary technical knowledge had already been grasped, including dovetail, plane, slightly curved (ball and socket) and zig-zag scarfs, "...perfectly matched, and so neat as to be water tight without any caulking." Endpieces were secured with pegs, withes, or original fibres, laced through angled holes "in such a way that very little of the lacing was exposed. Separate gunwale strips were fitted and pegged in place. These were replaced when worn out by the action of the paddles against them" (Durham, 1960:71). But there was no need to apply this technical ability in securing planks running the full length craft of normal, practical proportion.

Certainly no fishing boats were built up before the need arose following the introduction of gasoline motors.
boats. Specifically, bands on Valdez and Kuper Islands as well as those on the eastern shores of Vancouver Island were involved in both canoe and boat manufacture, while the small, 31 strong, band on Galiano Island was "chiefly engaged in fishing and boatbuilding" (Canada, Department of Indian Affairs, 1911:207-208). Other areas in British Columbia where Natives by the turn of the century were involved in plank boat manufacture for local demand included: Cape Mudge, at the northern end of the Strait of Georgia; Bella Bella, and Alert Bay, on the central coast; and Port Simpson, Port Essington and Port Rupert, off the mouth of the Skeena River (Knight, 1978:57-58).

On the Queen Charlotte Islands, Native-built plank boats are at least superficially documented. The boats, developed for crab fishing as well as hand trolling, were "...sleek, fourteen foot double-ended boats.... carvel-built... somewhat along the same lines as the canoe... with yellow cedar ribs and light red cedar planking" (Simpson, 1982:88). There were perhaps a score or more Haida boat builders, among them Robert Davidson, Robert Williams, and Joe Edgars, in the town of Masset alone. Haida boat-builders were often also respected wood carvers (Knight, 1978:58), not men who had neglected their traditional skills in the process of building boats in the European tradition. Wood used was all native, and often milled by the builders themselves. The boats handled well in surf, and were equipped with a sprit rig set through hole in the forward thwart. Like handliners used to the south, the Queen Charlotte Island boats "were made to row", but, for crab fishing, two fishermen

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123 In most cases, the types of boats built by the first Natives to build within the European tradition are not known. Types available for imitation, or construction methods presented through instruction or example, might vary considerably from place to place. For example, Mayne Island lighthouse keeper "Scottie" Georgeson, married a member of the Galiano Island band, and their several children were raised as part of this small Native community. Georgeson was also a boat builder, active in the last decades of the nineteenth century in building boats, based on those he was familiar with from the Shetland Islands, for use as lighthouse tenders. The influence of this one individual probably contributed to that community's documented rapid replacement of the canoe with the planked boat, and may have further affected techniques used locally in plank construction.

124 A British Columbia Provincial Museum photograph (PN 242) is a panorama view of the central coast village of Tsaidms Nukwoni around the turn of the century. Superficially, the village long-houses, totems, and dugouts bare scant testimony to European contact. Yet, among the nineteen dugouts of various sizes which are visible, is a single planked, decked, double-ended skiff, with mast up and rudder in place. The skiff was probably bought as surplus from a Fraser River cannery, but may have been built locally, and certainly demonstrates that plank boats were desired by at least a small segment of the Native population, even in remote settlements.
manned the craft. Typically, the forward rower sat facing aft, while the aft rower sat or stood facing forward (Simpson, 1982:88). Gillnetters in British Columbia and Alaska were also frequently rowed in this manner.

The best documented family of Native builders is the Davis family of Metlakatla (Loken, 1981; Gardner, 1991). Though their's is only partially a British Columbian story, the boats produced by the Davis family are best presented here in company with the double-ended handliners of British Columbia. John Davis Sr. was born in 1851, growing up in Hartley Bay, about 60 miles south of Prince Rupert. As a child, he had been deeply impressed when he saw for the first time a Hudson's Bay Company trading schooner, and particularly by the gig and long boats it carried. He carved cedar models of the trading schooners and their boats. Davis had no formal training as a boat-builder, but learned carpentry and blacksmithing before moving to Vancouver in the 1880s where he built skiffs on a part-time basis for the Fraser River gill-net fishery (Loken, 1981:5). After ten years as a house carpenter in Seattle, John Davis and his son, Rod, spent three consecutive summers, 1898-1900, in the Yukon, building flat-bottomed boats and barges during the gold rush there. The enterprise left them wealthier than most prospectors (Loken, 1981:6). The Davis family moved to Metlakatla in Southeast Alaska shortly thereafter.

Metlakatla was a Tsimshian village located outside traditional Tsimshian territory because the community's missionary leader, Father William Duncan, had had a doctrinal dispute with the Anglican Church and, in 1887, had abandoned an earlier settlement near Prince Rupert in favour of Alaska. Duncan's goal was to develop cottage industries such as weaving and manufacture of Victorian furniture. A water-driven saw mill and a cannery were also built at the village (Knight, 1978:54-55). Some of Duncan's industries were doomed to failure because their products could not compete in the long run with imported mass-produced items (Knight, 1978:53), however, the boat-building operation set up by the Davis' did very well.

In addition to the boat yard, the Davis' set up their own saw mill, marine ways, logging operation, general store, and years later even a bowling alley and movie theatre. But the boat yard remained the family's most important enterprise. The first boats built were sturdy transom-sterned skiffs, 12 to 18 feet (3.7 - 5.5 m) long with single plank sides, used by trappers, miners, drag seiners, and halibut fishermen. Two workers in the shop could produce two skiffs in a day. The shop's first round-bottom double-enders were built before 1905 for the sealing industry. Davis had worked out for himself the construction problems peculiar to round-bottom boats, and lofted directly from a carved scale model. The sealing boats were swift, graceful craft, 16 to 24 feet (4.9 -
7.3 m) long, with four rowing stations, one oar per man. Davis continued to build these boats for many years for the Lighthouse Service, after the sealing industry fell off around 1910 (Loken, 1981:8, 11).

Around 1905, Davis began building smaller double-enders for the hand-line fishery. These were built in 13, 14, 15, and 16 foot lengths, the 14-footers being the most popular with fishermen. Like the double-enders of the Queen Charlotte Islands, Davis boats were typically equipped with two rowing positions. They were frequently used year-round, fishing for salmon spring through fall, and halibut over the winter months. The design and construction of the Davis boats was not fixed, but was gradually changed and improved over the years (John Davis, Jr. cited in Loken, 1981:13):

[John Davis, Sr.] started with natural-crook stems, but when they became too hard to find he developed fabricated stems. Early models had a keelson, which was later abandoned. Planks were clenched-nailed with galvanized nails, and he later started riveting the gunwales and copper-riveting in the breasthook. The frames were always on eight-inch centers.

The keel was usually fir, posts yellow cedar, frames white oak, and planks red cedar. The boats were planked right-side-up. In 1930, a 14-footer sold for between $55 and $72, depending on extras. The rig was leg-of-mutton, and the boat was oar-steered when under sail. Thanks to Rod Davis' marketing acumen, boats were delivered throughout Southeastern Alaska. With molds, templates, pre-cut components, pre-bent frames, and steel tools custom made by John Davis, Sr. it was possible to produce a boat in a day. Modified with transom sterns and fuller sections aft so that outboard motors could be mounted, round-bottomed Davis boats continued to be built until the death of Rod Davis in 1962. John Davis, Jr., followed the apprenticeship he had received almost from birth under his grandfather with formal training in Naval Architecture and, semi-retired in 1980, was deputy program manager overseeing the construction of 435-foot Navy Frigates (Loken, 1981:14, 19-21, 23-24).

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128 "Some 271,000 pounds [of troll-caught chinook salmon] were shipped to Puget Sound in 1905, and the following year several mild-cure dealers established plants in the vicinity of Ketchikan" (Cobb 1917:87). The year Davis introduced his hand-lining boat, and the year in which Alaska's troll fishery became commercially important, were one and the same.

124 "The shop usually had about four workers, in addition to the Davis family. Apprentices were selected in the old-fashioned way, John Jr. recalls: 'If I wanted your son to become an apprentice I would seek your permission, not your son's. And if your Dad was living I'd ignore you and go to your father, asking permission to train his grandson.' Workers started as youngsters, sometimes, and stayed in the shop for many years - saving, drilling, hammering, laying planks, and working in the sawmill (or other businesses) when they weren't needed in the boatshop" (Loken, 1981:19-20).
Table 5. Summarized data for handliners in British Columbia and Alaska (see Appendix B).

<table>
<thead>
<tr>
<th>BOAT ID</th>
<th>LOA</th>
<th>BEAM</th>
<th>L/B</th>
<th>FLOOR</th>
<th>BILGE</th>
<th>DEPTH</th>
<th>B/D</th>
<th>SHEER</th>
<th>SEC</th>
<th>CF</th>
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<td>2.82</td>
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<td>50%</td>
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<td>3.75</td>
<td>3.53</td>
<td>-</td>
<td>-</td>
<td>1.25</td>
<td>2.50</td>
<td>1.25</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DAVIS</td>
<td>15.56</td>
<td>4.08</td>
<td>3.81</td>
<td>1:10</td>
<td>flat</td>
<td>1.75</td>
<td>2.33</td>
<td>1.33</td>
<td>84%</td>
<td>52%</td>
</tr>
<tr>
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<td>0</td>
<td>flat</td>
<td>2.0</td>
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<td>1.75</td>
<td>94%</td>
<td>50%</td>
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<td>.56</td>
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<td>3/31</td>
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<td>1.15/63</td>
<td>7.5</td>
<td>.58</td>
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The Seattle Center for Wooden Boats has a Davis boat, identified as a 14-footer, though its length, according to lines reproduced in Loken (1981:16-17) is 15 1/2 feet. A simplified lines drawing of this boat is reproduced in Figure 38B (see page 227). John Davis, Jr. has dated the construction of this boat to either 1927 or 1928 (Loken, 1981:21). This boat is included in Table 5 where it may be compared with two Georgia Strait handliners, and also with a double-ended sealer (Sager & Cole, 1976).127

In Alaska, handliners often employed sloops for travel and accommodation, towing a dugout, skiff, or small double-ender behind them.

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127 Interestingly, the lines of the double-ended sealer, drawn by naval architect Frank Fredette in the early 1960s, show full sections with quite a hard turn of the bilge, while the transom-sterned Toulinguet sealing boat, introduced from Newfoundland in 1887 (Collins, 1892b:17, Plate VI), though less popular than the double-ended sealer, has an entry and midsection more closely resembling those of the two handliners.
for use at the fishing grounds (eg Pacific Fisherman, January, 1918:56). These sloops were sometimes old round-bottom sailing gillnetters to which a cabin had been added, or were 20 to 30 foot (6 - 9 m) purpose-built double-ended boats known as "Alaska sloops", probably built in Alaska for the most part; they were quite consistently gaff-rigged sloops with bowsprits. Hand-lining by oar and sail did not end in 1939 in Alaska, but continued into the 1950s, and has even seen an experimental revival in recent years (Upton, 1977:127). As in British Columbia, many boats were built by the fishermen themselves, and other yards besides the Davis' produced boats for the fishery in settlements such as Sulzer, Klinquan, Howkan, Sukkwaan, Shakan, Deweyville, and Sarkar, places which are mostly ghost towns today (Joseph D. Sebastian, pers. comm. 1993). Though the Davis' owe no direct debt to Duncan for their boat-building success, the community realized at Metlakatla provided a permanence rarely found in small, early twentieth century coastal communities, offering an opportunity for Native entrepreneurs in that they could operate in a non-traditional community without suffering racial prejudice, and where the Davis' diverse enterprises could flourish in support of the boat yard.

**Ethnicity of fishermen and boatbuilders in British Columbia**

While activities of Native boat builders in British Columbia have largely gone unrecorded, recent histories of the salmon fishery have given Native fishermen and cannery workers full credit for the critical role they played in the development of the industry. Official reports, however, may lead to a faulty impression that fishermen in the Fraser River gillnet fishery were exclusively Native prior to 1883 (Rounsefell & Kelez, 1938:706). The first Japanese fisherman, for instance, is said to have worked on the river in 1875, and had an Italian for a partner (Shibata, Matsumoto, Hayashi, & Ida, 1977:5; Meggs, 1991:48). Among caucasian fishermen on the Fraser River in the 1880s were those who came up from the Columbia River. Others included "Englishmen, Swedes, Finns, Easterners, and Southerners, a few Jews, and Irishmen.... But for some reason there was an overwhelming number of Scotsmen" (McKervill, 1967:37). Gowan adds French and Italian to the list, and comments that

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The impression should not be left that hand-lining was carried out exclusively in double-enders like the Davis boats, particularly in the early years. Exemplifying the diversity of craft employed in handlining is a photograph from the Ketchikan Museum (85.1.35.105) showing trolls delivering their catch to a packer sometime in the "early 1900s": of 20 craft visible, besides one gasoline and one sailing packer, there are four round-bottom double enders, three double-ended flat-bottom skiffs, three transom-stern flat-bottom skiffs, two transom-stern round-bottom skiffs, two dugouts, two Alaska sloops, one dory, and three craft of uncertain form.
Newfoundlanders were the best fishermen, owing to their great endurance (Gowan, 1894:161).¹²⁹

Ethnic groups formed community clusters of scow houses along the lower river. These were not highly mobile scows used only in the fishing season such were used on the Sacramento, but were year-round residences moored more or less permanently. Norwegians tended to congregate around New Westminster and Annieville; the Finns lived on Sunbury Island and in Finn Slough; Deas Island had a community of Greeks; Spaniards, including Basques, lived on Rose Island; while Yugoslavians, mostly Italian-speaking, settled the riverbanks from Ladner to the Sea (Marlatt, 1977:3). Many fishermen had no intention of staying, and sought to make some money from the fishery before returning to their homelands. For the Japanese, the term dekasegi, which roughly translates to "leaving the village for employment", describes this profit-driven immigration (Bannister & Clayton, 1992:18). In 1892, gill-net fishing was restricted to British subjects. Though naturalization papers could be acquired after three years in the country, many migrant fishermen ceased working the river. Many Greeks and Spaniards departed, and "a traditional labor supply, American salmon fishermen who came from Puget Sound and the Columbia and Sacramento fisheries", was also stemmed (Stacey, 1979a:149). On the other hand, many Japanese fishermen made the decision to stay after naturalization, and brought brides over from Japan. In 1899 there were over 2,000 Japanese fishermen in British Columbia, and by 1907, there were 7,500 Japanese in the province, including women and children (Henderson, 1908:3). At the end of the era of sailing gillnetters on the Fraser River, the ethnic breakdown of fishermen was as follows (Meggs, 1991:93):

In New Westminster, federal fisheries chief inspector F.H. Cunningham provided an analysis of the 1912 licenses which gave an insight into the racist mentality of the times and the changing composition of the fleet. Of the 1,430 licenses issued that year, 660 went to Japanese, 230 to native people and the rest to whites. After careful calculations and study, Cunningham concluded that the white category was comprised of 205 Canadians, 101 Scandinavians, 78 British, 35 Austrians, 28 Greeks, 23 Finlanders, 19 Italians, 17 Spaniards, 8 Germans, 10 French and 7 Russians; there were 9 who "defied the efforts of the fisheries office to classify them and were described by Inspector Cunningham as indescribables."

¹²⁹ A study made of the relative efficiency of Japanese, Native and white fishermen at one cannery from 1905 to 1916 inclusive showed different results. "For this twelve-year period the average annual catch for individual Japanese fishermen was 1,782 sockeyes, for white fishermen 1,057 sockeyes, and for Indians 768 sockeyes" (Rousefell and Kelez, 1938:709).
On the northern streams the mix was altered somewhat with a much greater portion of Native fishermen, and a proportionally greater number of Scandinavians among caucasian fishermen.

Most surprising, with respect to the ethnicity of fishermen in British Columbia, are the early non-Native market fishermen. The pioneers in this field, the Chinese, Greeks, and Italians, are the same groups which pioneered in the other "inside" waters of the Pacific Coast where urban centres developed, Puget Sound and, more successfully, in San Francisco Bay. It would be fascinating to know more about these first market fishermen of Victoria, Nanaimo, and Vancouver, as it would be to know the fate of those Chinese fishermen at Cape Scott, to better understand how their activities and experiences differed from those in San Francisco. Unfortunately, Canadian records are silent on the matter.

The early market fishermen probably had to build their own boats. Even less is known about their boats than is known about the fishermen, but the latter probably had made their way north via San Francisco. Full-time boat builders who began to appear in Vancouver area in the 1880s had no prior connections with the West Coast, however. All known caucasian builders of the nineteenth century were trained either on the Great Lakes, or in New Brunswick. The Japanese builders who became the most successful ethnic group in fishing boat manufacture in the early years of the twentieth century came directly to British Columbia from Japan, receiving no training or experience anywhere else.

Originals and Replicas in British Columbia

British Columbia is fortunate in that remains of its salmon fishing industry are being preserved. At the mouth of the Skwena River, the North Pacific Cannery, has received designation as a site of national historic and architectural importance by the Historic Sites and Monument Board of Canada. The cannery village has been restored as a museum. The North Pacific Cannery was built in 1888 and operated until 1981. The Gulf of Georgia Cannery, built in 1894 in Steveston has also received designation. It is not yet open to the public, but the organization has the Vancouver Maritime Museum's Rivers Inlet skiff on loan for future display. It will one day join other artifacts and machinery which have been collected by the Gulf of Georgia Cannery Society. Two rudders from round-bottomed sailing gillnetters are preserved in this collection as are two early types of removable net roller.

Three quarters of a mile down the Steveston waterfront from the Gulf of Georgia Cannery is the Britannia Shipyard. This yard, which was once part of a cannery compound, includes a covered marine railway and associated structure set out on piles in the river, as well a smaller
boatworks, once run by Japanese boatwrights, located behind the dyke. The Britannia Heritage Shipyard Society is currently engaged in replacing machinery and tools removed after the yard ceased commercial operation nearly 20 years ago. In the boatworks, two 'replica' Fraser River skiffs have been built, based on Darrie Carter's drawing. An early powered fishing boat, the Iona, is being restored in the shipyard. It was hoped, in 1992, to build a round-bottomed gillnetter, based on Barfuet's plans for a Columbia River sailing gillnetter, but the funding application was not successful.

It seems that only with remains of a round-bottomed Fraser River sailing gillnetter will it be possible to build an accurate replica. A 1988 search by the author of the lower 15 miles of the Fraser River's South Arm by boat revealed no remains along the foreshore of any boats which had not been equipped with a motor. David Hill-Turner, member of the Britannia Heritage Shipyard Society and the Underwater Archaeological Society of British Columbia, is currently directing a search for underwater remains of fishing boats in the Fraser River delta. Suspended silt in the river precludes visual searches by divers. Experiments will be undertaken with remote sensing, but based on experience on the Columbia River, a walking search at extremely low tide is probably the method most likely to yield positive results.

Acquisitions at the Vancouver Maritime Museum include several dugouts in various states of repair, in addition to the two handliners detailed above. The museum also has a model of a round-bottomed gillnetter like those used on the Skeena River. It was a sailing model made by a young man, Victor Noble, of Port Essington, around 1910. The model is not a scale representation. Another model of a Skeena River boat is held by the British Columbia Maritime Museum (Acc. # 985.8.1) in Victoria. This model is of superior quality in detail, and may be accurate in proportion and shape, but the author was unable to get access to the model in its display case. A Rivers Inlet skiff, described above, is suspended from the Museum's ceiling. In the small museum at Gibson's, on Howe Sound, the handliner built by writer Hubert Evans has also been preserved.

The only remains of a round-bottomed gillnetter in British Columbia may be the partially crushed boat at the Tallheo cannery near Bella Coola. However, given the remoteness of many north and central coast canneries, the existence of other dry or submerged remains is probable.
Alaska

The Russians were the first non-Natives to preserve salmon on the Pacific Coast of North America. Their first fishery was established at Karluk, Kodiak Island, in 1784. Another major Russian fishery was established on Baranof Island, and both remained productive throughout the period of Russian occupation (Ivan Petroff cited in Netboy, 1973:405). The Russians themselves fished on Kodiak with both traps and nets in the streams (Andrews, 1918:245). The Karluk River would later prove a most productive drag seining ground for American canners, so this was probably the type of net employed by the Russians. Nothing is known of what sort of boats may have been used to set the nets. By 1800, more than a half million fish were cured annually on Kodiak (Gibson, 1976:40).

The Russian-American Company both sun-dried salmon in the Native fashion, known as iukola, and salt-cured it. The principal purpose of taking salmon was to feed company employees, and also Native fur hunters in order that more of their time could be spent taking skins for the company than in traditional food-gathering (Golovin, 1862 (1979):82). Natives certainly supplied fish to the company as well, but the proportion of fish caught by Natives to that caught by company employees is unknown.

The export of salmon by the Russian-American Company was an enterprise repeatedly, but sporadically, pursued, ultimately with little success. Small quantities sent annually to the officers of the company in St. Petersburg were the sum total of exports to Europe (Netboy, 1973:405). Some trade with California developed, but lapsed when Fort Ross was abandoned. Attempts to revive the California trade following the Gold Rush were unsuccessful, ostensibly due to the lack of warehouse facilities in San Francisco. Trade with the Hawaiian Islands was longer lasting, but the Russian product seems not to have fared well against salmon cured by the Hudson's Bay Company, in terms of quality or cost (Golovin 1862 (1979):82-83, 101, 104-105).

Because the United States broadened trading relations with Russia when that country was hard-pressed during the Crimean War (1854), the "American-Russian Commercial Co. was granted a twenty-year contract which extended trading privileges to coal and fish as well as ice. Under this charter the San Francisco company became the only foreign company permitted to trade in ice, timber, coal and fish in the Russian possessions" (Kushner, 1975:8-9). American salt-curers were working in Alaska shortly before the Alaska purchase in 1867 (Spurlock, 1940:128). In negotiations that ultimately led to the purchase of Alaska, the wealth of that region's fisheries perhaps argued most favourably for acquisition by the United States, though it had been generally anticipated that cod
was the fishery which could most profitably be developed (Dall, 1870; Kushner, 1975:15).

It was whaling, however, which attracted most attention in the first ten years following the Alaskan purchase. The numbers of American salmon salt-curers grew, but only following the territory's first cannery, built in 1878 in Southeastern Alaska, did salmon begin to assume commercial importance. The fishery expanded rapidly in 1890s. The last year the pack from the Columbia River surpassed Alaska's was 1892, and, from 1897, when the British Columbian pack surpassed Alaska's for the last time, Alaska would remain the greatest producer of canned salmon. Already by 1915, 42% of all Pacific salmon ever packed anywhere had come from Alaska, and annual packs from the territory more than doubled the combined packs for all other regions (Pacific Fisherman Yearbook, 1916:47). The Alaska salmon fishery would grow to exceed an astounding 6 million cases annually in the late 1930s before suffering a rapid decline due solely to overfishing (Cooley, 1963:xiv-xix). Alaska's was the least regulated of any salmon fishery and industry until its statehood in 1959. The territory earned very little in taxes for a particularly ruthless exploitation of salmon resources, and the people of the territory, except for those in parts of southeastern Alaska, rarely benefited with direct, or indirect, employment from the industry (Netboy, 1973:405).

Formed in 1892, the Alaska Packers Association had almost a complete monopoly of Alaskan canneries within 10 years (Haycox, 1983:99-100):

APA operations did not rely on independent fishermen. Instead, fishermen and other laborers were employed in San Francisco by the corporation, or its constituent canneries, and transported north on APA ships. Both the white fishing force and the oriental and Mexican [cannery] workers came north together....

At the end of the nineteenth century, at a time when the world's shippers were rapidly converting to steam and iron, the Alaska Packer's Association carried on their operations by buying and chartering old wooden sailing ships -most of them three-masted barks- and used them to service one of the most financially successful oceanic trades anywhere. Indeed, it was a trade unlike any other, and particularly in its own time. The mass movement of the canned salmon pack from Alaska is one of the major movements of canned goods anywhere, even today. Within several week's time, in the 1920's and 1930's, between 6.5 and 8.5 million cases were moved from central and southeast Alaska canneries to warehouses in San Francisco and Puget Sound in lots of 50,000 to 70,000 cases each, in a flurry of activity and tight organization. It is a matter of considerable interest that the largest shipper during that time shipped nearly all its share of the pack-in sailing vessels, which it continued to use until 1929.

Head offices and the principal warehouses for the Alaska Packers Association were in San Francisco, 1,500 miles (2,400 km) from Bristol Bay. A considerable portion of their Alaskan enterprises originated in
Seattle, while a smaller consortium, the Columbia River Packers Association, naturally, based its operations in Astoria. It was from these three centres that fishermen were recruited, and material and equipment for the Alaskan canneries was furnished, including boats.

The following exposition of the Alaska salmon fishery and the boats employed in it will be less detailed than previous sections. This brevity is consequent to the data available. For the Alaskan fishery prior to 1900, information notably sparse, making comparison with data collected in the nineteenth century for southern fisheries difficult. In later years, data on the Alaskan fishery is abundant, but comparison with the largely powered fleets to the south is irrelevant. Furthermore, Alaskan boat-building for the salmon fishery found creative expression only in handliners (see pages 230-234) and salmon dories. Though a few derivative seine boats and skiffs were also built in Alaska, gillnetters were the exclusive preserve of builders in the distant southern ports of Seattle, Astoria and San Francisco.

Southeast and Central Alaska

Only in Southeast Alaska, where the first Alaskan canneries were built, were Natives employed in any number. At Metlakatla, a cannery was built, owned, and operated by the Native community (Freeman, 1935:123). In other canneries along the panhandle, Natives often comprised a considerable portion of the fishing and work force (Lindsay, 1881:10). At least on Afognak Island, near Kodiak, they participated in boat-building at an early date: "At Afognak many of the natives are employed about the canneries as carpenters. They are engaged, also, in making boats of various kinds and their labor in this direction is appreciated" (Bean, 1891:206). The building of boats at canneries did not last, all boats seem to have been imported in later years, or, in some cases, bought from independent Alaskan builders.

The first boats used to set gillnets in Alaska were dories (Tanner, 1890:5; Yates, 1979:25). Dories brought to Alaska by cod-fishing boats were probably the first inexpensive plank boats available for sale and imitation by residents of Alaska. Salmon dories used in Alaska developed their own identifiable form, evident in Figure 39, but the extent to which boats used in canneries were built locally, or were imported from builders to the south is uncertain (Collins, 1892b:45-46):

In many cases dories built in the East have been brought across the Continent by rail, but generally it has been found most profitable to build them on the west coast. But while the building of dories might appear to be a simple matter, the attempt to imitate the Atlantic type has usually been a partial failure at best. Though the west coast dory is generally copied after its eastern prototype it usually lacks
the grace and lightness of the latter, and often has special characteristics of its own. Some of the so-called dorries used in the salmon fishery of Alaska are hybrids -- a type between the dory and the sharp'y. They usually have the bow, sheer, and bottom, of the typical dory, but differ in having a much wider stern, which, however, is narrower, and much deeper than the stern of a sharp'y. This modification is caused by the need for additional buoyancy at the stern, but the general form of the dory (which is so excellently adapted to use in rough water and to land upon a beach in a surf) is preserved.

In Alaska, particularly at St. Paul, dorries are built by the Indians and Creoles for general use about harbors and islands. Spruce and cedar are used in their construction. Alexander says they approximate to the shape and general appearance of the New England dory, but are not good copies. But, in view of the fact that white men who are professional boat-builders often fail to imitate the dory successfully, he thinks the Indian builders of St. Paul have no reason to feel ashamed of their workmanship. The dorries vary in size from about 13 feet in length on the bottom (the size used for hand-line cod fishing) to 15 or 16 feet.

Dories, even with widened bottoms, were less than ideal as gill-net boats, and other boats had generally replaced them by the turn of the century. The values of dorries at this time ranged from $10 to a maximum of $30, depending on size and condition. By 1900, only about 18 dorries were used in the salmon fishery of Southeast Alaska, that is the panhandle as far north as Yakutat Bay, (Moser, 1902:329-330). Most of these were probably used with seines.

Columbia River sailing gillnetters were used in Alaska some time before 1896 (Moser, 1899:66-67). In 1900, 87 of these boats, valued at $200 each, were fishing in Southeast Alaska (Moser, 1902:329-330). Flat-bottomed boats were also used for gill-netting. What form these flat-bottomed boats took is not known, but the 27 fishing in Southeast Alaska in 1900 were valued by Moser at between $40 and $60, a price range matched by flat-bottomed gillnetters used in the Prince William Sound and Kenai Peninsula area of central Alaska. A half dozen "sailing boats" valued at $100 and based at Metlakatla are mysterious, as are the eight "old river boats", worth $25 each, employed by the Glacier Packing Company near the mouth of the Stikine River. Moser typically values skiffs at $25 (Moser, 1902:329-330). Skiffs in Southeast Alaska were generally light, transom-sterned boats, about 15 feet (4.5 m) in length, often used to tend traps, or as an auxiliary boat by seine crews.
Southeastern Alaska was not a place where the gill net would flourish. By 1922, 60 percent of the salmon caught in this area would come from traps, 36 percent from purse seines and only four percent from gill-netting and trolling combined (Spurlock, 1940:99). By 1900, there were 135 seine boats in Southeast Alaska, nearly twice the 1898 number. Moser makes no distinction between those used to haul drag or purse seines, and the value ranges greatly from $30 to $200 each, with $100 being typical (Moser, 1902:329-330). These seine boats, or skiffs, appear to resemble closely those used in Puget Sound and on the Columbia River, ranging in size from four to eight oars, but the lack of raised platform observed on British Columbia purse seine skiffs is also noted for some boats in Alaska (Moser, 1899:155):

In all parts of Alaska where drag-seine fishing is carried on, the style of boats varies but little, they being about the same shape and build. Those used at Karluk are from

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130 In earlier years, new seine skiffs were valued at $4 per linear foot (Moser, 1899:57).

131 One exceptional feature is evident in a panoramic photograph of one cannery at Karluk (Moser, 1899:Plate 53), where three large seine skiffs have shaped "wings" raising the sheer line at the transom. These appear to be brackets bearing a roller across the top of the transom between them.
28 to 30 feet long and 9 feet wide, flat on the bottom, and square across the stern. The seine is stowed in the bottom of the boat, and when being set is thrown from the stern by two men. In localities where small seines are used a platform is built at the stern of the boats, upon which seines are stowed. Seines 450 fathoms long, such as are used at Karluk, can not be stowed to advantage on a platform, as considerable room is required, and in a short choppy sea, which is frequently encountered off the mouth of the river, the net would be likely to topple over.

At Karluk, the old Russian fishery on Kodiak Island, drag and purse seines were used exclusively. The greatest concentration of dories in the Alaska salmon fishery was found on the island; about 80 dories worked with 50 seine skiffs (Moser, 1902:327-329). A single dory was used as "snag tender" with either type of seine. With a purse seine, two or more dories secured the cork line once the bag was formed, and then received the catch, the fish being pitched into them with "pews" or with large salmon dip nets holding 18 to 20 fish, a process known as "bailing out" (Moser, 1899:154-155):

The dories range in length from 16 to 22 feet. The large ones are used mostly in carrying salmon from the seining ground to the canneries. When fish are plentiful and large hauls are made, scows are used. Small dories are used in tending the seines when set, such as clearing the foot line from boulders or other obstacles on the bottom.

Horses were not used for hauling the seine in Alaska. A typical crew consisted of 16 to 18 men, said to be the "youngest, strongest, and dumbest" of the fishermen (Moser, 1899:153):

Previous to 1896 seining at Karluk was performed by hand. In that year steam power was introduced, which greatly facilitated the work and reduced the manual labor by half. Formerly the time occupied in setting and hauling a seine was from four to six hours, depending largely on the weather and other circumstances. The average time required to make a haul under favorable conditions was about four hours. In setting a seine the inner end was anchored close to beach; the outer end, when thrown out of the boat, was usually the length of the seine rope from the shore, about 75 to 100 fathoms. The seine rope was then run to the shore and taken to a wooden capstan. Setting the seine was comparatively easy, but it required the united strength of the crew to haul it in, and frequently the assistance of a second crew was needed. In this way only a few hauls could be made each day. The labor connected with this kind of fishing was hard, and only men inured to exposure could continue through a season.

The introduction of steam power on shore and the use of steam launches in setting seines has done away with a large portion of the manual labor connected with the fishery.

The fishery on Kodiak Island was intense, but short-lived. In 1890, nearly half the salmon caught in Alaska came from Kodiak, and in particular, from the Karluk River, a stream only 16 1/2 miles (26.5 km) long. Seven canneries operated on the island in 1893, but, by 1918, all had been abandoned or moved, and the fishery was dead for commercial
purposes, despite attempts to revive it with hatcheries (Andrews, 1918:249-250).

Although traps and seines dominated the mainland portion of the salmon fishery in central Alaska, gillnetters found some employment there, supplying between seven and ten percent of the regions catch in the 1920s. In 1900, of 125 gillnet boats in the area, approximately half were Columbia River sailing gillnetters, and half flat-bottomed gillnetters. It is interesting to note, however, that unlike the pattern seen in all fisheries to the south where flat-bottomed boats decreased in numbers once round-bottomed boats were introduced, on the central Alaskan mainland, the numbers of flat-bottomed boats had doubled over the three years preceding 1900, whereas Columbia River sailing gillnetter numbers remained almost constant (Moser, 1902:327-329).

Bristol Bay

On Bristol Bay, only gill-netting was permitted by law. In 1900, 153 gillnetters used there were of the Columbia River model, while 131 were flat-bottomed boats. But, in the preceding three years an equal number, 69 of each class, had been added (Moser, 1902:327-329). Again, the generalization that round-bottomed boats supercede flat-bottom predecessors is not supported in Bristol Bay. The flat-bottomed boats of Bristol Bay were twice as expensive as the flat-bottomed gillnetters used in central and southeastern Alaska, but at $100 were still half the price of Columbia River gillnetters (Moser, 1902:329). Moser describes and compares the two classes of gillnetter used on Bristol Bay around the turn of the century (Moser, 1902:180):

The gill-net boats used on the Nushagak and Ugashik are regular Columbia River boats, built in San Francisco at an average price, complete, of $200. The usual dimensions are: Length, 25 feet 1 inch; beam, 7 feet 8 inches; depth 2 feet 6 inches; capacity, 300 cubic feet. They have a centreboard and spritsail, and will carry, as an extreme, 1,400 redfish. The boats used on the Kvichak, and Naknek, and Egegak are flat-bottom double-enders, about one foot longer than the Columbia River boats, but have the same rig and capacity, and on the water resemble them very closely. Their value is about $100, complete.... [Fishermen] work on tides, and when the fish are plentiful remain near the canneries, but when the run is slack they may drift 15 or 20 miles away.

A photograph taken at Naknek in 1906 (University of Washington Library, Cobb Collection 2406) shows that these flat-bottomed gillnetters were

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122 This gear restriction did not substantially change fishing methods used by canneries on Bristol Bay as conditions there were generally unsuitable for the use of pound-net traps; only small Native weirs and traps were affected, except on the Togiak River where no canneries were built and fishing was reserved for locals (Cooley, 1963:46).
still used exclusively at this location. Moser’s general description is confirmed: they are large boats, slab-sided, with very little sheer or rocker, but with slightly more rake in the ends than the Columbia River sailing gillnetters. The bottom is planked lengthwise with no internal longitudinal structural members except for the centreboard trunk; a false keel deepening to a shallow skeg aft is fitted to the bottom. Side planks, three in number, are flush-laid. This photograph, showing these flat-bottomed gillnetters, is a rare one. At some point after 1906, all gillnetters used in Bristol Bay were based on the Columbia River boat. The flat-bottomed gillnetters of Bristol Bay seem not to have been a type which evolved independently, but rather a type developed by canners as an equally capacious but less expensive version of the Columbia River sailing gillnetter, which best fulfilled its cost advantage at a time when fleets were expanding rapidly. That the type did not long continue in use may have been the result of poorer performance, but probably reflected less sturdiness and longevity, which led to greater long term costs.

Sturdiness was certainly a characteristic demanded in any boat working gillnets on Bristol Bay. The bay’s bars and banks, extending many miles seaward, are frequently exposed by the world’s third largest tidal range. Though the bay is 200 miles (320 km) wide, its greatest depth is only 25 fathoms (46 m), so that waves are short, steep, and build quickly. Current action is strong and erratic, and summer storms rolling into the bay, which is open to the Bering Sea, are frequent, violent and sudden. Loss of life among gill-net fishermen was an annual occurrence, and usually the result of boats being broken up, or capsized, in shallow water (Morgan, 1978:24; Leather, 1979:376; Wellepp, 1991b:44). Western Alaskan Columbia River boats, which only came to be known as Bristol Bay boats in the 1940s long after the size and scantlings of the Alaskan boats had grown beyond the dimensions employed on the Columbia River, had a great reputation for sturdiness. Fishermen recall surviving storm driven waves while stranded on bars where “any other boat would have stove in” (Andree, 1986:33).

In the Bristol Bay district, power boats were prohibited until 1951. Though this measure was sometimes justified as a conservation measure (Gregory & Barnes, 1939:21), given the general lack of conservation legislation, and great influence on the part of canners regarding what legislation was passed, the rule clearly paralleled efforts by canners in British Columbia to maintain the control provided by cannery-owned fleets.

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133 Kvichak and Egegak canneries were both part of the Alaska Packer’s Association, while Naknek was not; therefore, use of different boat types seems not to have been a function different company policies.
while keeping fleet costs down and limiting competition from independent fishermen with powerboats.

By the 1920s, gillnetters were being designed by naval architects. The drawing of a "Columbia River type" published by Chapelle (1951:189), was traced from drawings made in 1924 by A.W. de Young. There are also plans extant made by naval architect Joseph Dyer. Few boats used in Alaska were built in small yards, instead, were built in large yards filling orders for many boats at a time. Clearly, boats were becoming increasingly "stock", yet reports from fishermen indicate that distinctions remained. Gillnetters built in Astoria, known as "Pinn built" to the fishermen, had a reputation of being "notably shapely and strongly constructed" (Leather, 1979:378). Another fishermen is more specific (Andree, 1986:34-35):

Different companies had somewhat different styles of sailboat. Fishermen liked, both the Nakeen and Carlisle Packing Company boats, for they were narrow in the bow and fast under sail. Libby boats also had a sharp stern and a fairly sharp bow. Columbia River Packers boats, with a sharp bow and a sharp stern, were also among the best sailing boats. Red Salmon Packing boats were also good sailers. Alaska Packers boats had a fat bow and a fat stern, and many fishermen referred to them as 'barnacle boxes,' and didn't think much of them as sailers. However they were marvelous for packing a big load of fish. I've seen 3,000 fish that averaged close to six pounds each come out of a Packers boat.

It was hoped at this study's outset to examine several surviving Bristol Bay boats and plans, with the expectation that patterns would emerge distinguishing boats built in Seattle, Astoria, and San Francisco. These differences may have suggested nineteenth-century characteristics peculiar to each region, for which no data is available. With these distinctions established, assumptions might be made regarding early gillnetters and how their forms may have varied according to local demands. Unfortunately, it has not proven generally possible to identify where boats were made according to builder's marks, and packing companies did not always have boats built in the town where their head offices and warehouses are located. For example, in October of 1937, the Naket Packing Corporation, of Seattle, sent an invitation for tender to the Columbia Boat Building Company of Astoria for the building of three "Columbia River Gill Net Boats". The bid of the Columbia Boat Building Company was successful, and 50 boats were ultimately delivered at a price of $666.50 each. Clearly, it is not possible to determine place of manufacture for boats by company location.

Very interesting are the specifications laid by the Naket company to the builder: "Length overall 29'-0"; Beam, moulded 8'-10"; Depth to top of keel amidships 2'-10"; Sheer fore and aft 1'-7"" (Nakat Packing Corporation, 1937). These criteria left very little room for innovation.
on the part of the boat builder, except in midship shape and fullness of the ends.

Table 6 summarizes one builder's model, two plans, four surviving Bristol Bay boats measured by the author, and three by informants.134

134 The background for Bristol Bay boat data presented in Table 6 is as follows:

RISWICK: Builder's model used by John Riswick, boat-builder on the Columbia River; date of model is uncertain, as is the fishery for which the boat was intended; for comparison it is represented as a 1" = 1' model in both Tables 4 and 6; offsets taken from model by Bruce Weilepp in 1989, and lines drawn by author (Figure 21, see page ).

SCWB 1: Boat in sailing condition and used regularly at the Seattle Center for Wooden Boats; operated by Libby, McNeil & Libby, a Seattle-based member of the Alaska Packers Association; builder and date of construction unknown, but boat is said to be "about 80 years old" (Dick Wagner, pers. comm. 1992); partially measured by author, March, 1993.


ASSC 70: Plans represented in Chapelle, Figure 70 (1951:189); prints available from the Smithsonian Institution (ASSC 70); original design by A.W. de Young, 1924.

MMSD: Boat in storage at the Maritime Museum of San Diego; operated by Libby, McNeil & Libby; built in 1930; builder may have been the company yard in Seattle, but this is uncertain; partially measured by museum staff in May, 1993.

MATI 1: Boat on outdoor display at the Museum of Alaska Transportation and Industry; last used privately under the name Lazarus; previous cannery operator and builder is unknown; it is said to have been built in 1930s in Puget Sound; partially measured by Curator, Harry Yost, May, 1993.

SCWB 2: Boat in deteriorating condition, stored outdoors at the Seattle Center for Wooden Boats; when acquired in 1980 had fishing licence for 1967 attached; previously operated by the New England Fish Company; builder and date of construction unknown; partially measured by author January, 1992, and March, 1993.

NMM: Boat in storage at the National Maritime Museum, San Francisco (Cat # 9886); acquired without rigging in 1976; operated by the Alaska Packers Association; last located at the Haines Cannery, but marks (NN) indicate previous use at Nushagak (APA), Bristol Bay; builder and date of construction unknown; complete hull measurements taken by the author in October, 1988.

CRMM: Boat on display at the Columbia River Maritime Museum, Astoria; acquired complete from Bumble Bee Seafoods; operated by the Columbia River Packers Association at Nushagak (CRPA); built by the Columbia Boat Building Company of Astoria, perhaps in 1940; complete hull measurements taken by author in October, 1988.
Generally, midsection forms fall into two categories: sections with very flat floors and softly turning bilges, as found on ASBC, CRMM, and SCWB 2; and sections with slightly more rising floors but marked by notably straight floors and topsides, and a very sharp turn of the bilge, as found on SCWB 1 and NMM. The former midsection type was clearly used in boats originating with Columbia River builders, but the latter, a form used by Alaska Packers affiliates, could easily have originated in either Seattle or San Francisco. Apart from the two groupings defined by midsection form, the greatest differences seem to arise in scantling details, which cannot be analyzed with respect to chronology (Table 6).

The Columbia Boat Building Company built its boats on a keel of Begac, with "stem, stern, skags, aprons and deadwoods" of the "Best Eastern White Oak." Eastern oak was also used for frames, knees, breasthook, combings, gunwales, and bed pieces for the centreboard trunk. Planking consisted of ten strakes of Port Orford cedar, 7 inches wide, with the hollowed bilge strake in three pieces, but all others with no more than one hollow seam butt (Columbia Boat Building Co. 1938). Details of construction illustrated by Chapelle's drawing (1951:189) were in no significant way deviated from in boats studied by this author. At least in Columbia River yards, Bristol Bay boats were set up and partially planked right-side up (Fig. 40). "After attaching the first of several topside planks, the hull was turned upside down, the bottom was planked and caulked and then flipped over for finishing" (Weilepp, 1991b:46). Caulking was properly done with a wheel, rather than an iron (Cary, 1970:105).
Table 6. Summarized data for Bristol Bay boats, taken from surviving boats and plans (see Appendix B).

<table>
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<th>BOAT ID</th>
<th>DIS- WICK</th>
<th>6CWBR</th>
<th>ASBC 70</th>
<th>ASBC 70</th>
<th>MMSD</th>
<th>MATI 1</th>
<th>SCWB 2</th>
<th>NMM</th>
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<td>3.19</td>
<td>3.33</td>
<td>3.32</td>
<td>3.22</td>
<td>3.28</td>
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<td>1/6 raised</td>
<td>1/10 flat</td>
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Figure 40. Bristol Bay boat under construction in Astoria (after a photograph in Bumble Bee, 1946:2.5:7).

There is no point in analyzing the ethnic composition of Bristol Bay fishermen; none were resident, and they had virtually no say on how the boats were built. Most fishermen, however, were of either Italian or Scandinavian descent. It has been suggested "The canneries liked Scandinavians from the Lofoten Islands off the coast of Norway, where sailing boats similar to those in Bristol Bay were used, and Italians from Sardinia or the Messina Straits for the same reason" (Andree, 1986:35). However this may be, it is interesting to note that these two ethnically prevalent groups, handled identical boats in identical circumstances in cultural distinct ways. "Italian boats" could be identified from afar because Italian fishermen always left their mast up, while "Swede boats",

135 Canneries intentionally hired crews from different ethnic groups, and manipulated ethnic loyalties in order to increase production. "A cannery superintendent... would deliberately hire Finns, Italians, or Scandinavians, telling them, 'I know you Finns (or Italians or Scandinavians) are the best fishermen. I expect you to show those Italians and Scandinavians (or Finns) how to catch salmon.'" (Andree, 1986:35)
manned by fishermen of Swedish, Finnish or Norwegian descent, always struck their masts while fishing. This different approach to the handling of the mast had some repercussions with respect to rigging. The Italians typically set up a permanent forestay, and, in the precious preparation time between arrival at the canner site and the opening of the season, would sometimes make a tiny jib to get a little more sail area out of the fore triangle area. Scandinavians on the other hand would spend their time searching for the lightest mast, or even shaving one down if necessary (Andree, 1986:54). Some would also rig removable iron crutches in which to rest the lowered spars out of the way. These ethnically distinguished practices continued despite the fact that, by the 1930s and 1940s, most of these men were second-generation West Coast salmon fishermen who had learned to fish on power boats in the south, and whose only vocational sailing experiences were in Alaska. When the Columbia River Maritime Museum invited veterans of the Bristol Bay fishery to help with the rigging details on the Bristol Bay boat displayed there, these old disagreements reemerged and were expressed on many fine points of setup, rigging, and marlinespike seamanship, much to the somewhat confused fascination of museum staff (Kytr, 1989:8).

Figure 41 displays the lines of a typical Bristol Bay boat. The few surviving Bristol Bay boats have out-lived most of their seasonal "masters", displaying an impressive longevity in a infamously difficult fishery. Accounts written earlier in the century boasted that the boats would last through 10 to 12 years of hard use, yet many lasted much longer. Before the ban on powered craft was lifted, about 150 sailing gillnetters remained working in Bristol Bay (Leather, 1979:380). Some were converted to power boats and others were bought as recreational sail boats. Al Andree, who worked on some conversions, found many boats, even some 40 years old, to be perfectly sound (1986:34). On the shores of Bristol Bay, hulks of sailing gillnetters can still be seen, half buried in sand, near high tide marks (eg Morgan, 1978:73).
Figure 41. Bristol Bay boat, lines (after Hansen, 1954).
CHAPTER IV

Analysis

This study of West Coast fishing boats, the material culture remains of the region's fishermen and boat builders, forces a broadening of historical perspectives most often brought to the Pacific fisheries. By necessity, the context for boat usage demands more than "a history of so many pounds of fish" (Kimmel, 1989:65). While this study has benefitted from several histories of the West Coast salmon fishery which do precisely that, these take a regional approach, often relating the West Coast fishery to the East only in terms of investment capital and consumer markets. Nor has material published to date generated more than regional interest, so that it remains outside the main current of historical discourse. "The interest of American historians in the North American fisheries could almost be said to have begun and ended with the great cod fisheries of the Atlantic" (Damron, 1975:16).

Frederick Jackson Turner's promulgation of Manifest Destiny lingers in contemporary historical perspectives which still view western settlement as a largely land-driven phenomenon (Stratton & Frykman, 1988:1), neglecting its maritime component. The salmon canning industry is commonly analyzed in isolation from fisheries in general; with emphasis placed on its corporate structure, mechanized modes of processing, and labour relations. It has, indeed, much in common with the other great resource-based industrial monothemes of the western economy, logging, mining, and large-scale agriculture (Lamar, 1983:315), yet, the fishermen and the boats upon which their lives depended, embodied pre-industrial traditions. Without these men, the boats which were their most important tool, and the men in small shops who built these boats, the industry would never have been born.

The vagaries of the historical record with respect to West Coast fisheries have led to fundamental misconceptions in the field of North American small craft study. They may be summed up by the following sentiments: "West Coast small craft types were few, and essentially limited to derivatives of East Coast models"; the felucca (one generally accepted exception to the first assumption) was "outside the main current of American nautical history" (Morris, 1927:24); and the Columbia River boat was "just a stock boat", meaning that the type was essentially a mass-produced industrial product, overwhelmingly ubiquitous, and fixed in form.

It is true that the variety of West Coast boats built in the European tradition in the late nineteenth century was more limited than on
the East Coast. However, this contrast is the natural product of the great difference between the two coastal populations in terms of density and duration of European settlement (Baker, 1983:65). Because of the ethnic diversity represented among fishermen, and, to a lesser extent among boat builders, the variety of West Coast types is greater than might be expected, and the "mental templates" (Carrell, 1989:76) of tradition these men brought with them were more often made in Europe or Asia than eastern North America. Even where there is a clear familial relationship between East and West Coast types, "traditional" eastern boats often came into being only in the middle or late years of the nineteenth century (Chapelle 1951:7,43), so that some West Coast vernacular craft were produced by a parallel evolutionary process, rather than one diffusing directly from an East Coast source.

Native Craft: Dugouts to Handliners

By essentially overlooking West Coast fisheries and dismissing boats used in the region as derivative, students of maritime culture miss the opportunity for meaningful extra-regional analysis through the contrast of fisheries evolving under some notably similar circumstances on opposite sides of the continent. An example of fundamental importance is that on both shores an aboriginal inshore fishery preceded and, for a time competed with the immigrant inshore fishery. In colonial North America, Natives comprised the first ethnic work force, while, on the West Coast, Natives were similarly the first ethnic work force in the fishery (Lamar, 1983:290). In some recent studies, it is still be asserted that only in the eastern United States and Canada were dugouts used in a commercial fishery (MacKean & Percival, 1979:53). Yet indigenous small craft were pressed into service of the immigrant fishing economy on both coasts, and were used by both Native and immigrant fishermen. On the East Coast from Florida to New Brunswick, the use of dugouts and dugout-based craft in commercial fishing largely ceased about 1920 (MacKean & Percival 1979:53). The explanation generally offered is lack of suitable logs remaining near the coast, beginning in the 1880s in some parts of the eastern littoral [Hopkins, 1987:106; Chapelle, (1943) 1979:1]. Yet, the last dugouts passed out of the West Coast commercial fishery around 1920 as well, despite no lack of trees. A reassessment of the viability of dugout manufacturing techniques in light of experiences on both coasts would suggest that local timber resources were not the critical factor in whether or not dugout construction for commercial use continued. Rather, some explanation tenable to both coasts should be offered, such as the common use of gas motors, or the increased availability of less costly
sawn lumber, both from local and exotic sources, owing to production provided by mechanized milling processes and cheaper transportation.\textsuperscript{134}

With the exception of the Chinese, who certainly made dugouts in northern California, and possibly did so for their fishing operations as far north as British Columbia, virtually all West Coast dugouts were built by Natives in the traditional manner, albeit with metal tools, and notwithstanding the few canoes with planks added in order to accommodate motors. By the mid-nineteenth century, makers of East Coast dugout-based boats were almost exclusively of European or African descent, and the construction techniques and forms produced were sometimes radically different from indigenous precedents.

Differing relations between immigrant and Native fishermen on each coast partially explain divergent dugout traditions. On the north-eastern coasts of the continent, indentured fishermen working for overseas interests and, later, fishermen/settlers, had violent confrontations with Native fishermen over valuable inshore and estuarine fishing resources. Natives were eventually driven inland where their canoe-building skills naturally decayed. On the West Coast, at least from Oregon northward, where the Native population was too valuable at a time when labour was in short supply and indentured workers from an overcrowded Europe were in unavailable, the objective for commercial interests was to persuade Natives to fish for them.\textsuperscript{137} Throughout the salt-fish and early canning fisheries, financial incentives, while not overly generous, were sufficient inducement for a large number of Natives to join the ranks of commercial fishermen and cannery workers. Those who did well fishing commercially became relatively wealthy within Native communities (Gowen, 1894:164). Access to traditional fishing grounds was lost in areas which became more heavily populated in the nineteenth century, but traditional

\textsuperscript{134} Log construction used in bugeyes and log canoes was heavy, but this was not a disadvantage while these boats were propelled by sail because the thick bottoms provided built-in ballast as well as great strength. In gasoline-powered boats light weight construction paid a higher premium, and high costs of engines made hulls, and any cost savings to be made there, less significant relative to the total investment required for a boat. Log-based hulls are also not readily shaped to modifications in form demanded by the installation of a propeller.

Lower retail costs of milled wood is illustrated by the increasing use of exotic woods by commercial boat builders everywhere on the continent around the turn of the century. By 1920, this trend had reached even the fishermen/builder; skiff-builders on the lower Mississippi, for example, were at this time replacing local cypress with West Coast cedar (Comeaux, 1978:79).

\textsuperscript{137} Violent clashes largely over fishing resources occurred on the Rogue River and in Puget Sound shortly after American annexation of the region, and on the Fraser River during the gold rush there, but these were not typical.
subsistence fishing was still an option in many locations, particularly as declining Native populations relieved pressure on the resource. However, as fishing at widespread cannery locations began to deplete even isolated fish stocks and the financial return for fisherman and worker became so low that Natives were better off fishing for subsistence than for cash after the turn of the century, canners looked to government legislation rather than guns to remove the last effective competition for the fish resource on the part of Natives using traditional techniques. It is no coincidence that these techniques and implements, including the dugout canoe, disappear at this time.

Nevertheless, for nearly 100 years, many, if not most, Natives on the Northwest Coast had the option of fishing traditionally for subsistence and Native trade, or working in the commercial fishery for cash; most chose to do both. Depending on the fishery or fishing method employed, Native fishermen used either dugouts or planked craft, while some Native craftsmen learned to build in both traditions as well. With the exception of the reef-net fishery (see pages 179-183), there is no evidence of the commercial fishery affecting traditional canoe form in any significant manner. Generally speaking, canoes remained the preferred craft for Native fishermen in all fisheries except gill-netting and seining until the twentieth century.

For caucasian settlers on the West Coast, dugouts were consistently available at a relatively low cost from Native canoe-makers whose craft actually flourished for many years after contact; there was little incentive for settlers to take up the adze. If they chose to make their own craft, boats built with planks were more economical not only because of less labour required, but also the low costs for lumber from numerous

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118 Government collusion with canners in Canada is well illustrated by the comments of a fishery inspector charged with closing down a thousand-year old Native weir fishery known as the Babine Barricade above Skeena River in 1906, on the grounds that it was detrimental to fish stocks: "The trouble is the Indians are so lazy and idle they will not do anything at all. The reason they want barricades is because the women can go and shovel the fish out.... Let them come down to the cannery and work as all other Indians do, not loaf. The Babine Indians must realize that they must work as the other Indians do, they cannot be spared" (cited in Meggs, 1991:79).
coastal mills. For the same reasons of economy, plank construction became an increasingly popular method among Native builders.

It is, unfortunately, impossible to quantify the contributions of these builders to West Coast small craft. Though they certainly built other types, double-ended handliners of northern British Columbia and Alaska are the only boats known to have been built in some numbers by several Native builders. That the type may have evolved as a small version of another West Coast type, the double-ended sealing boat has been discussed. Whether the double-ended boats of the Queen Charlotte Islands predated or followed Davis' first handliner in 1905 is unknown. Boats built by Linton, Lindsey, and Turner of Vancouver and used in the Georgia Strait probably did predate Davis' boat by five to ten years (Templeton 1977:1B.42), but the initial operating range of these craft was limited. Yet, John, Sr., and Rod Davis may have seen these boats as they steamed back and forth in the last years of the nineteenth century from the Klondike to Seattle, and then introduced the type to north. Linton was trained in New Brunswick, just as the peapod, by name, appeared in nearby Maine around 1870 (Gardner, 1951:8; Simson, 1963:172). Linton then, may have introduced the type, based on the peapod, or St. Lawrence skiff, or their immediate predecessors from Maine and New Brunswick.\footnote{140}

It is far too easy to fall back upon a sort of "great man" theory to explain boat-type introduction. Though, certainly in some cases, one man has been responsible for introducing a new type from a distant source, or by invention. For, handliners, where there are no facts relating to origin, it is important to look beyond individual builders. In Maine, it is often suggested that the Maine peapod was "inspired" by the

\footnote{139 Illustrating the much lower material costs for shipbuilding on the West Coast is a 1874 report of the American Board of Marine Underwriters. Despite labour costs which were still much higher on the Pacific coast, it "showed that, with the exception of coppering, hulls could be built from 8 to 12 per cent cheaper here than on the Atlantic Coast, the availability of high-grade material being more than sufficient to offset the higher cost of labor" (Wyllie, 1917:64).

\footnote{140 Besides the double-ended form, peapods shared other features with West Coast handliners. Both were primarily craft designed to be rowed easily by one man, and some were built to row only. For those boats equipped with sprit sails, the lack of centreboards and relatively shallow keels (on all peapods regularly beached) did not make for particularly weatherly craft, but both were very seaworthy for their size. Though peapods worked the lobster fishery, these boats had to be maneuverable in close around ledges, reefs and rocky headlands, as had the little double-enders of the Pacific whether trolling, crabbing, or to a lesser extent, halibut fishing. Interestingly, the most popular size on both coasts was 15 feet. Boats in both localities showed local and personal variation in mid-section form. The one consistent difference is in the heavier construction employed in Maine.}
Passamaquoddy ocean-going canoes, that it was essentially a planked canoe. Unlike most Native fishermen of the Atlantic Coast, the Passamaquoddy porpoise hunters remained on their traditional fishing grounds and continued to build their sea-going canoes into the second half of the nineteenth century (Gardner, 1951:8). The Passamaquoddys' experience in Maine is exceptional in that it most closely, among Native groups of the East Coast, parallels the experience of groups on the Northwest Coast. Further parallels may be drawn in climate and geography between the coast of Maine, and those of British Columbia and southeastern Alaska. All this brings us no closer to defining the "origin" of these double-ended handliners, yet, strikingly similar social and environmental conditions in two regions where very similar craft emerged highlights the possibility of parallel evolution rather than diffusion as a root for handliner development. The early contributions of Native builders of planked craft on the West Coast also suggests a possibility, apparently not considered in the East, that the Passamaquoddy craftsmen made a similar adaptation and contributed more than just "inspiration" for peapod development.

Chinese-Built Boats

Recognition of Chinese activities in West Coast fishing is usually limited to their labours on the canning lines, where they butchered, cleaned and canned salmon from the Sacramento River to Bristol Bay. They were commonly forbidden or restrained from taking these valuable fish themselves. Even among Chinese market fishermen, salmon was not a commonly sought catch because white-fleshed fish were more popular in the Chinese communities where the greatest portion of the catch was delivered. Remarkable, however, is the geographic range and early dates for the establishing of Chinese fishing settlements. While the substantial and long-lasting fisheries around San Francisco are fairly well documented, Chinese fishing colonies established in northern California, Oregon, Puget Sound, and on Vancouver Island in the 1850s and 1860s are very poorly understood. These pioneers were often the first non-Native fishermen in the respective areas, yet their establishments appear at uncertain dates, apparently flourish, and then disappear at uncertain times for uncertain reasons, leaving scarcely a trace of their presence in the historical record.

Of all the ethnically distinct groups, the Chinese fishermen and boat builders remained the most isolated. Particularly sharp racial lines coupled with "an exclusively Chinese economic system whose raison d'etre was to maintain the insularity of the Chinese community" (McEvoy, 1977:123), entrenched this relationship. At first glance, Chinese
fishermen and boat builders seem to have made few alterations in their traditional boats and fishing methods in their operations on the eastern shores of the Pacific. R.F.G. Spier supports this perception in his analysis of nineteenth-century food habits of Chinese Californians; he states that while there was "substantial [cultural] exchange between the... [Americans and Chinese in California], with the Chinese becoming more Americanized and the Americans becoming somewhat Sinified.... traditional foods, the culinary wares, the implements of production, and the techniques of processing were all transplanted from China to California" (1958:134-135). This conclusion is easily drawn with the recognition that the food produced by West Coast Chinese was meant for an almost exclusively Chinese market, whether exported to China, or shipped to Chinese communities in North America. All procuring and processing methods, such as air drying shrimp before shelling in fanning mills corresponding to Chinese types of very ancient model (Spier, 1958:129), seemed also to be exclusively Chinese. No other West Coast immigrant group maintained its traditional food habits as rigidly as did the Chinese, nor did any group to the same degree take "direct steps to maintain... not only... food habits... [but also] the associated behaviors" (Spier, 1958:134-135). The traditional Chinese diet places heavy emphasis on fish, as seafood is second only to rice as a staple (Worcester, 1958:49). This applied not only to the residents of Chinese communities, but also to Chinese work crews in the employ of American companies which often paid salaries in part with traditional food: "Chinese masons who erected the Parrott Building in San Francisco (1852) received daily wages of $1.00, one half pound of rice, and one half pound of fish" (Spier, 1958:131); while in 1870 Chinese railway crews were fed with traditional fare which was both healthier and of much greater variety than that received by white workers (Spier, 1958:130).

Western North America had much better transportation links with the Orient than with the eastern parts of the continent before the completion of railroads and the Panama Canal. In the early 1850s, as a startling example, some "San Franciscans sent their laundry to Canton, and many common items of American usage were imported from China rather than from the eastern United States. As well as food and ceramics, these included such basic things as lumber, building stones, and furniture" (Spier, 1958:134-135). Nets used by Chinese fishermen on the West Coast were certainly of Chinese manufacture as were masts and early sails (see page 53); entire boats may have been brought over "possibly in pieces, on other vessels. The probability of the latter mode of importation is supported by the importation of pre-cut houses from China" (Spier, 1958:82).
Until about 1880 China remained San Francisco's third largest foreign market (Armentrout-Ma, n.d.:28). The years following were marked by a decline in the trade and withdrawal of many Chinese merchants from the shipping business, events which owed much, either directly or indirectly, to anti-Chinese legislation. A decline in Chinese imports, particularly those not intended for the caucasian market, and an increase in their costs might be expected to follow. A study of the response of North American Chinese communities forced to rely increasingly on North American materials, if not products, might offer some insight to Spier's thesis.

While most Chinese boats used on the West Coast were of local manufacture, to analyze whether indeed these boats were directly derived from Chinese models, firm data regarding Chinese fishing boats used in the southern districts in the nineteenth century are required. Unfortunately, these are not available. G.R.G. Worcester has commented that "Chinese fishing has received very scant attention from the authorities interested in European fishing" (1958:63), and this amateur maritime sinologist, who has done so much to document traditional Chinese craft, concentrated his studies on the Yangste River where distinctive northern types prevailed. Nevertheless, uniquely southern junk features found in Kwangtung Province are easily recognized in the large craft of the Chinese fishermen in California. Sails used on Californian junks, called "lorcha" sails by some nineteenth century chroniclers (eg Collins, 1892b:46), follow the "southern batten lug" form, in contrast to the northern batten lug, or canted square-headed lug (eg Buys & Smith, 1980:235, Fig. 2). Also used in California was standing rigging consisting of three wire stays on either side, set up by lanyards and dead-eyes, a feature not found in northern China (Worcester, 1959b:137). Fenestrated rudders, observed on both Californian junks and skiffs, are again a feature found only in southern China (Worcester, 1959b:136). Both round-bilged and flat-bottomed junks of California, as far as can be determined from photographs, match the junks of southern China in hull form and detail far more closely than those of northern China. It may be noted without surprise that obvious details of junk construction demonstrate that Chinese fishermen in North America were predominantly members of the well-documented emigration of Chinese in the nineteenth century from southern China.

The small boats of southern China have almost completely escaped documentation, so comparison with the skiffs, canoes, and sampans of California is impossible. The Californian types do not match the few known Chinese examples, except for the punt (Fig. 8, see page 56), which
matches closely in shape and framing format the "Changsha sampan" illustrated in Worcester (1971:418), but the latter is much larger, boasting a 45 foot (13.7 m) length and 6 1/2 foot (1.98 m) beam, a bottom without rocker, and scow ends curving upwards in profile. The Changsa sampan also originates on the interior waterways of Hunan, far from the southern sources of most Chinese emigration to California.

Further comparison might readily be dropped and the Spier thesis accepted in the face of inadequate documentation from China. However, the lateen used on the small Chinese boats in California where it was so readily accepted as a "typical Chinese sail" (Chin, 1969:38), was apparently never used in China. Buys and Smith, in their brief study of the distribution of Chinese sails (1980), make no mention of lateens, though they acknowledge and illustrate the use in China of square and sprit sails in addition to various lug forms; likewise, neither Dabry de Thiersant- (1872), Smyth (1906), Needham (1971), nor Worcester (1958; 1959a; 1959b; 1971) make reference to the lateen in China.

If the use of the lateen sail on boats in California was a locally innovated or borrowed technology for the Chinese builders, two questions must be asked: why this rig, and what advantages did this rig, unfamiliar to its users, offer? Clearly, as the sail most used on small craft by the other prevalent fishing group in California in the nineteenth century, the lateen used by Italian fishermen provided a commonly seen model which might be imitated. Given that the lateen is a close cousin to the lug sail, its adaptation may not have been as radical as it may appear. Figure 6 (see page 50) reveals that the stays of the southern Chinese lug rig were retained. While stays were not used on feluccas, and appear to be an impediment a lateen yard run out before the wind, Collins states that Chinese boats so-rigged performed well when before the wind (1892b:47). In China, "sails of the fishing craft are, for the most part, made of mats for reasons of economy, and also because, being heavier than canvas, they are more easily doused during fishing operations" (Worcester, 1959a:84). Even though canvas was far more durable than matting, which needed annual replacement, the cost of mat in China was so low that it was cheaper than canvas both in the long and short term (Smyth, 1906:381). The need to import mat would probably negate its economy on the West Coast; if weight aloft remained a desirable quality for fishermen then the single spar of the lateen rig would certainly provide this. Chinese lug rigs generally employ masts of unusually large diameter, in contrast to masts used with other rigs of similar size (Oughtrd, 1987c:69); the preferred mast timber for lug rigs was also imported from China. The bamboo used for sail battens on the lug rig, whether sails were of mat or canvas, would also be more expensive in North America, and accordingly,
seems only to have been used on larger craft here. Smaller craft of the
least prosperous Chinese fishermen may have been more prone to economic
suasion which forced builders, either from an early date or as Asian goods
became less accessible into the last quarter of the century, to find local
substitutes for exotic materials traditionally employed in rigs and sails.

One canvas sail without battens used on some small craft in southern
China, and illustrated in Needham (1971: Plate CDXXV) is the sprit sail;
interestingly, it retains the multiple-sheeting arrangement of battened
lug sails, and would certainly perform more ably to windward than western-
style sprit sails without vangs. The single-sheeted lateen of Chinese
boats in California offered simplicity, and somewhat improved windward
performance over the Chinese lug as the latter cannot be aerodynamically
shaped for optimum efficiency on the wind (Oughtred, 1987c:69; Palmer,

Chinese use of the lateen in California was a notable departure from
traditional Chinese boat rigs. Its adoption appears to reflect the
unsuitability of North American materials for traditional Chinese small
boat rigs, and the expense of importing these. The lateen was adopted in
preference to other rigs because its performance suited local conditions,
as conspicuously demonstrated with its extensive use by another ethnic
group in the vicinity, while its handling requirements shared
characteristics with the lug rig familiar to Chinese boatmen. The common
local use of the lateen and similarity of the rig to the Chinese lug must
have weighed heavily, because the Chinese fishermen adopted the lateen
despite the fact that, of all the western sail rigs available for
imitation, the lateen is the most "...sensitive to the way that it is
set", and for that reason is considered today, in comparison with other
sail plans, very unattractive as a sail for a working boat (Palmer,

If the lateen rig was readily adopted by the Chinese, it must be
wondered, given no evidence to the contrary, whether hull forms were also
modified in North America. Adaptation to low-aspect lateens would have
placed no demands on hull form in terms of form stability, ballast or
lateral plane not required by the Chinese lug as well. However, Tom
Fordham has suggested that, following the Chinese Exclusion Act of 1882,
the Chinese fishermen adopted boats which looked very much like the
Portuguese dories used for bottom fishing in the same area, so as to avoid
proscriptions levelled against "foreign vessels" (pers. comm., 1991).
Several contemporary observers note the resemblance between Chinese skiffs
and dories (Jordan, 1887:738; Collins, 1892b:47; Chin, 1969:37). But the
observation cited by Chin is dated to 1873, predating the Exclusion Act by
almost a decade. In any case, the Act only classified as "alien" Chinese
vessels over five tons (Collins, 1892b:46), and so would not have affected the skiffs.

It is possible that in a less specific sense the Chinese adopted a boat form which made them less identifiable on the water so as to avoid the unwanted attentions of the water-borne fisheries officers, or white fishermen, but this is scarcely supportable. The use of flat bottoms would not have changed the appearance of these boats from afar on the water. Many distinctively Chinese features remained, including elements of the rig, the large Chinese sweep, overlapping planks at the transom, coal-tar preservative coating, not to mention fishing techniques. So the theory that the Chinese boats were rebuilt to mask the ethnic affiliation of their users may be safely discounted.

A photograph in The Monterey Public Library collection, labelled simply "Monterey, 1875", shows a row of skiffs in profile. Lydon reproduces this photo (1985:158), yet chooses to date it in the "1890s". Close examination of the boats in detail is hampered by an earthen berm which unfortunately obscures the lower half of all the transoms. However, the boat in the foreground shows wear marks at the planking seams revealing relatively narrow planking; near the transom the strakes appear between three and five inches wide. The narrow, edge-worn planks may indicate a rounded hull, in contrast to the wide-planked, slab-sided form evident on skiffs photographed in the 1890s. If the Monterey Public Library date is correct, then the round-bilged form of the skiff (see 57; Lydon, 1985:33; Hemp, 1986:30) may well have ante-dated the flat-bottomed, hard-bilged version of essentially the same boat. A very early piece of evidence supporting the late introduction of flat-bottomed skiffs is a painting (done sometime before 1865) by F.A. Butman of the Rincon Point fishing village showing exclusively round-bottomed skiffs, with an external keel, or false keel, visible on one (Van Nastrand, 1980:Plate 28).141

The resemblance of the Chinese skiff to the dory, already noticeable in general proportions and sweep of the sheer, would have been much magnified with the implementation of a flat bottom. The adoption of the flat bottom on skiffs, based on admittedly thin photographic and documentary evidence, would seem to have occurred around 1880, a time when decreased imports from China may have made a supply of suitable imported framing timber for round-bottomed hulls unavailable, or prohibitively expensive. A hard-chined hull would be better suited to the local planking material, redwood planks up to 24 inches wide (Tom Fordham, pers.

141 These boats have sprit sails. Although this rig is not unknown in China, this may be the only record of its use on Chinese fishing boats in California.
comm. 1991), which, in the latter years of the century, were always used by Chinese boat-builders in California according to documentation. In China, boat-builders used grown frames wherever possible (Worcester, 1959a:84), but the hard-chine and flat-bottom form is better suited to the economical utilization of frames sawn from straight-grained wood than the round-bottom form. Given the long tradition in Chinese boat-building of the flat-bottomed form, its adaptation for skiffs which may originally have been round-bottomed would constitute a less radical change than that of rig. By 1880, successful examples of flat-bottomed boats built by caucasians, such as Portuguese dorries and various bateaux or sharpies, were in use and may have encouraged the use of flat-bottoms on Chinese skiffs, but there is little reason to believe the form would not have been adopted in the absence of these non-Chinese examples.\footnote{Small fishing boats illustrated in Dabry de Thiersant (1872), seem somewhat stylized, but boats not dissimilar in profile to skiffs used in California (transoms inset from planking ends, and sharp bows) are consistently round-bottomed, while those with flat bottoms have square, punt-shaped ends.}

Future research into the Chinese fishing craft in California would greatly benefit from detailed studies of small boat types used in the mid-nineteenth century in southern China. Many of these types may have survived much longer there, making photographic studies potentially fruitful. Comparative examination might shed some light on the extent to which Chinese fishermen adopted new forms or methods of hull construction in California. Close matches might lead researchers to specific locales in the Kwangtung area where Californian types originated. Worcester notes that Kwangtung builders were much less likely to "turn out an amazingly standard type" than the more conservative builders located elsewhere in China (1959b:136). If boat types were transplanted, then it might be possible to distinguish by boat type West Coast fishing stations settled by Chungshan, Sze Yap or Tanka peoples, whose mutually incomprehensible dialects might be reflected in distinctive boat types. Such evidence could test Armentrout-Ma's claim that the Chinese fishing settlements "did not follow clan and probably did not follow regional lines" (1981:150).

The variety of types used by Chinese fishermen in California is striking. That the one boat recovered from the field matches no previously documented example demonstrates that archaeology might reveal further types. Basic hull proportions are highly diagnostic as to boat type, although it is unfortunate that the data are far too few to grasp the proportional range of each type. The length/beam ratio of the smaller skiffs was about 3.5/1, while the larger skiffs were closer to 4/1. The Chinese canoes were clearly narrower, but the ratio indicated by the
Smithsonian model of 5.1/1 may be extreme. The seine boats had lengths something in excess of 3/1 beam with its greatest dimension, at least latterly, across the stern. The China Point sampan had a length/beam ratio of 4.3/1, while the Chinese dugout model is 5.7/1.

Written sources have proven inadequate in establishing which species of fish were pursued by specific types, and with the exception of the seine boat noted in Puget Sound (see pages 51), none have been linked with the salmon fishery. Future Chinese boat finds in lower reaches of salmon streams may well have been used in the salmon fishery, however, without further evidence this could not be drawn conclusively as sturgeon was a secondary Chinese catch found in most larger salmon streams, while shad could be caught in most of the more southern streams, such as the Sacramento River.

Distinguishing fragmentary remains of Chinese fishing boats from boats built by other groups in North America may not be as simple as might be expected. The similarity in form of Chinese skiffs, seine boats, and dugout canoes to boats built outside the community is apparent. Bulkheads commonly used in Chinese vessels do not appear in any greater frequency in the smaller fishing boats of Chinese manufacture than those built with fish bins for caucasian fishermen.\textsuperscript{143} The China Point sampan is consistent with photographic evidence which indicates a common framing pattern of relatively light, widely-spaced frames. The edge-joining of planks was a uniquely Chinese fastening method and was probably used in most of their round-bottomed and multi-chined boats, but whether the practice was used in hard-chined versions is unknown, but unlikely. The use of Chinese fastenings has been noted (see page 52), but nails used in the China Point sampan are of common North American manufacture. In China, boats have traditionally been caulked with a combination of lime, wood oil (t'ung nut) and oakum. It is not clear if this combination was used in North America,\textsuperscript{144} but it could be identified with lab analysis. Chinese rudders are never hung with pintles and gudgeons, but rather with wooden jaws or sockets (Sleswyk & Lehmann, 1982:281; Needham, 1971:632). As there is no indication of this practice changing in North America\textsuperscript{145}, the presence of these elements would be an excellent indicator of Chinese origin for boat.

\textsuperscript{143} Dabry de Thiersant's illustrations (1872) show no frames, only bulkheads, but the veracity of these drawings is sufficiently doubtful not to warrant the presumption that the extensive use of frames developed California.

\textsuperscript{144} The China Point sampan exhibited no caulking residue at the time of examination by the author.

\textsuperscript{145} The open wooden jaws visible in photographs of skiffs near Monterey are typical of one of three types identified by Worcester (1971:98).
remains. Unfortunately, the majority of elements which would most conclusively distinguish Chinese fishing boats are those least likely to survive archaeologically. These include rigging components, rudders, sculling oars, fishing apparatus, and the upper portions of hulls.

The utilization of inexpensive native redwood planks is a feature common to apparently all of the later Chinese boats built in California. It should be remembered that some caucasian-built boats of California and Oregon, particularly flat-bottomed skiffs such as the "tule splitters" (Shaw, n.d:7), also used redwood planking. Whether Chinese boats used in the more short-lived Chinese fishing settlements in Oregon, Washington, and British Columbia were built with California redwood is uncertain, but unlikely in most cases. Local red cedar, however, would be the wood most likely chosen for boats built in more northern locations. Chinese dugouts may be distinguished readily from Native canoes in these areas by the former's planked ends and relatively thicker sides.

In the China Point sampan, redwood was used not only for planking but for all structural elements. It is uncertain how general this practice was, even in the later stages of Chinese boat-building in North America. On the China Point sampan all frames were sawn as might be expected on any boat using frames made of straight-grained, Californian timber. Woods imported from China may have been used on some early boats, but this practice seems to have ceased before the 1880s. Chinese boat-building has traditionally followed three steps in this order: first, laying bottom planks; second, setting up bulkheads and/or frames; third, securing side planking (Worcester, 1971:32). Fastening patterns might be expected to reflect this, and, indeed, the China point sampan seems to have followed this sequence.

Beyond the apparent introduction of flat-bottomed skiffs in the 1880s, there are no features of shape or construction with which to reliably date Chinese boat remains in North America, though some general inferences may be drawn. Imported materials such as exotic wood and Chinese fastenings are more likely features of early boats. The use of western-style nails, rigging blocks or anchors probably indicate a relatively late date of construction. Junks over five tons burden were probably built prior to legislative restrictions of 1882, though large junks again appear in the twentieth century Chinese shrimp fishery.

The greatest potential for archaeological recovery of Chinese fishing boats is at the sites of Chinese fishing settlements. So far, the three boat models excavated at Rincon Point are unique. If such models were commonly built to scale, then potential model finds of the future may tell us much about Chinese boat forms and building techniques even in the absence of full size small craft remains. Most of these fishing villages
and camps within the Pacific salmon habitat were in the San Francisco, or Monterey Bay regions. Village locations are indicated in Collins (1892a:plate IV), Chin (1969:39), and Lydon (1985:52,139); see also Figure 13 (page 79).

Salmon, however, were never a commonly sought species in these locations. The Chinese were just being excluded from the salmon fishery of the Sacramento and San Joaquin Rivers when they began to establish permanent, primarily agricultural, settlements there. Prior to the mid-1870s they had based their fishing in this area on junks moored as mobile living accommodations at various points along the river banks (Armentrout-Ma, 1981:150). Salmon caught in seine nets at Port Madison in Puget sound is the only known instance of salmon fishing at northern Chinese fishing settlements.

**Italian-Built Boats**

Italian fishermen were also pioneer market fishermen in locations as far north as Puget Sound and southern British Columbia, though their activities outside of San Francisco, where feluccas bore conspicuous testimony to their presence, have largely been overlooked. Feluccas were not the only boats built by Italians, but were the boats which most completely embodied Mediterranean traditions. While some feluccas fished for salmon, the many Italian fishermen who caught salmon from Monterey to Bristol Bay used small hand-lining boats or, most commonly, sailing gillnetters.

The most outstanding characteristic of the felucca, compared with other West Coast sailing fish boats, was its adaptability to different fisheries with disparate gear handling requirements. Although it cannot be said with any certainty that a felucca variation, modified in form or length, was specifically built for the salmon fishery, circumstantial evidence (see 92-93) points to some feluccas finding principal employment in this fishery. It is perhaps surprising to find the felucca employed in salmon gill-netting at all because certain of its characteristics made the felucca a relatively poor candidate for this fishery. Its deck layout was not suited to handling the large gillnets used to catch salmon.\(^{146}\) A salmon gill net is best set over the stern, or quarter, of a boat; a fisherman’s back would be badly strained handling the net from deck level, the

\(^{146}\) Gill nets used by feluccas in the capture of herring and smelt were only 30 to 40 fathoms (59 - 79 m) long (though these were sometimes strung several together) and 10 to 12 feet (3.3 - 3.9 m) deep, in contrast with typical salmon gill nets in use on the lower Sacramento which were 250 to 500 fathoms (82 - 164 m) long and up to 33 feet (11 m) deep.
felucca's central hatchway is poorly placed, and the helmsmen's well too small, for easy handling of this net. A gill-netting fish boat almost never has its sails set while fishing; the lateen rigged mainsail is not a handily furled sail, and the spar left aloft would add top hamper weight, making for uncomfortable drifts. That the feluccas found employment in the salmon fishery, whether full-time or temporarily in season, is testimony to the boats' performance off the fishing grounds rather than on them. The felucca's performance was better suited to the disposal of its catch than the method and conditions of capture. In other words, the felucca was above all a market boat, capable of getting the variety of species desired to market speedily, not a boat designed to be optimally efficient on grounds with catch delivery points conveniently nearby.

The felucca seems to have been particularly well-suited to San Francisco Bay's semi-exposed waters, which it could traverse with some speed in a variety of conditions. Though some sources claim that the felucca was not quick (eg Brooks, 1900:238), it would be a mistake to underestimate the premium placed on speed in a boat serving a market without fixed prices, a market which rewarded the first boats in with the best prices for their catches. Achille Paladini, a fisherman who went on to become a very wealthy fish wholesaler, apparently owed his early fishing success to personal stamina in cold weather and his learning "...to catch the sweep of the flood tide perfectly to beat his rivals back to the fish market by the seawall" (Dillon, 1985:98). Clearly, personal abilities aside, competitive fishermen wanted swift boats. It follows that quicker boats would be more valuable, and a boat builder with a reputation for building fast boats would enjoy better business (Fig. 42). It would be a tribute to these builders and the envelope of design possibilities we call the felucca if that speed was achieved without sacrificing safety. Collins claims that it is "a matter of record that only one [felucca] has ever been lost from the San Francisco fleet." (1892b:41). However, Henry Rusk's careful examination of newspaper reports reveals that in 1864 alone, no less than 5 boats and at least 13 men were lost from the market fleet, and in several other years sinkings and casualties are listed also (cited in Gilkerson, 1977:46). These losses fit more closely the image of a competitive market fleet where design innovations in pursuit of speed press the limits of safety. While felucca design may have "stabilized" with respect to safety by the time of Collins' report, the variability in hull form demonstrated by this study's samples hints that boats were variously shaped for different duties and personal tastes, or that some experimentation continued.
Among the feluccas sampled (Table 2, see page 62) the average length to beam ratio of just over 2.9 demonstrates that generally these boats followed a sensible compromise between stability and speed. The larger boats are proportionally somewhat beamier, perhaps reflecting the paranzella net’s handling requirements, but as smaller boats also handled this net by 1890, the greater beaminess probably highlights a decreased reliance on oars and the need for greater carrying capacity for boats which might expect to be out for two or three days gathering their catch. Prismatic coefficients show that feluccas generally carried their girth well into their ends, emphasizing that they were built in pursuit of stability, sail carrying ability, and capacity. The larger boats tend to have sharper waterlines in the ends. The figures do not preclude speed, but feluccas would perform best in a blow.

The Collins boat may the only one for which a reliable sail plan is portrayed: SA/WS and SA/W²/3 (Appendix B) figures of 216 and 179, respectively, show this boat to be generously canvassed, even by modern yacht standards. The rig would provide power the hull could certainly use in low wind conditions. Even matched with the powerful hull of the felucca, most rigs of this size would have to be reefed in the 25 knot (45
km/hr) winds which so regularly sweep San Francisco Bay. Several photographs show feluccas in moderate to strong winds without reefed sails. The feluccas' lateen mainsails carried sometimes two sets of reef points, but the sail plan seems to have been well suited to conditions prevalent on the Bay. The manner of seizing yard to mast with a collar and lanyard arrangement allowed the mainsail to be shifted forward or back (Gilkerson, 1976:49), thus allowing for a balanced helm under a full mainsail once the jib was taken in. The high degree of flex yielded by the rig's unstayed mast and fine tapered yard permitted the carrying of generous canvas in the strong and gusty wind conditions. The shape of a lateen sail is very sensitive to adjustment, allowing for "down-powering" by an experienced sailor who could flatten his sails, or allow for partial spillage. That the feluccas had generous canvas for those not accustomed to the rig is attested to by statements such as Brooks' that "except in the hands of their experienced owners, [feluccas] are rather unsafe (1900:238). Elderly Italian fishermen quizzed prior to the launch of Matilda D. as to how the feluccas lateen should be handled could provide few details, only that there were "tricks to it" (Gilkerson, 1977:45). For a more thorough explanation of lateen handling and performance, see Rosellini (1988:415-419) and Gilkerson (1977).

While the "...lateen is not particularly close winded, and five points (compared with the four of the contemporary yacht) is about the closest that it may be sailed to the wind.... under these conditions it is very fast" (Phillips-Birt, 1962:59). In the choppy water conditions found inside, a rig which could theoretically point higher than the lateen might not make as good time to windward versus a lateen-rigged boat sailing less close to the wind, but producing much more power in short, steep sea conditions. In Catalina Channel, gaff out-performed lateen on the felucca hulls in conditions more often light and rarely gusty, and where the fishery placed a premium on close-windedness in smooth water or easy swells.

The felucca's mainsail was boomless, a popular characteristic in various rigs used by working sailors (Oughtred, 1987c:67). Most boomless sails lose some performance to weather. The guys used to position the lateen tack to the bow, however, offered "...more flexibility in sheeting the sail on different points than is possible with most other loose-footed sails" (Oughtred, 1987c:68).

Collins' sampling of market boat sizes shows (see page 78) a definite gap between boats ranging up to about 25 feet (7.6 m) and those over 32 foot (9.8 m) in length. This gap is also apparent in this study's sample. 25 or 26 feet (7.5 - 8 m) probably represents the maximum size for a felucca, burdened as it was with ballast, which could be rowed with
comparative ease, but more significantly 26 foot (8 m) boats approximated the five ton limit for feluccas not subject to special regulations and taxation. The relative beaminess of the larger boats supports the hypothesis that rowing was not considered a serious form of propulsion, underlining the suggestion that these boats were not intended for inside work.

The point of greatest girth (CF) of boats sampled is remarkably consistent, in all cases located just forward of amidships. Midship section shape, however, is surprisingly varied. Chapelle notes that there seem to be two types of midsection shape, one rounded form with moderately rising floors, the other with a strong dead rise showing a form resembling that of "the old New York sloop" (1951:287). These two shapes show clearly in the sample. Feluccas identified as Hall and ASSC 106 clearly show the latter form, and Chapelle's description of USNM 22215 almost certainly indicates another of the type. Both the largest and medium-sized boats are represented in this sub-set, but other boats approximating their size show different forms. Clearly, no correlation may be drawn between size and form except perhaps the suggestion that the "New York sloop" form was not popular for the smallest boats. There is insufficient evidence to relate either of these forms to fishery and gear specializations.

Two noticeably different midship forms beg the question of whether their distinctiveness is a product of local influences, or stems from two different imported traditions. The thorny problem of the type's origin must first be confronted. The lateen rig, so consistent in its disposition on feluccas is an excellent place to begin. This rig is not so ubiquitous on traditional fishing boats of the Mediterranean as many authors suppose. In Greece, for example, the sprit is the favoured rig (Moore, 1925:92, 160). The lateen sails used in the Adriatic are four-sided al terzo sails, and are actually a form of lug rig sometimes called a setee, though closely related to the lateen (Gillmer, 1941:372; Rosellini, 1988:419). It is only in the western Mediterranean that lateens like those of the felucca were commonly seen off European coasts. However, not only Italian but French, Spanish, and Portuguese fishing boats utilized the rig. A distinctive feature of the felucca's rig is the strong forward rake of the mast.147 Most lateens in the Mediterranean are mounted on masts which are not raked and are stepped nearer to the bow.

147 While Mediterranean lateens with short masts raked heavily forward were classified as "latins", they were also described as a feluccio, or "felucca rigged" (Herubel, 1912:227; de Negri, 1988:510). This is probably the origin of the word applied by U.S. fisheries officials to the boats used in California.
On this basis some potential geographic sources may be eliminated: none of the traditional Portuguese craft listed by Leitao or Gillmer have forward raked masts (1978:8A; 1941:353-358); boats observed in Sicily have upright masts also (Gillmer, 1941:371-372). Forward-raking masts were used on several classes of lateen-rigged boats at various locales from the Straits of Gibraltar around the shores Spain, France, and Italy down to Naples (Gillmer, 1941; Gillmer, 1942; Gillmer, 1972:16-17; Oughtred, 1987c:67-68; Gaspard, 1987; de Negri, 1988).

There is no historical suggestion that the early Spanish inhabitants of California introduced any working boats to the West Coast. The record clearly shows a surprising disinclination among that population towards fishing by boat, or indeed, the building of small craft for any purpose (see pages 36-38). An examination of boats used in Central and South America further erodes the hypothesis of Spanish introduction for the felucca: Lane-Poole’s study of South American small craft rigs shows a remarkable variety including square, sprit, lug, gaff, and bermuda rigs, but the only lateen hails from far-off Maceio, Brazil (1940:336). Dugout canoes are still used today on the Mexican coast south of California. Hall’s supposition that the boat was introduced "by people from Mexico and Central America" (1884:40) may be safely ruled out.

That the felucca was introduced by immigrants arriving directly from Spain at the time of the Gold Rush is somewhat more plausible. The Catalan fishing boats, or barques, bear a strong resemblance to the felucca in terms of rig, sheer profile, deck layout, and is within the size range of the larger feluccas (Gillmer, 1972:16-17; Oughtred, 1987c:67-68; Gaspard, 1987), and the felucca has been described as "catalonia rigged" (Jordan, 1887:610). However, the lack of any significant Spanish presence among Californian fishermen noted later in the century seems to weigh against Spain as a source. Shaw’s guess at an introduction owed to French Gold Rush immigrants (n.d:12) suffers under the same argument, though the moure de ponar, bette, and pointu or rafiau, of southern France are also types resembling the felucca (Herubel, 1912:228; Gillmer, 1972:17). The beach boats of Genoa have the silena’s rig (forward raking mast but no jib or bowsprit), but show a very distinctive and extreme tumblehome of the stem. The few feluccas which have stem tumblehome may betray a Genoese ancestry, but the feature was

144 Demonstrating some of the difficulties in identifying ethnic sources by national boundaries even in Europe, Foerster states that, “Of some 2,400 fishermen in Marseilles a majority have claimed to be of Italian origin; their number is augmented in the summer by Neapolitans” (1924:136). Fishermen were also significantly represented among Italians living in Barcelona, part of “a not unimportant emigration” going back to at least 1870 (Foerster, 1924:206).
apparently never dramatic on Californian boats. The leudo, or Tuscan Coaster as Gillmer calls it (1941:365-366), is a decked coasting freighter found on the western shores of Italy, the size of the larger feluccas, and very much like them in rig and profile. Unfortunately, no lines, or construction drawings seem to have been published. A type with an ancestry dating at least back to the fifteenth century, the leudo has gone through an evolution in stem and stern post form, the most recent being nearly plumb, much like the felucca (de Negri, 1988:524). The small boats which still go fishing from the beaches of France and Italy tend to have ends more rounded in profile (Smyth, 1906:240). Beach boats’ midsections also appear quite full and rounded; they are rarely more than partially decked (Gillmer, 1941:366).

Brooks claims a felucca would be called a “paronzono” in the Mediterranean. The closest match found to this name is the paranzello, a distinct type native to Sicily. That this boat’s name matches almost exactly the name of the paranzella net, introduced to California in 1876 at a time when Sicilians were beginning to immigrate in numbers, is probably more than a coincidence. Unfortunately, this boat type, one of the larger ones hailing from Sicily, is mentioned by name only by Gillmer, as the type had disappeared before he undertook his survey (1941:372). If this Mediterranean type could be defined, it might well bear a close resemblance to the larger feluccas introduced simultaneously with the new net. A nineteenth-century Italian dictionary defines paranzella as a diminutive of Paranza: “sono grosse barche, a vela latina, che a due trascinano in mare, assai lunge dalle coste, immense reti, per far grossa pesca” (cited in Jordan, 1887:609). The relationship between net and boat names in Italy is confirmed, as is the technique employed as well on the West Coast. This net was not unique to Sicily, but was used throughout the western Mediterranean. The Spanish word for the same net is Parega, a term recognized, but never used in San Francisco (Jordan, 1887:609).

With the limited Mediterranean data at hand, it seems more than likely that feluccas, both large and small variants regardless of hull shape indeed had Italian ancestry. A possible hypothesis is that feluccas with flatter floors and fuller bilges retained some of the form of Italian beach boats. Boats with deeper midsections followed the form of the leudo, or perhaps the paranzello. Though the leudo was not a fishing boat, its hull form did not have to allow for beaching. As Californian boats were not normally beached even moderately-sized boats would tend towards this form. Unfortunately, lines and structural details are needed for Italian boats to confirm this. Available details for French and Spanish boats demonstrate external appearances may mislead. The Catalanian fishing boat, for example, though very similar to the felucca
in profile is beamier and has very flat floors, a keelson which runs only
half the length of the hull, and a peculiar set of struts coupling mast
thwart to keelson (Gaspard, 1987:3,6) The French pointu differs
structurally from the felucca in that it has a keelson (only the Collins
boat of those sampled has one), it employs bilge stringers, and the keel
is quite massive in section, with a greater sided than moulded dimension
(Gillmer, 1972:16).

The decoratively-shaped stem heads of the feluccas seemed to hold
potential for narrowing place(s) of origin because Mediterranean boats are
known for using distinctive shapes unique to specific regions. Gillmer
sketched a brief study of these stem head shapes, or rota (1941:360;
1942:60), but unfortunately, none of these bear any resemblance at all to
Californian examples. A brief survey of images from other sources show no
Mediterranean stem heads which vary appreciably from Gillmer’s sample,
although Moore mentions that the “little boats at Catalon Bay at
Gibraltar... have a kind of notch in the fore edge....” (1925:105); this
feature may be matched by the notches evident on the stems of ASSC 105
and ASSC 106. Further inquiry in this vein would require study in the western
Mediterranean.

An examination of the scantlings of the study’s samples show a
surprising degree of variability. Descriptions and photographic evidence
consistently show a typical felucca keel, beam in form, extending far
below the garboard, with moulded size far exceeding sided. Of the four
boats for which keel dimensions are measurable only two match this typical
form. The keel of HAMMS 16-21 is exceptionally small, and does not
protrude far below the fairbody. ASSC 106, on the other hand, has a
massively over-sized keel which is square in section amidships. From
Chapelle’s drawing it appears that the breadth of this keel was achieved
with two timbers, tapered longitudinally, sistered externally to an
original plank keel of normal proportions; these were probably added as a
repair or reinforcement to an already ancient hull. The original keel of
ASSC 106 was probably 2 by 7 inches (51 x 178 mm) which represents a keel
with about 75% sectional area of that recommended by Nevins’ rules. Even
excluding the exceptionally small keel of HAMMS 16-21, the felucca keels
sampled do not, when compared with Nevins’ rules, follow the expected
pattern of relatively heavy keels attributed to boats built in the
Mediterranean tradition. Frames follow more closely the expected
Mediterranean pattern in that they are somewhat oversized and more
distantly spaced than boats built in a northern tradition (Blandford,
1974:47). Chapelle’s suggestion that felucca’s were ceiled, except in the
smallest sizes (1951:288) seems to be supported.
It is not clear from felucca drawings what form the typical mast step takes. It was probably a block of wood, wedge-shaped to match mast rake, with a recess cut into it to receive a mast heel tenon. This component was probably only wedged between frames (Gilkerson, 1976:49), making this item unlikely to survive archaeologically. All photographic evidence suggest a mast step location approximately amidships. ASSC 105 and HAMMS 16-21 are notable exceptions.

All modern Mediterranean rowboats using wooden thole pins seem to utilize a single pin per chock. The apparent use of double thole pins on early feluccas is curious, but may serve as a rough age determinant, given the unlikely survival of this element in the archaeological record.

If it may be said with some confidence at this point that the felucca was an Italian import, it must be asked, why did the felucca thrive, and why it did do so in San Francisco? Pietro Bonzi established the nucleus of the Italian community in San Francisco in 1840 (Dondero, 1950:23) before a commercial fishery had been established. That the first Italian fishermen were truly pioneers, starting a fishery where previously there had been none, and building boats where previously there had been none or few built, gave them clear incentive to look to old familiar models. In contrast, Italian fishermen joining the Boston fishery in significant numbers around 1900, used Swampscott dories, which had been introduced by Yankee fishermen, then used by Irish immigrants after about 1840. Successful Italian fishermen in Boston moved up to so-called "Sicilian boats" after 1906, but these were really modified "Irish cutters", a type introduced by Irish fishermen before them who had also progressed in time to larger boats than the Swampscotts (German, 1982).

Most early Italian arrivals in San Francisco were seaman, castaways or deserters, who came from one specific area of Italy, Genoa. This helps to explain why the spirit of compardilismo was so strong at an early date. That the felucca proved so admirably suited to the waters of San Francisco Bay and the market fishery which it served, no doubt reinforced the merits of connazionali, as did the success of paranzella net. The sheer size of the Italian community in San Francisco, from an early date the largest west of the Mississippi (Dondero, 1950:v), and its dominance of a huge market fishery, helped ensure the preservation of Italian methods. While Italians fished in large numbers on the Sacramento River, and many other locations farther north, for the salmon canning industry, feluccas were not used because Italians did not pioneer this fishery, and their boats were poorly suited to the needs of this fishery, and for use in riverine environments.

As there were virtually no market fisheries making use of nearshore grounds from San Francisco to the Straits of Juan de Fuca, it is not
surprising that feluccas were not used on the coast to any extent north of Tomales Bay. Within the Straits of Juan de Fuca, the Gulf of Georgia, and Puget Sound, small market fisheries did develop, and the environment appears to have been one in which the felucca might have thrived. A few Italian fishermen did establish themselves as early market fishermen for the cities of Port Madison, Port Townsend, Victoria, and Nanaimo, but, while they may have been pioneer fishermen in these areas, with the possible exception of Port Townsend (see 204), they did not use the felucca. They were almost certainly preceded by boat builders who were not of Mediterranean origin, and, given the very small numbers of Italian fishermen in these locations and the relatively tiny Italian communities these cities supported, it is unlikely that there were those capable, or at least inclined, among them to establish a felucca-building tradition in these locales. The small size of these markets also did not create the same level of competition found in San Francisco.

Felucca building remained the preserve of specialized boat-builders, perhaps because Californian market fishermen generally fished year-round. Most feluccas used in California down to San Diego were actually built in San Francisco, where all the boat yards seem to have centralized. Given the select number of builders and that feluccas were largely limited to market fishing, might not Morris' statement that "the felucca ... is outside the main current of American nautical history" (1927:24) be accepted? And, as it might seem also to lie out of the main current of salmon fishing, why study it here?

To claim that the felucca lies outside the main current of American nautical history is to underestimate four factors: the significance of the San Francisco market in the fishing industry for all of California;¹⁴⁹ that the felucca had a great deal to do with the largely Italian state-wide control of the fishing industry; the influence that the felucca had on other West Coast fisheries in terms of boat-building technology; and that the felucca, by analogy, has much to tell us about the boats of the eastern coasts of the continent, boats stemming largely from a northern European tradition, boats which no one doubts belong in the main current of American nautical history.

Local fishery control was wrested from offshore interests by fishermen in New England when resident populations grew sufficiently to support a market fishery. The nature of the market fishery led to innovative boat design in a way that fishing for a fishing packing establishment did not, but no doubt the first boats were largely derived

¹⁴⁹ Before powered boats were in the majority, San Francisco had the second largest market fishery in the nation.
from types familiar to the first resident fishermen. Successful fishing centres such as Gloucester or Lunenburg soon became perhaps as well known for their boat-builders as fishermen. Fishermen who became prosperous did so by combining their fishing skills with boats that most successfully matched an Old World tradition, or combination of traditions, and local building materials, to the requirements local weather and fishing conditions. In time, the most prosperous fishermen came to establish fishing companies, fish wholesaling interests, and North American fish packing companies.

Similarly, on the West Coast, in a period for which better documentation is available, Italian fishermen found fertile ground for their Mediterranean boat-building and fishing technology. First the felucca, then the paranzella net, and later lampara nets, with some modifications, all most happily met the local requirements of the California market fishery. By 1870, while newly-arriving Sicilians began to set their nets in California, the most successful of the established Genovese fishing families had virtually monopolized the state-wide fishing business.

Most interesting of all is the question of whether the Mediterranean boat-building traditions embodied in the felucca remained outside the stream of development of other West Coast fishing boats. The use of the lateen on Chinese fishing boats in California has been mentioned (see pages 55, 58, 60). But the lateen is a particularly difficult rig to manage by the uninitiated (Oughtred, 1987c:68). This does much to explain why the felucca was not adopted by fishermen lacking Mediterranean ancestry; it should also not be surprising that the sail was not more often adapted to other boat types. Hull characteristics might more readily be adapted. San Francisco crab boats may at first appear to belong to a northern European boat-building tradition because of their transom sterns. But the fishermen who sailed them were usually Italian, and, unlike the feluccas, crab boats were often built by their owners (Shaw, n.d:6). Mediterranean features include a high crowned deck laid out like a felucca’s except lacking the helmsmen’s hatch, oarlocks positioned for forward-facing rowing, and a bowsprit that unshipped. Construction details are not available for crab boats and none appear to have survived, so it is impossible to say whether the resemblance means anything more, but the crab boat looks much like a small felucca shortened by a couple of feet at the stern, with transom and rig (plus bowsprit) adapted from the Whitehall.

It is interesting to note that of the limited sample of feluccas examined here, two of them (HAMMS 16-21 and ASSC 105) were probably not lateen rigged. It is also possible that the felucca photographed recently
in Tomales Bay had been sprit-rigged. These boats may have had their rigs changed by non-fishermen unfamiliar with the lateen who acquired the boats when their working days were over. However, these boats may have been rigged without lateens while still at work. HAMMS 16-23, for instance, still has gear for lifting crab. It may have been purpose-built for this trade; its beaminess and relatively high freeboard and unusual keel tend more toward the apparent proportions and construction of transom-stereded crab boats. It could hardly represent a transition boat in the development of crabs boats because it was probably built too late for this, but rather a crab boat built, probably on a one-off basis, by a fisherman/builder who spiced his design with more felucca than most.

Though other unusually rigged feluccas do not seem to appear in the photographic record, this record is biased to turn-of-the-century feluccas at San Francisco’s market docks, where the lateen rig reigned supreme. In earlier times, for specialized fisheries, and in different local conditions non-lateen rigged feluccas may have been more common than previously supposed. For example, thirty of the eighty-five boats docking in San Francisco in 1879 were small, sprit-rigged boats. No hull description is offered, but these boats were not crab boats, they engaged in the Bay hook and line fishery, joining the larger boats outside on fair summer days (Jordan, 1887:609). Goode and Collins speak of Italian fishermen in Monterey who “had five sail-boats, averaging three-fourths of a ton, and of the usual pattern. One is lateen-rigged, the others sloop-rigged” (1887:30). “Of the usual pattern” here, may be taken to mean of the usual Italian pattern, ie they all were felucca hulls.

Double-ended construction dominates on the West Coast, as it does in the Mediterranean, in sharp contrast to the East Coast where transom and counter prevail. Without more concrete data, this fact is a mere curiosity. The fact that both the felucca and the early Suisun Bay sailing gillnetters followed the Mediterranean tradition of using tight planks with no caulking is something more concrete. A fisherman, asked how to modify a felucca for fishing salmon in a river, would probably have said flatten the floors, mount a sprit rig, and take off the deck. Add a centreboard and the plank keel through which centreboards are usually set, and the result is a Columbia River sailing gillnetter. Gilkerson maintains that some feluccas were built open-decked (1976:46); while there seems to be no archival evidence to support this, such a boat may have represented a transition in the development of gill-netting salmon boats. This hypothesis, proposed by Steve Canright (pers. comm. 1989), may well

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150 Surviving work boats often owe their longevity to semi-retirement under “yachtsmen” owners; students of nautical technology can only bear the ensuing modifications graciously, however confusing these may be.
stand up anyway (see page 291-292). If the Columbia River sailing
gillnetter owes part of its existence to the nameless builder in San
Francisco of the first Italian-style fishing boat, then the double-ended
wooden power boats which evolved separately from the felucca and Columbia
River sailing gillnetters and are still in use today, nearly one hundred
and fifty years later, from San Diego to Alaska, are testimony that the
felucca and the San Franciscan market fishermen who sailed it are very
much part of main stream American nautical history.

Whitehalls

It is regrettable that so little is known about the Whitehalls used
on the Sacramento and Columbia Rivers. Along with flat-bottomed skiffs,
Whitehalls were pioneer fishing craft in the commercial salmon fishery on
those rivers. Unlike the skiffs, however, which continued in use in many
areas into the twentieth century, the Whitehall rapidly vanished as a
fishing boat in the 1870s, being wholly replaced by another round-bottomed
boat, the Columbia River sailing gillnetter. The Whitehall is the only
round-bottomed boat based on an Atlantic coast model to establish itself
in the West Coast salmon fishery.

The Whitehall is not commonly thought of as an ideal fishing boat,
and the favoured size used on the Sacramento, over 20 feet (6 m), was
large in comparison with most harbour boats which were not typically
longer than eighteen feet. Two of the East Coast fishing boats based on
the Whitehall could be larger than normal Whitehalls as well: the
Connecticut shad boat ranged between 15 and 20 feet (4.5 - 6.0 m) in
length (Chapelle, 1951:200); the Delaware gill-net skiffs were between 19
and 23 feet (5.8 - 7.0 m) long (Chapelle, 1951:203). The lap-straked
Connecticut shad boat was built as a stock boat as early as 1850 and was
exported to the southern states (Chapelle, 1951:200). While the
Whitehall-based fishing boats seem generally to have been built with
somewhat greater capacity and greater depth than harbour Whitehalls, there
is no consistent pattern through which, by process of analogy, a better
idea of the West Coast salmon-fishing Whitehalls might be formed. Some
were smooth-planked, others lap-strake, some had plank keels, others beam,
one, the Reach boat, even had the centreboard replaced by a deep false
keel (Chapelle, 1951:200-203). The Hudson River shad boat had its keel
cut away and rounded beneath the stern so as not to foul the nets (Barton,
1976:112). Any of these features found on an early West Coast Whitehall
might indicate a place of ancestry on the East Coast, but would also lead
to broader conclusions. If stock boats for example were imported to
California as early as the 1850s, then the boat-building industry of the
East Coast had a far-reaching export trade and influence earlier than previously supposed. If the Whitehalls of the West Coast evolved from Whitehalls of the East Coast which had already been adapted to fishing roles, then the East Coast shad fishery may have provided previously overlooked antecedents to the West Coast salmon fishery. The house boats used by Sacramento fishermen have already hinted at this relationship (see page 93).

The adaptation of the Whitehall to a fishing role on the West Coast may also have been a consequence of supply. The Argonauts of 1849 abandoned great numbers of ships in San Francisco Bay. Many of these hulks were dismantled in the years which followed. An even greater number of ship’s boats must also have been available for local uses, such as fishing, if they were not left too long rotting in davits. It has been previously noted that the Whitehall owed much of its lineage to light pulling boats such as gigs and cutters carried shipboard. Lengths for gigs, cutters, and stern boats in the 1850s were commonly over four times beam (Butts, (1858) 1991:100-101). The proportions cited by Kirkpatrick (1860:53-54) for boats fishing the Sacramento River match these more closely than the proportions available for East Coast Whitehalls which were somewhat beamier. Proportion alone is insufficient evidence to link the Sacramento Whitehalls with ship’s boats as Gardner has noted that the largest Whitehalls were typically built with sections little changed from smaller models in terms beam and depth (1953b:28).

Whitehall remains recovered in the field may be distinguished from round-bottomed gillnetters by the stern structure and large skeg below the high tuck of the heart-shaped transom. Crab boats, which share these features, tended to be shorter and beamier. The larger boats had fine lines perhaps sometimes approaching proportions of 5:1 length to beam. Other diagnostic features are more difficult to identify. Oak floors, steam bent or inserted cold, consistently were used across the top of the keel. But keels could be beam or planks form. Centreboards could be offset or centrally mounted, or omitted. Stems were built up. Some Whitehalls exhibit sufficient flare in the bows for a reverse curve to appear in section, but this was never as pronounced as on Columbia River sailing gillnetters. Whitehalls were often used on the Sacramento River as they were elsewhere on the West Coast as general transport boats; apart from the fact the largest Whitehalls, those over 20 feet (6 m) in length, were probably used in the fishery, there is no way, at this time, to distinguish between boats used for these distinct functions on the basis of structure.

The Whitehall’s demise in the fishery came with the introduction of the Columbia River sailing gillnetter in the years following 1868, both on
the Columbia and Sacramento Rivers. The early sailing gillnetters were not longer than the Whitehalls but were beamier, and therefore more able to carry a press of sail as well as provide greater capacity for gear and fish. The double-ended form was better for lying to with the net set, and provided a deeper footing for the man handling the net. The increased flare in the bows may also have been advantageous. All of these factors must have provided a considerable advantage to the Columbia River sailing gillnetter, for it completely replaced the imported Whitehall in the salmon gill-net fishery despite the fact that it may have been twice as expensive.  

Flat-Bottomed Boats

Almost all planked boats built in the early years of European settlement on the continent were round-bottomed, except for the "plats" of the St. Lawrence River (Chapelle, 1951:15). Flat-bottomed boats in many parts of the Atlantic seaboard came into popular inshore use only as they replaced log-built craft in the last half of the nineteenth century. Interestingly, the scant descriptions we have through Wilkes regarding Hudson's Bay Company boats on the Pacific Coast firmly assert they had keels and strongly suggest they were round-bottomed (see pages 117-118). The repeated use of the term "batteau" in Company records and the known use by the Company of true bateaux and York Boats in the interior of the continent lends considerable weight behind the assumption that flat-bottomed boats were used, or also used, on the Pacific Coast during the fur-trading era, but this is not supported by reliable description. Until the introduction of the Suison Bay boat in 1868, however, all planked inshore fishing vessels on the West Coast, apart from the Whitehall, the felucca, and the round-bottomed Chinese skiff, were flat-bottomed.

Because flat-bottomed boats were more likely to be built by their users than round-bottomed boats, they are more likely to display localized characteristics. Unfortunately, the are also the least well recorded class of boat. Terms like skiff, sharpie, bateau, and even dory are too

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1 Shaw's price of $5.00 per foot for Whitehall construction applied in the 1890s. This figure is almost certainly higher than prices in the early 1870s, but did not include the cost of outfit. Therefore, an estimate of $110 for a twenty-foot, outfitted Whitehall built in the early 1870s seems reasonable. In 1872, an undocked salmon boat built in San Francisco cost $220 (Collins, 1892b:39).

Whitehalls did not completely disappear from cannery fleets. For 1900, Moser lists four Whitehalls among 23 canneries operating that year in Southeast and Central Alaska. These boats were probably general-purpose craft or tenders for traps, however, and not used directly for fishing. Size is uncertain, but Moser lists their values between $50 and $85 (1902:329-330).
poorly defined on the West Coast to be of much service; specific and often local terms such as "Joe McGee", otter boat, and drift boat, are so obsolete as to be of even less use.

The shape of a boat's stern is one characteristic readily recognized and often recorded. Among Chinese boats, only the plank canoe had a sharp stern. The flat-bottomed skiff and seine boat were transom-stered and sharp-bowed, while the sampan and punt were square at both ends. The flat-bottomed boats built by Caucasians in California consistently had transoms. Transom sterns predominated early flat-bottomed types from California to Puget Sound, whether the prevailing ethnic background among resident fishermen was Italian, Scandinavian, Native, or American-born Caucasian. One exception is the double-ended sharpie used in the Port Townsend area (Chapelle, 1951:127), and perhaps early river dories in Oregon which were said to be double-ended, though no contemporary description has been located. Double-enders became increasingly popular around the turn of the century, however, with the introduction of the double-ended Cape Kiwanda dories, and gill-net boats used on the Rogue River by 1920 seem exclusively double-ended. Gill-net skiffs of the Fraser River were double-ended, and this form seems to have been used since the type replaced dugout gillnetters on the river. Double-ended skiffs may also have been used at first on northern streams in British Columbia, but, if so, were replaced by boats with narrow tombstone transoms. These boats were all effectively double-ended. In southeast Alaska, salmon dories had transoms which were considerably larger than the typical dory stern. Finally, the flat-bottomed gill-net boats, briefly appearing in central and western Alaska around the turn of the century, were double-ended.

Disregarding Chinese boats because their range outside California is unknown, double-ended, flat-bottomed fishing boats seem to be largely limited to British Columbia until the end of the 1880s. Double-enders used out of Port Townsend are said to have been also used in British Columbia where the type may have originated. In American waters north of British Columbia, the transom reasserted itself in the broadened dory stern of the salmon dory. If river boats of the Hudson's Bay Company influenced early boat forms, greater similarities between craft on the Fraser and Columbia rivers might be expected. While these similarities are not evident in gillnetting skiffs, the oyster bateaux of Shoalwater Bay near the Columbia were double-ended, and so was a type of Columbia River trap skiff recorded near the turn of the century, but of uncertain antiquity.

Also easily recognized is the planking method employed on the sides of boats. However, Collins never specifically mentions whether the flat-
bottomed boats he observed were lap- or flush-planked, unless his terms sharpies, skiffs, and bateau refer to this element of construction. Assuming that sharpies and skiffs were flush-planked and that bateaux were lap-planked, then the former mode of construction was far more popular in American waters. Only on the Coquille and Alsea Rivers does Collins use the term bateau. Again, surprising as it may be, the border, its exact location still disputed in the 1870s, seems to have already had greater influence on boat type than the Hudson Bay Company whose previous theatre of operations the line dissected. Although boats of the Port Townsend class used in British Columbia may have been flush-planked, gill-net skiffs were consistently lap-planked, or, more precisely, half-lapped in dory fashion in Canadian waters. In Southeast Alaska, however, even the salmon "dories" are flush planked.

This distribution pattern, based on early descriptions of flat-bottomed gill-net and hand-line boats, is clouded when seine skiffs are considered. American seining skiffs were consistently lap-planked, while skiffs for purse seining, if not drag seining, in British Columbia were flush-planked in a complete reverse of the pattern already noted. Finally, photographs taken after the turn of the century show lap-straked construction to have been employed on the boats of the upper Columbia River and some of those on the Rogue River. 152

Bottom planking method is an important element in defining type, but, unfortunately, is rarely mentioned in descriptions and is usually not evident from photographs. In a region where planks of great lengths were readily available, longitudinally-planked boats might be expected. Indeed, all known flat-bottomed gillnetters used in British Columbia and Alaska were planked this way, and there is no evidence to suggest this was not the case as far south as California. However, Shaw states that a minority of skiffs in the San Francisco area were cross-planked, and the Monterey handliners may belong to this category. Judging by their relatively sharply tucked sterns, American seine skiffs were probably cross-planked also. Purse-seine skiffs in British Columbia lack the feature, and were probably longitudinally planked.

The skipjack form, with its straight rising floors, was not employed for fishing in northern waters of the West Coast. This is surprising, considering the short supply good local hardwood for bent frames. Perhaps the lack of V-bottomed types tells more about the regional preference for shallow hull forms than construction methods. Shaw notes that some

152 Lap-planked boats usually employed three strakes per side, although some seine skiffs seem to have just two. Some small "flush-planked" boats had single plank sides.
skipjacks were found in the San Francisco area (Shaw, n.d:6), and some skiffs, including Monterey handliners, exhibit slight deadrise at the transom. Whether this deadrise appeared only in the aft sections of an essentially flat-bottomed boat, like the Chesapeake flattie (Chapelle, 1951:309-310), or whether the deadrise was greater amidships, in true skipjack fashion, is not known. The relatively flat chine line near the bow of the Monterey handliner is consistent with the former shape.

Where overall dimensions are known, flat-bottomed gillnetters the length of the West Coast demonstrate length to beam ratios of between 4 and 5 to 1. These proportions suggest craft primarily intended for rowing. Where sails were used and rig type is known, the sprit rig was used exclusively. Only where handliners were employed, on Monterey handliners and the Port Townsend sharpie, was the gaff rig preferred.

Flat-bottomed boats are generally thought to be less seaworthy than round-bottomed boats. The chine is weak in structural terms and a focal point for hull stresses. The flat-bottom tends to pound in a seaway which can create structural strain, inhibit performance, and may sometimes cause maneuvering boats to be dangerously caught in stays (Chapelle, 1951:312). Yet, some flat-bottom boats, the banks dory most notable among them, have demonstrated admirable rough water qualities. The seaworthiness of a flat-bottomed boat is a function of its midships proportions, sheer, and rocker.

Like Atlantic dories, flat-bottomed boats working offshore in the Pacific exhibit considerable rocker, while those boats working only in quiet waters have very little rocker (Hall, 1884:20; Chapelle, 1951:89). Rocker increases again, however, in flat-bottomed fishing boats working the upper portions of coastal streams where "rough" water is caused by current, and a quickly turning craft is advantaged in narrow confines.

Owen Roberts (1983) has devised an "index" for flat-bottomed boats, by which midship proportions may be quantified and compared. Proportions are defined by: maximum beam (MB), or beam at the sheer; beam at the bottom (BB); midship depth (DEPTH); the angle of flare from the horizontal (FLARE); the proportion of bottom beam to maximum beam (BB/MB); and an index from the formula, sine of flare angle times bottom beam over maximum beam (INDEX).

Based on his sample consisting of flat-bottomed boats of known provenance and dimensions, and boats with significant archaeological remains, primarily located in Europe, Roberts suggests that indices between .39 and .43 represent "boats intended for serious sea work in all forms of business or livelihood." Indices between .43 and .65, "are boats used on lagoons and estuaries and perhaps managing short coastline voyages in settled weather. These would be used in fishing, ferrying and cargo
carrying"; finally, indices between .65 and .9 "are boats from big rivers and lakes and expected to carry relatively large loads...." (Roberts, 1983:329). Above .9 and below .39 were for shallow water, and are not matched by any boats sampled from the West Coast.

Table 7 offers a selection of West Coast flat-bottomed types with a banks dory and a late eighteenth century bateau included for comparative purposes. These are ordered according to Index.

Neither of the types expected by their operational environments to be "intended for serious sea work", the sharpie, operating in the Strait of Juan de Fuca (ASSC 46) and the surf dory (C.K. DORY), fit the category so defined by Roberts. Both boats, however, compensate for their midsection forms with atypical sheers. The sharpie has quite low freeboard amidships and aft, presumably to facilitate the landing of large halibut, but has a rather high bow. The surf dory has a great deal of

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Boats described in Table 7 are as follows:

**DORY:** 18 foot Grand Banks dory built in 1881, included for comparative purposes (Roberts, 1983:325).

**RIVERS 1895:** 20 foot skiff used at Rivers Inlet and Bella Bella in 1895 (Bell-Irving, April 4, 1895; see page 218).

**C.K. DORY:** Dimensions cited for a "typical" Cape Kiwanda surf dory used in the 1820s (Neilson, 1957:9; 1959:8; see page 161).

**BAITEAU:** Late eighteenth century bateau excavated at Lake George, included for comparative purposes (Roberts, 1983:329).

**RIVERS BCMM:** Rivers Inlet skiff built by John Anderson of Scintula in the 1920s, now on display at the British Columbia Maritime Museum. Measurements taken by the author in 1993 are somewhat approximate because boat is suspended from ceiling (see page 217).

**RIVERS VM:** Rivers Inlet skiff, possibly built by John Anderson, owned by the Vancouver Maritime Museum, on loan to the Gulf of Georgia Cannery Association. Fully measured by the author in 1988 (see page 217).

**FRASER:** Fraser River skiff, approximate dimensions from photographs, interpreted and averaged by author (see pages 199-201).

**USNM 22217:** Dimensions based on Collins' description of the Chinese Canoe model at the National Museum in Washington (1892b:47; see pages 48-50).

**CARTER:** Fraser River skiff as recalled and drawn by Darrie Carter and recreated by David Moore and volunteer builders at the Britannia Heritage Shipyard (see pages 199-200).

**ASSC 46:** "Large double-ended sharpie for open water use" (Chapelle, 1951:126-127). Used in the vicinity of the San Juan Islands and Port Townsend, and perhaps in Victoria and Nanaimo (see page 171).
sheer, so that both ends are unusually high to meet the particular demands of the surf zone. Most indices of West Coast boats sampled in Table 7, fit between .65 and .43, as would be expected for their working environments. The Carter skiff (CARTER) is an exception; it lies outside the expected index range, without an unusual sheer line to compensate, and is also anomalous in length to beam, beam to depth, and sheer to bottom beam proportions, with respect to all other gillnetters. It is

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Table 7. Summarized data for flat-bottomed boats (see Appendix B).
interesting to note how the two later River Inlet skiffs (VMM and B COMM) match closely with the author's interpretation of the Fraser River skiff, and how all three bear quite a close resemblance in form to the Lake George bateau. The early Rivers Inlet skiff (1895), has a lower index owing to its lower freeboard and more sloping sides, not because it is more dory-like. Roberts suggests hulls with beam to depth ratios of over 3 are intended for shallow water work, and most boats sampled fit into this category, although the early Rivers Inlet skiff and the Cape Kiwanda boat to a surprising degree.

Unfortunately, this sample does not contain any gill-net skiffs for American waters. However, quite a clear idea may be formed regarding range in midsection forms employed by gillnetters in British Columbia, and unfortunately, the replicas recently constructed according to Carter's sketch do not fall within it.

In the early gill-net fishery on the Sacramento and Columbia rivers, flat-bottomed boats co-existed with Whitehall boats until the introduction of the double-ended, round-bottomed boat which became known as the Columbia River sailing gillnetter. This new type rapidly replaced both its predecessors on these two important salmon rivers. However, flat-bottomed boats continued to serve in other capacities (as trap or seine boats, for example) in large estuarine environments. On the upper reaches of the Columbia River flat-bottomed boats continued to set gill nets, and significant numbers of flat-bottomed boats continued to set gill nets in most coastal streams.\footnote{154}

Clearly, the persistence of flat-bottomed boats in some areas was a function of environment. It has been demonstrated that flat-bottomed boats were replaced as gill-net grounds were expanded into deeper, less sheltered waters. What the upper reaches of the Columbia River and coastal streams share is narrow, protected waterways. The relatively short, shallow nets did not demand a particularly capacious craft, and catches could be quickly delivered to the nearby cannery. Rowing was more important than good sailing ability where winds were less reliable, so that relatively narrow craft were required. Unless the boat operated in swiftly running water, few other criteria, in terms of form, had to be filled. If environment were the strict determinant of round-bottomed versus flat-bottomed usage, then the relative distribution of these classes of craft should follow stream size and exposure. But the Fraser

\footnote{154 Parallel examples exist on the Atlantic Coast where flat-bottomed types in the late nineteenth century worked the same fishery as round-bottomed boats. In some cases the two types coexisted on the same stream or general area, sometimes one replaced the other (Chapelle, 1951:137; Dunfield, 1985:52)}
River, the second largest on the coast, was the preserve of flat-bottomed gillnetters until the last decade of the nineteenth century, while some coastal streams and bays in Oregon and Washington were served by fleets of round-bottomed gillnetters at an earlier date.

The Fraser River is distinguished from the Columbia and Sacramento Rivers by the protection offered by Vancouver Island. Though sea conditions at the Sandheads can be treacherous, the average wind velocity in the lee of Vancouver Island is less than on the estuaries of either the Columbia or Sacramento rivers, or many coastal streams. Regional characteristics of flat-bottomed boats also indicate that the international border presented, at an early date, a barrier to boat-building traditions. However, the distribution of flat-bottomed boats on the coastal streams and bays to the north and south of the Columbia River may suggest other factors had influence.

Willapa (Shoalwater) Bay is a relatively large body of water where the Columbia River sailing gillnetter seems to have been used exclusively from the beginning of the gill-net fishery there. Yet, farther north, Gray’s Harbor is an even larger water body, where flat-bottomed gillnetters coexisted with a few of the Columbia River type at the time of Collins’ report (1892a); and in the 1890s flat-bottomed gillnetters at Gray’s Harbor seem to have replaced all round-bottomed boats in the role (see pages 167-168). In Californian coastal streams round-bottomed gillnetters were never significantly represented. Hume’s inventories from the Rogue River fishery show four round-bottomed gillnetters in use by 1881, but, unless the “drift boat” was a round-bottomed type, all new gill-net boats acquired after 1886 were flat-bottomed. In streams closer to the Columbia, Collins reports two types used on the Coos River and Bay, and mostly Columbia River boats at the Umpqua and Tillamook fisheries. All other streams used primarily flat-bottomed boats. It is true that the fisheries at Coos, Umpqua and Tillamook involved relatively large water bodies, but they were also distinguished by a large number of non-resident fishermen, and the greatest proportion of cannery-owned boats. Coos Bay had a local boat builder who turned out Columbia River sailing gillnetters (see page 130), which was rare for smaller streams. Generally, there is a pattern of streams closest to the Columbia River being the ones most likely to employ round-bottomed boats (see pages 154-162).

Clearly the Columbia River, and Astoria in particular in conjunction with banking/distribution centre, Portland, had became a "centre of maritime culture" (Westerdahl, 1992:6). This was an area which concentrated industrial capital, and supported a considerable number of boat builders with relatively large establishments. From its Columbia River epicentre the salmon canning industry expanded its influence
radially, introducing its capital, transportation, fishermen, and boats to a diminishing degree to smaller fisheries the farther they were located from the Columbia River. Central and western Alaska were exceptions due to the exceptionally small local populations there. Where local resident fishermen who owned their own boats were in the greatest number, and capital investment from Columbia River interests was the least, gillnetters used on the Oregon and Washington coasts were consistently flat-bottomed and transom-sterned. Because most resident fishermen were American-born caucasians or Natives, while most non-resident fishermen were of Scandinavian or Mediterranean descent, there is also an ethnic distinction between many fishermen who used round-bottomed boats, built primarily on the Columbia River, and those who built and used local flat-bottomed gillnetters.

The lower Sacramento River may be characterized as part of the San Francisco maritime culture centre, which was coast's largest, and be said to have "colonized" the Columbia River fishery in its early years of canning. In Puget Sound, the urbanization which accompanies successful development of a maritime centre, occurred relatively late. Due to the Puget Sound environment, the fishery component most influenced by development at this centre was the purse seine and its associated implements. Though the lower Fraser River today is bounded on all sides by Vancouver's suburban development, until the 1880s it was not a developed area at all. Capital for the province's fisheries was concentrated in Victoria, a city which did not possess a significant salmon fishery itself. In terms of fishery artifacts, Victoria's influence was focused in the halibut and sealing fisheries.

In northern British Columbia flat-bottomed boats were initially imported from boat-building shops in the Fraser River/Vancouver area, but the use of flat-bottomed boats only persisted where local shops, such as Anderson's in Sointula provided them. In Bristol Bay, where no local builders established themselves, all gillnetters were imported. The flat-bottomed boats which were used there briefly around the turn of the century were obviously not a local type. Based on the Columbia River boats, the flat-bottomed version were not successful, it must be surmised, because they did not perform as well, nor last as long, as the Columbia River boats of the same capacity.

The largest size of flat-bottomed gillnetter to have enjoyed success was the gillnetter type, around 27 feet (8.2 m) long, used on Rivers Inlet. Though a relatively narrow craft, this boat would have matched the capacity of the earliest round-bottomed gillnetters. While the early round-bottom gillnetters did not surpass the potential capacity limits of the flat-bottomed boats, in many areas they replaced the much less
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expensive flat-bottomed boats completely as gillnetters. The simultaneous replacement of the round-bottomed Whitehall demonstrates that the new gillnetters offered different advantages over their predecessors than those dependant on capacity and method of construction.

Round-Bottomed Gillnetters

The round-bottomed gillnetters of the Pacific Coast, most often called Columbia River boats, enjoyed a sphere of operations unprecedented among inshore fishing craft. They fulfilled requirements for a craft small enough to be managed by two men with oars or sail, capable of carrying the remarkably heavy loads of salmon which could be taken from the Pacific streams, and able to safely navigate the taxing interface between river and ocean in most conditions. In many respects, they belonged to a broad category of fishing shallows which appeared in various guises on the Atlantic Coast and Great Lakes in the early and middle years of the nineteenth century (Chapelle, 1951:136). Unlike many eastern boats in the loose class from the Atlantic, the round-bottomed gillnetters maintained the simplicity of a single-masted rig, despite convention of the Atlantic as well as Europe which split the rig in two on craft over 20 feet (6.1 m) in length (Oughtred, 1987b:84). Pacific gillnetters were unusual also in that they did not rely on deep hulls or ballast for seaworthiness, but earned form stability with full midship sections. To maintain performance under oars and sails the waterline was greatly hollowed at the ends. In compensation for the fine ends, and to provide reserve buoyancy in a seaway, dramatic flare was built in the bow and stern to meet a full sheer in plan. This flare has become common in this century as a typically shaped bow for powerboats, but in the mid-nineteenth century it was exceedingly rare. No similarly shaped fishing boat of the time in North America has been identified, and the closest approximation anywhere to the form seems to be the Norfolk wherry, a locally developed type used only on the coastal waters of Norfolk and East Anglia, England.

Though the Norfolk wherry was a sailing cargo carrier and considerably larger than the Columbia River gillnetter, it operated similarly in an often shallow estuarine environment with excursions into open water. Its form provided seaworthiness and reserve buoyancy for the heavy cargos, while reserving fine lines in its lower hull for performance when light. Its hollow lines forward were said to contribute to the wherry's remarkably good performance to weather (Green, 1953). One source suggests that the supposed first builder of the gillnetter, Griffin, may have hailed from the Norfolk area, given that his was a common name in the
area (Yates & Erikson, 1978:27). However, a search of common names in Norfolk has shown this assertion to be unfounded (Joan Moore, pers. comm. 1993). In any case, the lap-planked wherry has little in common structurally with the gillnetter.

Other researchers have suggested that the gillnetter had been inspired by lifeboats or whaleboats (Andrews & Larsson, 1959:56; Leather, 1979:377). The start and end point of this argument seems to be the shared double-ended form.155 Besides being sharp at both ends, the whaleboat has nothing in common, with respect to form, with the gillnetter, and shares no more structural elements with the gillnetter than it does with countless other boats. "Lifeboats", in the modern sense, with their double and full ends, had not yet been introduced in the 1860s. The more burdensome of the ships' boats had transom sterns, while, the long and light double-ended ships' cutters and whaleboats had more in common with true whaleboats than with gillnetters (Blandford, 1974:75-83; Ansel, 1978; Butts, 1858 1991:101).

The logical predecessors for the Pacific Coast gillnetter were the two round-bottomed fishing boats already in use in California in the 1860s. The feluccas were double-ended and had full midsections with fine ends. The sprit rig of the Whitehall had demonstrated its advantages over the lateen for gill-net fishing. Without more knowledge of the details of early Pacific Whitehall construction, it is not possible to say with certainty, but the Whitehall probably also offered the plank keel with centreboard arrangement. Both felucca and Whitehall employed nearly plumb ends. The lack of keelson, and keel without rabbet, which mark Columbia River boats used everywhere, strongly suggests a relationship with the felucca, as do the uncaulked planks employed on Suisun Bay boats. This last technique is of uncertain antiquity, however, and may have been employed only by builders of Mediterranean descent on the Sacramento, as gillnetters built at more northern locations after the turn of the century, if not well before, certainly were caulked conventionally.

The story of "Greek Joe" and the builder Griffin may be apocryphal, though Collins, who is the primary source for the tale in print, is generally reliable. But the form and construction of the gillnetters, along with the strong Mediterranean representation among Sacramento fishermen by the late 1860s makes very plausible the idea of a builder, or builders, perhaps with experience in Whitehall manufacture, being approached by Greek or Italian fishermen to combine the qualities of the

155 Chapelle notes that this is a "standard assumption..., for nearly every American double-ender" (1951:173). See also Gardner (1955:28).
felucca and Whitehall to best meet the requirements of gill-net fishing on the lower Sacramento River.

That the Columbia River type underwent gradual transformations at least until the 1920s is revealed in Tables 4 and 6 (see pages 132, 249). The length to beam proportions decreased on the Columbia River, beginning in the 1880s, to beamier proportions better suited for sailing than for rowing by the turn of the century. The evidence suggests that the distinctively flaring ends were developed over the years also, though this is more difficult to confirm. Projecting the evolutionary trends of Columbia River boat backwards, the first one built may have lacked strongly flaring ends, had a length to beam ratio around four to one or greater, and a length of only slightly over 20 feet (6.1 m). This hypothetical boat represents no radical departure from the Whitehalls already in use in the Sacramento gill-net fishery, apart from its sharp stern and a potentially different midsection. In this light, the double-ended gillnetter was an innovation based on existing types, not a radical new introduction. Yet, the Whitehalls and flat-bottomed boats were rapidly and completely replaced on both the Sacramento and Columbia Rivers. This implies that a midsection considerably different than the Whitehall’s was employed in the new gillnetter from the start, and begs further examination of the sharp stern’s advantages for gill-netting.

Fishermen claim that nets were more easily pulled over the quarter of a sharp-stereded boat than one with a transom. Without the rollers, which were employed much later, the "corners" of a square-stereded boat could have caught on nets. Interestingly, however, this was not considered a problem on the Atlantic Coast where gill-net boats were typically square-stereded. Sacrificed for the sharp stern was some stability, and the lack of working space aft. The former seems not to have been compensated for with a firm midsection. The latter sparked debate on the Great Lakes between proponents of the square-stereded Huron boats and those who preferred the sharp-stereded Mackinaws. However, this debate was not strongly voiced on the Pacific until the sharp sterns of power gillnetters were compromised to alleviate this problem. Sharp sterns are preferable in choppy, broken seas often found on lower estuaries (Folkhard, 1901:20). The sharp stern further provided gillnetters with the ability to take on substantial loads without immersing a transom and causing the attendant increase in resistance. This added a new dimension to the greater capacity offered by the double-ended gillnetter.

There is surely a cultural component to the startling success of the new type, however. While the fishermen who had first used the Whitehalls hailed from the Northeastern coast of the United States, salmon fisher
on the Sacramento by the 1860s were increasingly of Mediterranean descent. The mental template they had of the "proper" boat was a double-ended one. Whether or not they engaged in the construction of the new type themselves is irrelevant, because, through their selective buying power as independent fisherman, they could influence what boats builders produced. Mediterranean-born fishermen, of course, followed the salmon fishery north to the Columbia River, but they did not, as some have suggested, "take their boats with them". The boats leap-frogged quickly to the Columbia River because the early canners, unlike their successors, were fishermen first, who had only recently become fish processors. R.D. Hume, for example, fished himself from the double-ender he claims to have brought first from San Francisco. Once the new type had been launched on the Sacramento, these men would have been quick to see its advantages with respect to capacity, performance while loaded, seaworthiness, as well as the subtleties such as the double-ender's facility for following "lead" of the net (see page 155). They also possessed the capital to purchase and ship the boats to the Columbia, where the non-resident fishermen would not have.

Once the type was established on the Columbia River, other cultural influences undoubtedly contributed to modifications of the basic model. There, fishermen of Scandinavian descent were most numerous among resident fishermen. They were the ones most likely to own their own boats rather than use cannery-owned boats, and were consequently able to influence the type of boat produced by new local boat builders eager to establish their product's superiority over boats imported from San Francisco. It was a happy coincidence that for Scandinavians the double-ended form was so culturally agreeable, a factor which further stimulated modifications by many fishermen and encouraged others to become builders themselves. It is clearly not the case that the double-ended gillnetter was introduced by Scandinavians as has occasionally been suggested. But again, there is more than a grain of truth in the sentiment, because the type was certainly modified under the influence of Scandinavian fishermen and boat builders on the Columbia River.

It would be very interesting to contrast the parallel evolution which probably occurred on the West Coast, as one branch of double-ended gillnetters developed under primarily Scandinavian influences with respect to conditions on the Columbia River, while Suisun Bay boats responded to slightly different environmental conditions under primarily Mediterranean influences. Unfortunately, the record of the boats used on the Sacramento River is almost completely barren, so comparison between the two maritime culture centres is not possible without archaeological evidence. Hopes to find traces of two traditions in Bristol Bay boats were not fulfilled,
because none of the sampled boats has a confirmed origin in San Francisco, and the strict criteria which the Alaskan canners laid out for boat builders probably worked against the persistence of local building traditions in any case. Of the two distinct midsection forms which are evident in the sample of Bristol Bay boats, the flat-floored type with full bilges is certainly most closely related to the traditional Columbia River form. The boats marked by straight floors and topsides with exceptionally hard bilge turns seem more likely to have come off a twentieth-century naval architect’s board than be born of a nineteenth-century form locally evolved, but this is only speculation.

The local adaptation and evolution of round-bottomed sailing gillnetters on the Fraser River was just beginning as conversion to accommodate motors began. Essentially these boats were still an imported type, little modified from their original Great Lakes form. This is particularly the case for builders, like Watts and Wallace, who built their boats on solid molds, obviously with firmly fixed ideas of how their boats should be built. The variations in size and form noted in photographs were certainly, in large part, the contributions of Japanese builders working in smaller yards where flexibility was not only provided through construction methods, but also in the philosophy of the builders. For Japanese builders, so many elements of the boats they were building were alien, including the double-ended form, the rig, round-bottoms, and even the keel. To work in the new boat building tradition, these builders must first have almost completely shattered their old mental templates with respect boat building. In this state, modification and innovation within the borrowed tradition would have come very readily to Japanese builders. Under the continued influence of Japanese fishermen and builders, the round-bottomed sailing gillnetters in British Columbia would surely have rapidly developed in ways which responded in greater measure to local environment and building materials, than to tradition, whether local or imported. This potential was richly fulfilled with aesthetically and functionally superb engine-powered fishing boats produced in succeeding years by many Japanese builders, but their influence as boat builders on the West Coast came too late to be of great consequence for sailing boat design.

What is particularly interesting about the boats of the Fraser River is their definition by both fishermen and builders as Columbia River sailing gillnetters, when clearly they were an imported type, though, in some cases, modified to a small degree by Japanese builders and fishermen who had nothing to do with salmon fisheries across the border. The border which was a significant barrier to the migration of boat type proved utterly porous for terminology. "Columbia River gillnetter" seems to have
become a term divorced from a narrow definition of type, or of geographic significance, and had become synonymous only with the loose concept of round-bottomed salmon gillnetter.\textsuperscript{156} The gillnetters of the Fraser River were placed in this category despite the fact these boats had completely distinctive rigs, were somewhat smaller, were narrower in proportion to length, employed a distinctive keel structure which sometimes, if not always, included the use of a keelson, were often clinker-planked, and had a much less distinctive flare built into the ends.\textsuperscript{157}

Round-bottomed gillnetters were most often built in fairly large yards capable of a considerable production. It has been estimated that as many as 8,000 Columbia River boats were built, excluding those double-enders built in British Columbia and for the Alaska fishery (Yates, 1979:25). As a "stock" boat, the type was loosely defined, as illustrated by the application of the name, Columbia River boat, to round-bottomed boats used on the Fraser River. The form used, particularly on the Columbia River and for the Bristol Bay fishery, was not a simple one easily undertaken by minimally trained fishermen/builders. The flare built into the ends was a unique feature developed to meet specific criteria of the gillnetter's operating environment, and the Pacific salmon gill-net fishery. It was a feature which demanded of the builder considerable and expert twisting of the planks. It was also a shape achievable only with bent frames. As the preferred material for bent frames was imported oak, the building of these boats was further concentrated in maritime centres where imports were more accessible and less expensive.

Examination of data relating to Columbia River sailing gillnetters shows the design not to have been fixed, but rather in a gradual, but

\textsuperscript{156} The term Columbia River gill net boat was applied also to boats used on Bristol Bay at least until the late 1930s (Nakat Packing Corporation, 1937).

\textsuperscript{157} Notable similarities between the Fraser River and Columbia River gillnetters include the half-decked format, and the internal arrangement, both almost identical features on the two types. To phrase this another way, it is remarkable that the Columbia River boat resembled the double-ended boats of the Great Lakes in such a striking fashion. It must be wondered if this was coincidence, or whether Scandinavian fishermen on the Columbia, many of whom arrived on the West Coast via Minnesota and Michigan, brought more ideas with them from the Great Lakes than from the "Old Country".

The use of side-decks on the gillnetters was an important aspect of construction, which allowed the midship form to be kept shallow for easiest handling of nets and oars, despite increased overall dimensions. While this may seem of obvious benefit today, traditional preferences on the part of conservative fishermen, even into the early twentieth century, retarded the introduction of even half decks to many small fishing boats on both sides of the Atlantic (Knight, 1901:33).
constant, state of change, marked by some definable trends, at least until the 1920s. The pattern of development for this type within the stock-boat envelope, conforms to Chapelle's definition, though perhaps even greater flexibility was shown by most large boat shops on the Pacific Coast than Chapelle suggests (1951:189-191):

These boats show the strength and lasting qualities possible in the old standard building materials, and prove that the 'stock boat' may well be built under mass-production methods if the builder desires. Poor construction, or jerry-building is not inherent in the mass production of boats, if emphasis is placed on quality and not upon fancy finish or some other unimportant detail.

The mass-produced stock boat used for commercial fishing has never been recognized by writers for what it really was: a successful design that had been proven by trial and that had achieved sufficient recognition of this to permit repeat sales. Of course, the application of 'mass-produced' to small-boat construction is a little far-fetched, since in only a few cases were there large yearly outputs of a single model. Among the types which were built in very large numbers in a single year, the Banks dory is the outstanding example. The rest, with few exceptions, would be more properly classed as stock boats which were repeated without major changes over and over again, for a period of years. The yearly production of one of these boats, in a single boatshop, may range from two to a hundred, as was the case with the Gloucester seine boat, the New Bedford whaleboat, the New Haven sharpie, the Columbia River salmon boat, and others.

Many local types of small working boats were produced by a very small number of professional boatbuilders, with additional boats being built by amateurs, fishermen, and others. The professionals tended toward the stock boat, for they knew that any new design was, to a great extent, an experiment. Once a successful and outstanding model had been produced, it was well to repeat it when possible. This would not only avoid the uncertainties of a new design, but would also allow the use of existing molds and patterns and the experience obtained in building the first boat. This would lead, normally, to the freezing of the designs and to a lack of improvement -- the usual complaint of standardization. However, in boat shops this difficulty was rather academic for a number of reasons. In early days, mass production was not a fetish, and the builders did not begin business by obtaining a design and then tooling up to produce it in huge numbers. They began business as 'custom' builders, constructing boats to order. When one was found that appeared to be in demand, it was repeated as long as sales were possible. As a result, the stock boat in a shop came into being very gradually and usually without extensive and speculative 'stocking-up' of boats in advance of sales. The lack of expensive jigs and special equipment enabled the shift to be made from one design to another, when such a change was evident in the demand for boats. Therefore, the effect of competitive design in these small craft was constantly met and the possible braking effect of mass production was rarely felt.
Boat-Builders

The salmon canning industry was one marked by sharp ethnic division. These divisions often were defined by, or often defined, labour classifications. At the bottom of the hierarchy were the cannery workers, Native, Chinese, and later, Filipino and Mexican. Though many North American-born caucasians worked as fishermen, Mediterranean or Scandinavian immigrants were the most numerous in the United States, while Natives and Japanese in their turn were the most numerous fishermen in British Columbia. Cannery foremen were generally North American-born caucasians, while the canners themselves were a solidly Anglo-Saxon group born usually on the eastern seaboard of the continent, or in Great Britain in the case of several British Columbian canners. The Native-run cannery at Metlakatla, and the Afro-American canner, Deas, on the Fraser River, were rare exceptions.

The boat-building profession was largely removed from the ethnic solitudes built into the canning industry. These craftsmen enjoyed a sharply different relationship with fishing companies than boat-builders in the early East Coast cod fishery, where boat building was often part of indentured tenure (MacKay, 1990:19). Generally, the first builders of boats for the canning industry were North American-born caucasians, who, like the cannery owners, came mostly from the East Coast. Later, immigrants contributed considerably as professional builders supplying the canning industry. The boats they built acquired their distinctive features through a series of small innovations, without any great departures from the forms and construction methods already proven suitable to fishery and environment. The gillnetters spread the length of the Coast due to the fact that newly opened fisheries had few boat builders and no established boat-building tradition, at least in the round-bottomed class of gillnetter. Though, clearly, the canning industry made conspicuous efforts to retard dramatic change in boat design after the introduction of engines, for the most part, the industry was not antagonistic to gradual and conservative change over preceding years. Even boat builders who built large numbers of boats for cannery orders over the years had the freedom to engage in a "new work" (Gilmore, 1981:24) while staying within the envelope of type ordered by canneries.

Three factors worked within the canning industry against the introduction of a radically new type once the local mental template of the "right sort of boat" for salmon gill-netting in the Pacific had been formed. The first was represented by the canners, who made their demands of boat builders very clear in later years (i.e. Naket Packing Corporation, 1937; see page 246). Whether they did so to the same degree at earlier dates is not known, but with the ability to order dozens or even hundreds
of boats at a time they were clearly a force builders had no choice but to respond to. The canner, Bell-Irving, demonstrates in his diary notes (16, December 1, 1896; see 249) that with respect to variation in boat form, a few cannery-owners, at least, were prepared to take the recommendations of fishermen seriously when placing their orders for boats. Thus, even fishermen manning rental boats may have had some influence on design. As has been demonstrated, it was the independent fisherman who had the greatest potential among fishermen to alter the design of boats, and yet, again, they showed no inclination towards radical departure from the established form of the gillnetter. Finally, the boat builders themselves were a factor. Whether from good business sense, or the necessities of demand, or simply a practical respect for types already proven in the region, new professional builders rapidly abandoned any preconceptions brought with them from their homeland or place of training. The relative strengths of these factors undoubtedly varied at different times and locales, but ensured that round-bottomed gillnetters, as well as seine boats, would be used in most areas of the Pacific Coast where canners were active.

While the canning industry had tremendous powers of distribution, it did not stimulate great innovation in boats. This corresponds with the industry's broad approach toward new technology, which was generally borrowed and adopted, rather than specially developed (Stacey, 1977:1-2). The double-ended gillnetter was not created for the salmon canning industry. It appeared on the Sacramento River at a time when canners were not active on the river; it was a product of the market fishery. While the market fishery lacked the canning industry's ability to distribute a single type, its independent fishermen and the small yards which served it were far more creative. It was within the market fishery that the felucca was introduced along with the crab boats and handliners employed by Mediterranean fishermen. The full variety of Chinese boats emerged in a market fishery, as did the sharpies in various locations, and double-ended handliners of northern waters.

The ethnic divisions of the market fisheries tended to be vertical, rather than horizontal. In the heavily populated San Francisco area, two ethnically distinct market fisheries developed more or less simultaneously, and existed side by side for many years. Within each system, all participants from fishermen to retailers, including boat builders, shared a single cultural background. The boats first built by or for the pioneer Chinese and Italian market fisheries were transplants, though these were later modified to a degree not definable with the data at hand. The builders of Chinese and Italian market boats prove not to have been as culturally isolated as previously supposed. Even the
Chinese, the least assimilated of the two groups, incorporated some changes from outside their traditions, and may have contributed to the development of the purse seine later used by canners. Italian builders built not only feluccas but crab boats, which seem to have owed much to the Mediterranean boat-building tradition, and also flat-bottomed handliners, which were entirely outside the Mediterranean tradition though eminently suited to local building materials. The felucca, in turn, may have substantially contributed to the development of the double-ended gillnetter. Italian builders also began building gillnetters for the Sacramento River fishery, and at least one builder, Cristofani, of Anderson & Cristofani, built gillnetters in large numbers for the Alaska fishery.

Clearly, the introduction of a new type in an area is highly dependant on timing. Builders seem to reproduce what they knew from another place only when no suitable and proven type is yet used in their new location. There must also be a strong local cultural base for an introduced type to continue in use and develop. The lack of ethnic communities with sufficient size and economic stature, appears to be the most important reason why Chinese and Mediterranean types did not take hold in Puget Sound and southern British Columbia. However, timing is all important, as the example of the large and active Italian fishing community in Boston, which exclusively used boats previously introduced by American and Irish builders, demonstrates (see page 275). The predominance, original building tradition on the West Coast, the Native dugout canoe, was, however, completely ignored by immigrant builders.

In terms of human behaviour, the most interesting phenomena is not that the first immigrant boat builders introdud boat types from their homelands, but rather that the ones who followed, sometimes very shortly after, did not. The Japanese builders in British Columbia offer the most dramatic case in point, yet the scenario was typical. Watts is not an exception; when he introduced the Collingwood boat to the Fraser River at a relatively late date, no round-bottomed boats had preceded his model on the river, and his boat so near to the common vision of the Columbia River boat that it escaped distinction by name. This perspective provides some insight to the, now almost cliche, expression that "all fishermen and builders are conservative". Evidently, all types unique to the West Coast were the product of very gradual and conservative alterations taking place over many years between the first appearance of an imported progenitor and the more radical alterations needed to accommodate gas motors. The "conservatism" of both builders and fishermen, however, was firmly set in the context of their new environment, the "proven theories and well-tried fashions" from which they worked (Gilmore, 1981:24) were established on
the West Coast, rather than in the cultural traditions or mental templates brought with them from abroad. The most valued tradition was clearly the local one, no matter how recently it may have been established.

Typology

The typology of Salmon fishing boats on the Pacific Coast is presented in Table 8. Classification is based on the principal that minimal remains are present, so that elements prioritized from the bottom. In the first order of classification are the categories dugout, flat-bottom, deadrise, and round-bottom. All these categories reference structure rather than form. In the second order, bottom structure is defined by keel type in round-bottomed forms, and by direction of bottom-planking in flatbottomed forms. In the third order planking method is described as either lapped, flush, or strip. And finally, in the fourth order, stern structure is described as either sharp (double-ended), transom, or dory (tombstone).

A selection of boats are identified under the appropriate classifications. The use to which the boats in each category were put, either for seining, gillnetting, or trolling, is represented with symbols (boats used as tenders, trap boats, etc. are not listed). General area of use is also indicated.

This typology is simple, and by no means complete. It should, however, provide a starting point for archaeologists uncovering boat remains on the West Coast, and have some heuristic merit for the purposes of this study.
Table 8. Typology of salmon fishing boats on the Pacific Coast.

<table>
<thead>
<tr>
<th>General Class</th>
<th>Bottom Structure</th>
<th>Plank Type</th>
<th>Stern Type</th>
<th>Use Type</th>
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Key to Area and Use Symbols:
- A: San Francisco/Sacramento R./Monterey
- B: Northern California Coastal Streams
- C: Oregon Coastal Streams
- D: Columbia River
- E: Washington Coastal Streams
- F: Puget Sound
- G: Fraser River
- H: B.C. Coastal Streams
- I: Southeast & Central Alaska
- J: Bristol Bay
- K: Gill Net
- L: Seine Net
- M: Hook & Line
CHAPTER V

Conclusion

Small craft have always garnered less academic attention than larger vessels. This neglect has been particularly striking on the Pacific Coast of North America. A century has just passed without more comprehensive and descriptive studies being published than J. W. Collins' reports under the auspices of the U.S. Fish Commission (1892a; 1892b), and these studies did not include British Columbia and Alaska. While East Coast small craft have been neglected less than those on the West Coast, small craft analysis suffers due to the lack of data from other regions through which assumptions about the introduction, evolution, or development of small craft may be tested by analogy. Consequent to the isolation of East Coast small craft studies is a tendency to limit analytic scope by type, or narrow geographic definition, rather than establish a frame of reference based on a specific type of maricultural activity, its modes of exploitation, and its attendant subcultures (Westerdahl, 1982:5). In this study, an inshore fishery (for salmon), oriented primarily towards an export market, backed with considerable outside capital, and developed in an area sparsely inhabited by the cultural group(s) intent on exploiting its fish resource, is examined through the material cultural remains (fishing boats) of two important fishery subcultures, fishing and boat-building.

In several important respects West Coast salmon fishery development is analogous to the cod fishery on the East Coast of North America in the seventeenth and eighteenth centuries. The cod-fishing grounds first exploited by European fishing expeditions were inshore grounds (Albion, Baker, & Labaree, 1972:25). For the short fishing season and for the processing of fish on shore in a land largely unsettled by Europeans, great numbers of temporary workers had to be transported to the grounds along with all the equipment necessary for catching and preserving fish (Samson, 1984:25). Introduced fishing boats came from various building traditions, French, English, Basque, and Portuguese. Fishermen and boat builders were often of ethnic origins distinct from company owners; most of those indentured to English firms were Irish, for example. Competing for the inshore fish resource were first the indigenous populations, and, by the late seventeenth century, independent resident fishermen who had settled the new territory despite contrary wishes and efforts of the fishing companies (Faulkner, 1985:57, 69; MacKay, 1990:17-19). Resident fishermen established boat building traditions which produced the first North American boat types after those of the Native peoples. At a very
early date, both flat-bottomed and round-bottomed boats were employed in the East Coast fisheries; the chaloupes and batteau plats which coexisted on the lower St. Lawrence River in the 1700s anticipated similar side by side developments of flat- and round-bottom types in nearly all emergent North American fisheries. The broad parallels drawn between the East Coast cod fishery and the West Coast salmon fishery as a similar systems of maricultural exploitation may be drawn as well with Great Lakes fisheries, and to a lesser degree with fisheries on the Gulf Coast.

Cultural traits exhibited in small fishing craft from 1850 to 1900 on the West Coast prove extremely sensitive to which cultural group first introduced a craft suitable to the specific fishery and method of fishing. If "tradition" is defined as the mechanism of transfer for cultural elements (Hasslof, 1972:20), it is possible define which traditions among the six suggested by Hasslof (Hasslof, 1972:20-25) had greatest influence on West Coast small craft used and built by immigrants. Oral and manual traditions were of great consequence for the Italian and Chinese fishermen who built boats for the coast's first market fisheries; for successive groups, however, these traditions were of very little importance in ways which would be manifest in the archaeological record of small craft, though they continued with great resilience to influence fine points of fishing technique and seamanship. For oral and manual traditions to effect small craft shape and construction methods, the cultural milieu must be sufficiently large to include individual specialists with the boat-building skills to pass on. In San Francisco, the Chinese and Italian communities were sufficiently large to ensure the reinforcement of oral and manual traditions with object tradition by way of the continued local manufacture of small craft which embodied particular cultural elements. This was apparently not the case in Chinese or Italian fishing communities in Puget Sound and southern British Columbia. While the market fishery was one in which the full range of traditions were most likely to find some expression, object tradition, that provided by boats already successfully in use locally, was still the most influential of the traditions. Within the salmon canning industry, as might be expected, social or institutional tradition was dominant for small craft design once a type had been adopted. Builders in large yards may also have drawn on written and iconographic traditions in the form of newly available published material relating to the building of small craft in the late nineteenth and early twentieth century, but this influence would be most apparent in more standardized construction methods rather than form. The example provided by Japanese builders in British Columbia, who built for both market fishermen and the salmon canning industry, often with minimal reading ability in English, underlines the power of object tradition for
small craft on the West Coast. The best example emphasizing the significance of object tradition is provided by the experiences of Tsimshian boat builder John Davis, Sr. (see pages 231-232).

Given the obvious power of object tradition for West Coast boat building, it seems strange that log-based craft were sometimes used, but almost never built by immigrants to the West Coast. Tentative explanations for this include the considerable number of highly skilled Native craftsmen who remained active in dugout canoe manufacture throughout the nineteenth century, and the rapid proliferation of lumber mills which provided inexpensive, but high grade, planking material beginning in the 1850s. The object tradition provided by Native log craft was rapidly removed in most areas of the Atlantic Coast, yet, immigrants there frequently built log-based craft. Contrasting log-based building on both coasts raises more questions than it answers, but one clear suggestion is that log-based craft on the East Coast were based on European rather than Native models.

Perhaps because dugouts were not readily adopted by immigrant groups to the West Coast, flat-bottomed boats were built the length of the coast. In both Chinese and Italian market fisheries round-bottomed and flat-bottomed craft were used, as they were in the salmon canning fishery. For gill-netting, round-bottomed boats demonstrated superior seaworthiness, capacity, and performance which led to their replacing earlier, less expensive, flat-bottom types as the fishery expanded to more environmentally challenging grounds. But, flat-bottomed boats continued to be used and evolve in many areas where the environment for gill-netting was less challenging and the institutional tradition of the salmon canning industry was weakest, or with specific fishing methods, notably seining. The replacement of round-bottomed boats by flat-bottomed versions of the same class by Chinese builders (see pages 263-264) demonstrates that flat-bottomed construction had recognized advantages in an area providing abundant straight-grained soft wood, milled to large dimensions. Variations in shape and construction methods used in West Coast flat-bottomed craft were considerable. The flush-planked, mostly transom-sterned boats predominate on the California, Oregon and Washington coastal streams share features with flat-bottomed types of the eastern United States, and were usually called "sharpies" by Collins. The introduction of this type seems to have come early to the West Coast, however, probably in advance of similar flat-bottomed boats which appeared in the Carolinas and Georgia the 1870s, for example (Chapelle, 1951:22). Flat-bottomed boats used in British Columbia, distinct in form and construction, emphasize the barrier that the border created from an early date. This division of type also draws into question the supposed influence of
Hudson’s Bay Company bateaux on early flat-bottomed fishing boat design, because this should have led to similar boats being used on both the Columbia and Fraser rivers. If the boats of the fur traders were not models for early fishing boats, then the strength of object tradition may have been rather strictly limited by function. However, there is some reason to question whether the Hudson’s Bay Company even used flat-bottomed boats on rivers draining into the Pacific. Only archaeology will provide more information about some of the first non-Native craft built on the Pacific Coast, how they fulfilled demanding transportation requirements of the fur trade, and how they may have influenced small craft which followed.

The significance of the border, illustrated by the distribution of flat-bottomed types, was again underlined by the exclusion of the true Columbia River sailing gillnetter from Canadian waters. Cross-border distinctions in boat construction and distribution argue against the commonly held supposition that the expansion of the canning industry was one based in San Francisco, where the industry’s financial, institutional, and technological roots were established, and from which point the industry spread homogeneously northward to the arctic. Despite financial investment in the salmon canning industry of British Columbia by San Francisco-based interests between 1877 and 1892, the observed distribution of construction methods and boat types suggests distinct institutional traditions either side of the border, and bolsters the thesis advanced by Ralston (1969:43):

The development of the British Columbia salmon canning industry does not... support the hypothesis that relations between San Francisco and British Columbia in the years 1877-92 were simply those of metropolis and hinterland. There was no simple transfer of an industry from Maine to San Francisco Bay and then northward under the aegis of the commercial and financial agents of the dominant centre. Salmon canning in British Columbia began independently. It was financed primarily by local merchants with trade connections with Great Britain. The bulk of the pack was exported directly, not via San Francisco. American canners on the Fraser and Skeena Rivers were not advance representatives of a takeover by United States industry but a minority interest that was unable to sustain itself and was bought out by British- and Canadian-backed companies.

The record of boat development also suggests that the importance of San Francisco is over-emphasized within the American salmon canning industry as well. The development of the sailing gillnetter on the Sacramento and Columbia rivers seems to have diverged at least by the 1880s. Shaw’s ability to distinguish between Suisun Bay and Columbia River types in use on the Sacramento River at the turn of the century (n.d:9-10) suggests that the Columbia River was exporting ideas, if not artifacts, back to the supposed centre of salmon canning development. Beginning in the 1880s,
the lower Columbia River should be viewed as a maritime culture centre in its own right, with distinctive institutional traditions becoming evident in boat form. While some building material may have been exotic, the boat form was regionally derived, and locally influenced. That "Finn-built" boats (built on the Columbia River) could still be distinguished to the end of the sailing era in Bristol Bay in 1951, demonstrates the strength of these traditions.

While small craft in the salmon fishery belong to the history of capital and industrial development of the West Coast (Schuyler, 1970), they also reflect the more personal, pre-industrial traditions of the independent boatman for whom the boat was his "primary material link with his cultural identity" (Lonergan, 1988:96). Among early market fishermen, boats were important manifestations of ethnicity reflecting successfully maintained traditions which survived despite forces of acculturation and assimilation (Pastron, 1989:53). Late-arriving groups quickly adapted to previously established boat types in part because the relationship of labour and capital within the canning industry left gear-renting fisherman in the weakest of all possible positions (Acheson, 1981:290). While no significant innovations in boat design appeared among boats built for the canning industry, nor was the market fishery marked by great innovation after its formative years. The evidence presented here challenges by analogy the supposition that the types which emerged in the middle and late years of the nineteenth century on the East Coast were products of the industrial revolution, and significantly different from craft which preceded them (Adam, 1988:2). In respect to small craft, the power of emergent institutional traditions intrinsic to industry lay in their capabilities of distribution rather than invention. While some local types might be overcome by a type introduced by industry, the new type was not a product of industry, rather, another local type given a greatly expanded sphere of operation by industry's embrace of it. Consequently, the new types were not really new, and only significantly different than types which preceded them in areas where previous types belonged to a boat building tradition unfavoured by industry. However, it is also evident from this study that boats adopted by industry did not become standardized industrial products. They were still subject to the influences of gradual change and modification consequent to experience gained by boat builders and fishermen, and subject to imprint by emergent maritime culture centres within the broader sphere of industrial operations. With the exception of a very few yards, boat building in the nineteenth century was not industrialized; the "interplay between tradition and innovation... one of the most typical traits of... non-industrialized craft[s]..." (Crumlin-
Pedersen, 1972:217) remained an important element even for those yards which largely owed their existence to the salmon canning industry.

Maritime activities of the last century and even the early twentieth century remain poorly understood. In many ways, small craft and the maritime cultures which produced them are lost to "prehistory within memory" (Lehmann, 1988:173). The wealth of new information which can yet be gleaned from a limited selection of photographs only underscores the paucity of the written record in this field. The photographic record deserves more attention, as digitally enhanced images manipulated by computer hold much promise as a research tool. But, archaeology holds the greatest potential for improving our understanding maritime activities on the West Coast.

This study is largely historical due to the almost complete failure of archaeology to fulfill its promise for the West Coast to date. Herreshoff may be right in his assertion that wood was made to rot, but the estuarine environment, where most of the wooden artifacts examined in this study were used, lost, and abandoned, is ideal for preservation. The recovery of the China Point sampan and the boat models from Rincon Point, the partially documented gillnetter remains on Puget Island, and scattered undocumented hulls on land in remote parts of British Columbia and Alaska, all bode well for future finds. That archaeology has contributed so little in this field is the product of academic neglect and oversight, and the lack of cultural resource management programs responsive to the cultural resources in the maritime environment generally, and sensitive to small craft remains specifically.

Fishing was a staple industry vital to European settlement on both Atlantic and Pacific coasts of the North American continent. Historic records have been well mined, and those who might provide oral testimony to the early salmon fisheries of the West Coast have almost all passed away. New information pertaining to early West Coast fishing boats may be entirely dependent on the archaeological record; it is only hoped that another hundred years will not pass before the next study.
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APPENDIX A

REGARDING FIGURE 2

Statistics for the 1888 fishing season used for the southern three states were gleaned from Collins (1892a:170, 174, 175, 177, 234). Statistics for British Columbia relate to the fishing season of 1888 and are taken from Rousefell & Kelez (1938:706). Detailed Alaskan statistics are unavailable for 1888; those indicated are for 1889 (Wilcox 1893:300). The map shows a distribution of boats which reflects a salmon fishery where the Columbia River still boasted the greatest number of salmon caught, before the more northern streams were fully developed. The Columbia River, however, had already begun its decline; its 1884 pack of 620,000 cases of Chinook salmon would be surpassed only by the 1895 pack of 634,000 cases, a pack which includes three other species of salmon as well as steelhead trout, all which began to be canned on the river in 1888 (Craig & Hacker 1940:153). The number of gillnet boats operating on the Columbia rose to 2,596 in 1904 before powerboats began to make a serious impact, however the latter figure includes both boats used for nets and traps without differentiation (Craig & Hacker 1940:183). The Sacramento River pack of 68,000 cases for 1888 would never again be exceeded, though contrast with the 200,000 case high for the river in the year 1882 shows the extent of that river's decline. The Fraser River was officially under licence limitation to 500 boats in 1888; the numbers had not exceeded 1,000 in previous years, but reached a high of 3,096 licenses in 1903 (Rousefell & Kelez 1938:706). The greatest pack on the Fraser was 956,000 in 1901 (D.O.F. Reports for 1902-1914). Greatest packs for Northern British Columbia and Alaska came in the twentieth century. Eight million cases were packed in Alaska in 1936; nearly 4,000 gillnet boats, most of these still operating under sail, were licensed in the territory that year (Cooley 1963:48-50). Seine nets, still used in relatively small numbers in 1888, would increase steadily in number to the end of the century in the areas indicated. Location of both seines and fixed gear was often determined by legislation. The handline fishery was ubiquitous, but developed commercially only in the five areas indicated near the turn of the century; adequate statistics of the numbers of boats participating in this early fishery were never recorded.
APPENDIX B

KEY FOR TABLES SUMMARIZING BOAT CHARACTERISTICS

Tables summarizing characteristics of boats studied here are headed with briefly identified data fields requiring some explanation. Not all the fields, or columns, are used in every table. All the terms used in the tables are listed below in the order they generally appear in tabular form, grouped in four categories: numeric hull shape descriptions; graphic representations of hull shape, rig, and details of finish; scantling descriptions; and construction details.

Numeric hull shape descriptions

LOA: length overall, length between the extremes of stem and stern post, excluding appendages such as a rudder or bowsprit, expressed in feet and decimals of feet.

BEAM: maximum beam, or breadth, measured to the outside of the planking, typically at the sheer, expressed in feet and decimals of feet.

BB: bottom beam, or breadth to outside of planking across the bottom of flat-bottomed boats, expressed in feet and decimals of feet.

L/B: length overall (LOA) divided by maximum beam (BEAM). Following McKee's classification, a boat with a quotient of 2.6 and under is "beamy" while 3.75 and over is "narrow" (1983:81). For comparison see Henry and Miller (1965:13-15).

This ratio is usually most usefully expressed as waterline length over waterline beam instead of length overall over maximum beam, but available data often supply only the latter, and the West Coast boats examined exhibit generally bluff ends and relatively vertical topsides which would not prejudice results using the latter measurements.

FLOOR: the rise of the floor amidships expressed as a slope, rise over run. Following McKee's classification (1983:81), floors rising less than 1 in 8 are noted "flat", and floors rising between this and 1 in 3, "raised". Floors rising more sharply than this are described here as "steep" instead of "ree" to avoid confusion in terms with v-bottomed, hard-chined boats. Where only a written description of floor rise is available, this is indicated in quotation marks.

BILGE: the turn of the bilge expressed per McKee (1983:81) as beam divided by radius of the turn of the bilge. Bilge curvature under one tenth of beam is called "hard", over one third "slack", in between "round". Hard chines are so noted. Where only a written description of the bilge turn is available, this is indicated in quotation marks.

DEPTH: the boats' depth measuring from the top of the sheer amidships to the fairbody, or line formed where the lower face of the garboard meets the keel, expressed in feet and decimals of feet (McKee 1983:81). In descriptions taken from texts, hold depth may be quoted, that is, depth measured from the bottom of the deck beams to top of keelson or ceiling.

B/D: BEAM divided DEPTH. A quotient 2.0 and under is "deep", 3.0 and over, "shallow" (McKee 1983:81).
FBRD: freeboard, measured in feet from load waterline amidships to the sheer, or deckline on boats with bulwarks, divided by LOA.

SHEER: height of sheer expressed as the highest freeboard, typically measured at the bow (from sheer, or deckline on boats with bulwarks) in feet to load waterline, over freeboard measured amidships.

ENDHT: vertical height of most prominent end (bow or stern) from horizontal extension of forefoot to end of sheer line, expressed in feet and decimals of feet. Used only for craft with considerable rocker.

SHR(FT): sheer expressed as the difference in height between sheer at the lowest point and sheer at the highest end, measured from a baseline, in feet and decimals of feet (used when waterline is not obvious).

ROCKER: difference in height from baseline to bottom at lowest point and bottom at highest end, expressed in feet and decimals of feet.

SEC: percentage of the midship section related to the rectangle defined by DEPTH multiplied by BEAM. Following McKee's classification percentages over 85 reflect "full" midsections, 80 to 85 "firm", or if under 70 "easy" (1983:81).

SLOPE: slope, or flare angle of sides, on flat-bottomed boats, measured in degrees from horizontal (Roberts, 1983).

BB/MB: bottom beam (BB) over maximum beam (BEAM, or MB) (Roberts, 1983).

INDEX: index, or coefficient, expressing the product of sine of flare angle (SLOPE), and bottom beam over maximum beam (BB/MB) (Roberts, 1983).

ENTSHR: angle off the centreline to sheer in plan (at bow), expressed in degrees.

ENTWL: angle off the centreline to load waterline (at bow), expressed in degrees (often termed "1/2 entrance angle").

TWIST: difference in degrees between ENTSHE and ENTWL.

PC: prismatic coefficient, a formula of displacement, expressed in cubic feet, over waterline length multiplied by the area of the largest section in feet. See Kinney (1973:283-285).

CF: centre of flotation, expressed as a percentage of waterline length aft. This typically locates a boat's fullest section.

DISP: displacement, under normal loaded conditions as they can be best estimated, expressed in pounds.

DISP/LWL: DISP over waterline length, expressed in feet. For comparison, see Henry and Miller (1965:19).

SA/WS: sail area, divided by wetted surface, or surface area of the hull below the load waterline, both expressed in square feet. See Kinney (1973:286-288) and Henry and Miller (1965:40-41).

SA/\sqrt[3]{W^3}: sail area, expressed in square feet, divided by the cube root of the boat's weight squared. This formula is similar to SA/WS but is less sensitive to factors of scaling. See Henry and Miller (1965:40-41) and Kay (1971:151-152).
TONS: tonnage, when supplied by historical text is presumed to represent full capacity tonnage, or gross registered tonnage, a figure based on total internal volume. Tonnage calculated in this study is based on "builder's", or "classification societies' tonnage". The formula is LOA x BEAM x depth (top of ceiling to underside of main deck, or gunwale in undeked boats) x 0.75, divided by 100. This figure is typically within 20% of gross registered tonnage providing rough comparative data (Desmond 1919) 1984:25-27}. It is a particularly useful formula because it is based on three dimensions commonly provided in texts.

Graphic representations of hull shape, rig, and details of finish

STEMHEAD: stemhead motif drawn in profile, not to scale.

THOLE: number of thole pins used in each rowlocks. "/" distinguishes principal rowlocks from secondary ones, usually located near stern.

MARK: representation of identification marks.

MIDSHIP SECTION: midship half-section from centreline to sheer with loaded waterline and deck indicated, not drawn to scale.

Scantling descriptions

KEEL TYP/RBT: keel type and rabbet. Keel type, indicated first, is either beam, "b", if the midsection moulded dimension is greater than the sided, or plank "p", if the sided is greater. Rabbet presence or absence in the keel indicated "yes" or "no".


KEEL PROP: keel proportions, sided to moulded.

KLSN: keelson, presence or absence, indicated by "yes" or "no".

FRAME S/M: frame sided and moulded dimensions in inches, measured at heel. Percentage figure compares frame dimensions to Nevins' rules for wooden yachts, calculated to displacement (cited in Kinney 1973:234-240). Where only sided measures are available the frame section is presumed to be square.

FRAME R/S: frame room and space, or frame spacing, expressed in inches. Percentage figure compares frame spacing to Nevins' rules for wooden yachts, calculated to displacement (cited in Kinney 1973:234-240).

PLANK THICK: planking thickness in inches, and compared by percentage with planking thickness according to Nevins' rules for wooden yachts, calculated to displacement (cited in Kinney 1973:234-240).

PLANK SIDE, or PLANK BTM: planking thickness as above, but for side or bottom respectively for flat-bottomed craft.
Construction Details

CAULK: caulking, presence or absence, indicated by "yes" or "no". If caulking is present only between the garboard and keel, "garboard" is noted.

CB: centreboard, presence or absence indicated by "yes" or "no".

MASTP: mast step position, expressed as a percentage of LOA measured from the bow.

Notes referencing Henry and Miller (1965), Kay (1971) and Kinney (1973) provide more detailed background to the formulas used above and their interpretations; graphs presented in these works display trends in comparative data, information which is very useful with the strong caveat that their subjects are modern yachts. Most of the summarized data and calculations relating to West Coast fishing boats described in this study may be easily contrasted on a boat-by-boat basis with British workboats as described by McKee in his Appendix IV (1983:233-248).
26 August 1993

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VITA

Charles David Moore was born in Vancouver, British Columbia, on January 25, 1959. He grew up on the Fraser River Delta, near Steveston, home port of Canada's largest fishing fleet. As a young enthusiast of all things maritime, he became an avid sailor, amateur boat-builder, sailing instructor, and studied small craft design, but considers himself a very poor fisherman. He completed a program of architectural and mechanical drafting in 1978. He received a diploma in classical studies from Vancouver Community College, Langara Campus (VCC), Vancouver, in 1983, and completed his B.A. in History, at the University of British Columbia (UBC), in 1985. He entered the Graduate College of Texas A&M University (TAMU) the same year. He worked on the TAMU Port Royal Project in 1986 and 1987, both in the field and in the College Station lab facilities. As draftsman/cartographer he worked on several projects for the Institute of Nautical Archaeology and the TAMU Archaeology Lab until 1988. Returning to British Columbia, Charles worked with the Underwater Archaeological Society of British Columbia, and served there as Education Director. He has served as Project Manager for underwater excavations at a pre-historic site in Montague Harbour, B.C., each summer since 1989. He has taught maritime archaeology in the Archaeology Department of Simon Fraser University (1991), and for Continuing Education at UBC (1990), and VCC (1990). In addition to his drawings accompanying several publications, he has published in the International Journal of Nautical Archaeology, Argonauta, Proceedings of the Third Annual Conference on Shipbuilding in Antiquity, and the Underwater Archaeology Proceedings from the Society for Historical Archaeology Conference. His Documenting Shipwrecks: The British Columbia Archaeological Site Inventory, Shipwreck Recording Guide and Forms was published by the British Columbia Archaeology Branch in 1992. He is co-chair of the Underwater Program, the Society for Historical Archaeology Conference in 1994. His permanent address is: 5651 Colville Rd., Richmond, B.C., Canada, V7C 3E9.