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Scorpion Preservation for Taxonomic and Morphological Studies

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ABSTRACT: The problems of preserving scorpions for taxonomic and morphological studies are discussed. A new method of scorpion preservation is presented which recommends rapid killing by heat shock followed by specimen fixation in a modified formalin, alcohol, and acetic acid solution. Specimens prepared by this method have many advantages over those prepared by the traditional alcohol-preservation method; they are better preserved, a more natural color is maintained, hardness or brittleness may be avoided, and taxonomic study is facilitated without specimen destruction.

INTRODUCTION

Scorpions and related arachnids have traditionally been preserved by merely placing living specimens in alcohol. Such specimens are often difficult to study or measure and frequently are not well preserved internally. The purpose of this paper is to present a method which yields specimens that are significantly better preserved, and that facilitate study without specimen damage. This method has been used with success on scorpions and many other arachnids by the author over the last four years.

METHODS

SPECIMEN KILLING. Specimen killing is an important first step

in the preservation of scorpions. The most satisfactory method found is heat shock, accomplished by dropping living specimens into hot water (90-99° C.) until the metasoma straightens out. This takes from 10 to 60 seconds depending on the size of the specimen and temperature of the water. Care should be taken to prevent cooking the specimens by not leaving them in hot water longer than necessary for rapid killing.

Comparison of heat killing with other methods such as freezing, drowning, and cyanide indicates that heat killing yields the best specimens for study. Specimens killed by heat shock preserve in a symmetrical form with metasoma positioned in a straight line with the body. The hot water also appears to increase the permeability of the cuticle for fixative penetration.

SPECIMEN FIXATION. Specimen fixation takes place immediately after killing. During this step the tissues are preserved and the specimens are physically arranged for study. Any desired fixation may be used; however, for general preservation the following formula is recommended:

Formalin, commercial strength	12 parts
Isopropyl alcohol, 99 percent	30 parts
Glacial acetic acid	2 parts
Distilled water	56 parts

This fixative is a resonably good penetrant and preserves both the internal and external body structure without excessive hardening or significant change in color. Large (specimens over 0.5 gram), engorged, or gravid specimens may require faster penetration of the fixative to prevent postmortem changes (such as color changes) than is accomplished by cutaneous diffusion. In such cases it may be desirable to make several slits in the membranes of the mesosoma or to inject fixative directly into this body region. If injection is employed, care should be taken to prevent distortion of the body proportions by excessive injection. Smaller specimens (less than 0.5 gram) generally do not require slitting or injection.

Specimens are then laid on their dorsal sides in flat preservative trays, completely covered by the fixative. The taxonomic specimens are physically arranged to facilitate later study; the fingers of one pedipalp are spread, the chelicerae are pulled

anteriorly until clearly visible, and the fingers of one chelicera are spread apart.

Specimens are then left in fixative for 12-48 hours to complete preservation. Large specimens require a longer fixation time than smaller specimens. To prevent excessive hardening, specimens should not be left in fixative longer than necessary.

RINSING AND STORAGE. Following fixation, specimens are rinsed in 50 percent isopropyl alcohol for an hour and transferred to 70 percent isopropyl alcohol for permanent storage. Specimens should be stored in the dark to prevent fading.

Discussion and Conclusions

One of the main problems of preserving intact scorpions is that of fixative penetration. This can be traced directly to a small surface-volume ratio of the body, and a highly impermeable cuticle. Fixatives, therefore, often do not enter the body before the tissues begin to undergo postmortem decay. Heat shock appears to increase cuticle permeability to fixatives. The use of a highly permeable fixative vehicle such as acetic acid also appears to increase the speed of fixative entrance to the body. Even more rapid fixation is induced by slitting the cuticle or by direct injection into the mesosoma. Problems of decay are greatest in the area of the digestive caeca located within the mesosoma. These caeca, frequently filled with food undergoing digestion, rapidly darken in color and begin to decay if not quickly acted upon by the fixative. Such decay may cause color changes in those species with a relatively transparent cuticle.

The best way to compare preservation methods is to look at the results which they produce. In general, scorpion specimens now in museum collections show the following undesirable features: distorted body form, significant color changes, excessive brittleness or hardness, internal structure often completely or partially decayed, chelicerae tightly withdrawn under the carapace, and pedipalp and chelicerae fingers closed thus complicating study of their taxonomic characters. By comparison, the specimens prepared by the method described in this paper are considerably more desirable for scientific study. The physical posture of these specimens permits easy study and efficient stor-

age of large series of specimens. These specimens remain flexible and permit manipulation of body parts without specimen mutilation. The better preservation of both internal and external structures permits more flexible use of specimens for diverse studies. The normal body proportions and color of specimens are preserved.

Spiders, whipscorpions, solpugids, and many insects have also been satisfactorily preserved by this method, with resulting specimens generally being better preserved than by alcohol preservation. The student of any unique group may easily modify the fixative and physical manipulation of the specimens to yield the most suitable results for a particular interest.