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ARTICLES:

An Exploratory Assessment of the State of a Fluid-Preserved Herpetological Collection

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The methodology and results of a pilot assessment of the herpetology collection at the University of Kansas Natural History Museum are presented. We evaluated 139 characteristics describing the composition and state of the containers, fluids, labels, and specimens in 110 samples. Simple univariate descriptive statistics provided a preliminary assessment of the usefulness of the results for each characteristic, as it was determined. Four characteristics (preservative concentration, container volume, preservative fluid plus specimen volume, and specimen volume) were found most important, since they allowed determination of the effect of topping procedures on final preservative concentrations. Characteristics that assessed the state of preservation of the specimens themselves are clearly important, unfortunately, those characteristics remain subjective and, consequently, are probably not highly replicable over time or between collections. Characteristics that assessed the preservative fluid are objective and replicable but the relevance of most fluid characteristics to long-term collection preservation is not yet clear. The results of this study provide a view of the means and dispersions of a wide range of characteristics of samples in a fluid-preserved collection.

The Theoretical Bases of Collections Management

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A collection may be managed as individual elements or as a set of elements. Collection management can be depicted graphically with order

shown on the x-axis, collection growth on the y-axis, and conservation on the z-axis. Individual collection elements, or the entire set, can be graphed as points in xyz-space. The management of the collection can be evaluated by analyzing the location and form of the cluster of points p (x,y,z). This analysis may be done in conjunction with other methods of collection management evaluation, such as the Collection Health Index. The cost of management of a collection is equivalent to the cost of reducing the expression of entropy in the collection, which is accomplished by controlling the agents of deterioration (direct physical forces; theft; vandalism, displacement and curatorial neglect; fire; water; pests; contaminants and pollutants; light and radiation; incorrect temperature; and incorrect relative humidity). These are easiest to control at the microenvironment level, and microenvironments are best controlled using the principles of the theory of enclosures. Collections should be managed with an understanding of entropy, enclosure theory, and preventive conservation theory to direct the investment of resources.

Use of temperature to control an Infestation of Biscuit or Drugstore Beetle Stegobium Paniceum (L.) (Coleoptera: Anobidae) in a Large Economic Botany Collection

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An infestation of biscuit or drugstore beetle, Stegobium paniceum, was discovered in the Economic Botany Collection at Kew. Large numbers of adult insects were found in the collection and a wide range of specimens were infested in one area. Severely attacked specimens were starch-rich, such as Manihot, and many other roots, fruits and seeds. The options for control of Stegobium included fumigation and freezing. Because the collection storage area was air conditioned, we decided to lower the temperature to 17°C to prevent the insects breeding. Beetle numbers immediately dropped, but the following year there was a further problem with emerging adults. An additional chiller unit was installed that enabled the temperature to be reduced to 13°C. The population of insects again declined and, apart from isolated occurrences in enclosed jars, no live adults have been seen. Insect traps have been used to monitor wandering adults and attractant lures were effective in increasing trap catch when temperatures were above 17°C. The Stegobium infestation was successfully controlled for four years without the high labour costs that would have been incurred by moving objects for treatment. The collection is currently safe from attack as long as temperatures remain low.

Oh No! Ethnobotany. The Safe Handling and Storage of Hazardous Ethnobotanical Artifacts

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Oh No! Ethnobotany, a hazard communication training program that addresses health and safety issues inherent in the handling and storage of hazardous ethnobotanical artifacts, was designed, developed and prototyped at the Science Museum of Minnesota. The program looks beyond the wide range of residual toxic chemicals present from the treatment of an ethnobotanical artifact to specifically address concerns raised by toxic chemicals inherent in the object itself. This paper provides an outline of the Oh No! Ethnobotany program, including a list of hazardous ethnobotanical artifacts present in collections. It includes a description of policies and procedures for hazard communication, labels and other forms of warning, accessibility of information, ethnobotany material safety data sheets (EMSDS) and training.

Effects of Various Fumigants, Thermal Methods and Carbon Dioxide Treatment on DNA Extraction and Amplification: A Case Study on Freeze-Dried Mushroom and Freeze-Dried Muscle Specimens

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The effects of several treatments for pest eradication on natural specimen DNA were examined using freeze-dried mushroom and freeze-dried muscle. The data clearly showed that the fumigants methyl bromide, methyl bromide/ethylene oxide mixed gas, ethylene oxide, propylene oxide and methyl iodide, all caused significant degradation of specimen DNA, even with a single fumigation. Subsequent steps at amplification of certain DNA fragments by PCR (polymerase chain reaction) were difficult in these samples. There were more problems in amplifying larger DNA fragments than smaller fragments. The main cause for the decreased efficiency of PCR was thought to be the degradation of template DNA. On the other hand, thermal methods (heating and low temperature), 60 percent carbon dioxide treatment, and fumigation by sulfuryl fluoride seemed scarcely to affect the DNA molecules of the specimens, allowing subsequent PCR to be successfully performed. Direct sequencing of the PCR products was also performed to check for the possibility of modifications to the DNA sequences. When the PCR products were amplified to the sufficient amount for direct sequencing, the DNA sequences were normal in our examination

of a few gene regions.

Examination of Macroscopic Particles from Dust Accumulations in Collection Storage Areas

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The dirt from the floor of a collection storage area was examined to determine its usefulness in understanding collection conditions and practices. Accumulated floor debris was separated into different groups based on particle size. The larger-sized particle groups were subjected to macroscopic examination for material identification. All particle-size groups were subjected to analyses to determine moisture absorption potential, as well as the proportion of ferrous material, soluble proteins, and organic material present in the sample. This study demonstrates the usefulness of analyzing dust and debris in collection storage areas for evaluating practices. Also, the study provides fresh perspectives about dust and debris in terms of pest management, the nature of particulate matter in collections, and human health concerns.

Phenoxyethanol as a Relaxant Before Fixation in the Sea Cucumber Cucumaria Miniata (Echinodermata)

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Phenoxypropanol has been used as a relaxant before fixation with varying success on many taxonomic groups. Experimental evidence in this study shows that a similar chemical, phenoxyethanol, effectively relaxes specimens of the sea cucumber Cucumaria miniata (Brandt 1835) before fixation. The desired state of relaxation was with the tentacles exposed. The use of phenoxyethanol before fixation in 70 percent ethanol reduces the amount of shrinkage as measured after three months. A review of the literature shows that phenoxyethanol has not been tested on many groups as a prefixation relaxing agent.

DMDM-Hydantoin: The Promising Result of a Search for an Alternative in Fluid Preservation of Biological Specimens

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Since occupational health and safety authorities throughout the world have

more strictly regulated the use of formalin and storage of ethanol, and the natural history community is more aware of the occupational risks involved, the interest for non-hazardous alternatives grows. For this reason, I initiated a study of the properties of “modern” biocides, currently used for preservation in food, cosmetic, and pharmaceutical products. In order to determine their suitability for preservation of biological specimens, a set of parameters was defined that could be weighed against the properties of the biocides.

Of the 22 biocides that were reviewed in this way, only DMDM-hydantoin was considered to be suitable as an alternative for fluid preservation of biological specimens. This biocide is a so-called formaldehyde-releasing agent that is primarily used as a preservative in cosmetic and personal care products. Apart from a short-term experiment that I conducted, DMDM-hydantoin has never been used for the preservation of biological specimens. Therefore, additional research is necessary to reveal the long-term effects of DMDM-hydantoin on the structural integrity of biological specimens.

Weight Changes On Oxidation Of Drying And Semi-Drying Oils
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Objects in ethnographic and ancillary natural history collections contain many types of vegetable oils as components of varnish coatings, paints and lubricants. Tests were performed on thin oil films dried in a laboratory environment. These oils, composed of the glycerol esters of unsaturated fatty acids, will oxidize through a free radical process and crosslink to form polymers of variable properties. Oxygen uptake produces an initial weight gain but further oxidation yields compounds such as carbon dioxide, and short chain acids, aldehydes, ketones and alcohols that can volatilize and contribute to a loss of weight. Monitoring weight changes can provide information on the duration and magnitude of these reactions. Weight changes are greatest in the first year and are still detectable up to two years later. Acid or base processing of the oils affects the incubation period for oxygen uptake but not the long term weight change behavior. Weight loss can be quite dramatic depending on the oil composition. Oils with low linoleic acid content eventually lose more weight than linseed oil and even a non-drying oil with high oleic acid content, olive oil, is surprisingly active after two years. In addition to the chemical effects, changes in weight also indicate alteration of the physical and mechanical properties of the oil films.

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