Archaeological Preservation Research Laboratory Report 9:

Consolidation of Formalin Treated Marine Crustacean Specimens Using Silicone Oils

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Specimen preservation using formalin and formaldehyde have been the most commonly used methods of preserving marine crustacean for long-term study. Specimens preserved in these solutions however, are generally smelly and disagreeable to work with and formaldehyde-based preservatives offer little cellular support when the specimen is removed from its storage solution for study. While these processes work well as storage media, the long-term usefulness of specimens is greatly reduced. Currently, most biological study labs have an abundance of plant and animal specimens that have been conserved using formaldehyde-based preservatives. The object of this experiment is to take a crustacean specimen that has been preserved by these means and by bulking it with silicone oils, stabilize the specimen so that it does not require wet storage. The benefits of this type of specimen are numerous. Silicone bulked specimens simply last longer since free-water and preservative fluids are replaced with a polymerized silicone media. Additionally, since specimens do not require wet storage, more specimens can be curated in a smaller space. One of the most important aspects of silicone bulking as a means of specimen preservation is that in many cases, this is an invaluable alternative for stabilizing unique and one-of-a-kind specimens that may be deteriorating after years of storage in formaldehyde.

For this experiment, a crab that had been stored in a formalin solution was selected for re-treatment. The crab was placed into a series of fresh water rinses in the hopes of removing as much of the preservatives as possible from the specimen. After three days of rinsing, the crab was placed into a large beaker with 500 milliliters of acetone and allowed to dehydrate for twenty-four hours. The contaminated acetone was then replaced with fresh acetone and the beaker was placed into a freezer-mounted vacuum chamber. A vacuum of 28 Torr was applied to the specimen in solution for eight hours and then it was left in acetone at ambient pressure for an additional eighteen hours. Because the specimen had been treated in formalin, excessive dehydration was not necessary because the initial processes of preservation had removed all intercellular water within the specimen.

After allowing the specimen a brief period of draining acetone from its cavities, the crab was moved to a warming oven that had been preheated to 110 degrees Fahrenheit (Figure 1). As in many of our other experiments, a flat bottom containment chamber was placed in the warming oven to contain the concentrated fumes of catalyst in close contact with the specimen. As a means of exposing the specimen to heavily concentrated fumes, an external source of catalyst, was supplied using a beaker in which catalyst was heated using a heat lamp. With the specimen placed on a mesh screen above the catalyst tray, the lid of the containment chamber was placed in position and the oven was closed. To ensure that additional fumes were entering the containment chamber from the catalyst, a small air pump was used to pump air into the containment chamber. Because this beaker had a second tube running to the oven mounted containment chamber, catalyst fumes were easily channeled to the specimen during the polymerization process.

A. Warming Oven
B. Containment Chamber
C. Crab
D. Warmed Catalyst
E. Mesh Support Screen
F. Catalyst Dish
G. Heat Lamp
H. Support Stand
I. Air Pump

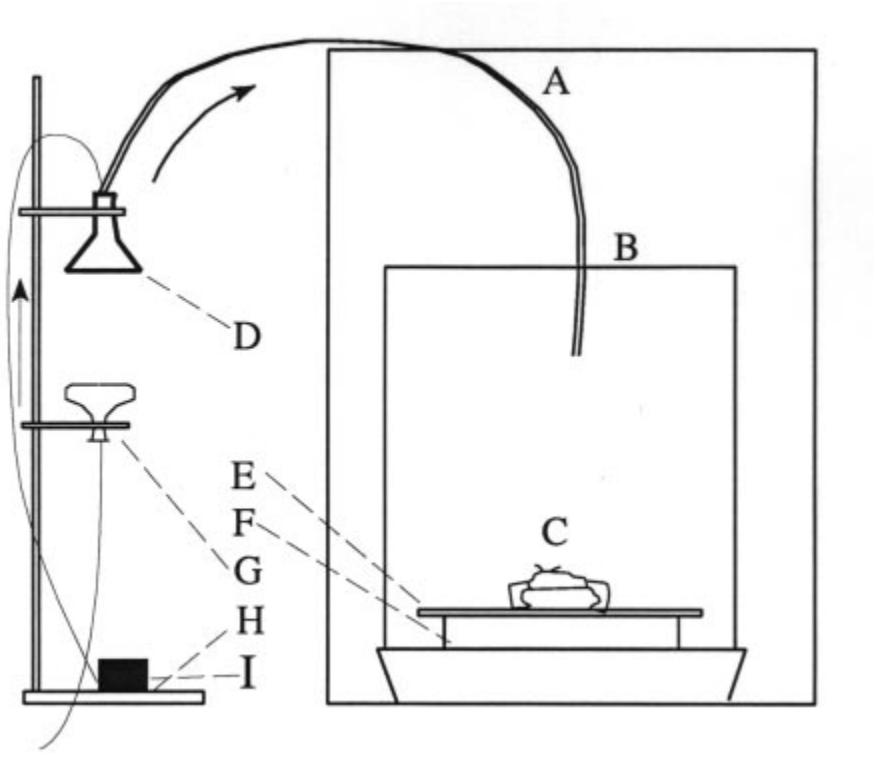

Figure 1 Set up for curing the crab.

After 48 hours, the crab was removed from the warming oven and allowed to "air" for several days. Initially, the crab had a strong catalyst and formalin odor but within 12 hours it had substantially dissipated. After 48 hours, the pungent odor had largely disappeared.

Observations

As the odor of catalyst and formaldehyde dissipated, the crab felt dry to the touch. During this drying process, changes in the articulation of claw and leg joints were noted. After five days, the crab felt completely dry and its joints were quite flexible.

Because the crab had been preserved in a formalin solution containing methanol, heat was used as a means of driving off alcohol from the specimen. Possibly, more extensive draining of fluids from the crab shell would have aided in speeding up the process of polymerization, but because this was our first attempt to introduce silicone oils into formalin-cured tissues for the purpose of stabilizing the specimen for dry curation, it was feared that excessive draining may remove enough of the bulking agents that stabilization would be incomplete.

After five months of curation, the crab shows no signs of deterioration. While examining the specimen, it was noted that the legs and tail sections of the crustacean could be removed by applying slight pressure on them. This may be advantageous because any appendages that were removed were easily reattached by simply "plugging" them into their joints. In its post treatment state, this specimen is much more enjoyable to handle and because it has been stabilized using silicone, its expected usefulness as a study specimen should be considerably longer than specimens requiring wet storage.

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