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SUBSCRIPTION RENEWAL

In the past, the Curation Newsletter has been distributed at ASIH meetings and sent by mail to approximately 400 addresses. In the interest of minimizing reproduction and mailing costs, we are asking interested recipients of the Newsletter to access it electronically (gopher://muse.bio.cornell.edu/11/curation/ichs_herps) rather than requesting a printed copy. This issue of the Newsletter will be mailed to all on the current mailing list but we are requesting a subscription renewal ONLY by those who do not have access (or do not expect it within the next year) to the internet, or cannot otherwise access the Newsletter electronically. Libraries and those wishing to renew should send their name, title, institution name, department and address to Susan Jewett (see address listing at the end of this newsletter for Susan's address as well as the complete physical and email addresses of all Curation Newsletter Subcommittee members).

Future issues of the Curation Newsletter will be mailed only to those who renew at this time.

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PARAFORMALDEHYDE/ALCONOX PROBLEMS

Douglas W. Nelson (dwnelson@umich.edu), John Sparks; Division of Fishes, Museum of Zoology, University of Michigan, Ann Arbor, MI 48109-1079.

The UMMZ staff has noted some "clearing" problems with fish specimens fixed in paraformaldehyde which was prepared using Alconox, an agent that helps dissolve paraformaldehyde in water. The problems were similar to those discussed by Saul (1981). The formula for making the solutions was basically the same as described in Fink et al. (1979: pp. 7-8).

Most of the problems appeared only after transfer to 70% ETOH although there was some clearing in a few specimens prior to transfer to ETOH. Specimens had begun to clear and had suffered pigment loss after a few months. These specimens also appeared to be swollen or "bloomed" in comparison to members of this same taxon that did not exhibit this clearing phenomenon. The material had been processed (i.e., transferred into ETOH) at another institution, and a portion has been moved to the UMMZ. The material had been kept largely in the dark, typical museum conditions, with minimum UV exposure. The specimens were not rinsed in water prior to transfer to 70% ETOH. We believe that this is the problem.

Measurements of pH in the jars of ETOH-preserved specimens that showed this clearing problem yielded results of 9.5-10. Even after repeated changes of 70% ETOH, the pH in these jars remained at this high level or even rose in some cases. We believe that phosphates and/or chelating agents and emulsifiers composing Alconox, which had not been adequately rinsed from the tissues of the specimens, are the source of the high pH and the problems associated with clearing. For example, see Tucker and Chester (1984, p. 982). Although these researchers were concerned with fish larvae preserved in formalin, the descriptions of the specimens are similar and we believe that the phenomena may have a common cause.

The director of technical services at Alconox, Inc. (pers. comm.) pointed out two major items that should be of great interest to persons working with the paraformaldehyde/Alconox mixture (direct quotations from his letter are herein provided). (1) Alconox is a "reasonable thing to use in dissolving paraformaldehyde" -- due to its chemical composition, availability, and (perhaps most important) its "free rinsing ingredients". (2) Specimens should be thoroughly rinsed in water after fixation and prior to transfer into alcohol. "Fortunately all of these potentially problematic ingredients are very free rinsing and a thorough water rinse should substantially remove them."

This initial communication is simply to alert the ich./herp. community about the necessity of rinsing paraformaldehyde/Alconox-fixed specimens in water prior to transfer into alcohol. Studies into the nature of this problem and its prevention are continuing at the UMMZ.

LITERATURE CITED

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Saul, W. G. 1981. Paraformaldehyde problems. Curation Newsletter 3: 1. (see also: ASIH website cited above)

Tucker, J. W., Jr. and A. J. Chester. 1984. Effects of salinity, formalin concentration and Buffer on quality of preservation of southern flounder (*Paralichthys lethostigma*) larvae. Copeia 1984 (4):981-988.

AN ALTERNATIVE TO GLASS? YES! (FOR SOME CASES)

H.J. Walker, Jr. (hjwalker@ucsd.edu), Cynthia I. Klepadlo (cklepadlo@ucsd.edu), Scripps Institution of Oceanography, Univ. California, San Diego 0208, La Jolla, CA 92093-0208, and John E. Simmons (jsimmons@kuhub.cc.ukans.edu), Natural History Museum, University of Kansas, Lawrence, KS 66045-2454.

A preliminary investigation (occasionally anecdotal) into the efficacy of using polyethylene terephthalate (PET) jars as a substitute for glass collection jars indicates that PET offers a quality, short-term, low-cost, lightweight, and practically unbreakable alternative to borosilicate glass in certain circumstances. PET is the only transparent plastic approved by the U.S. Food and Drug Administration for use as containers of high-ethanol concentration products for human consumption (hard liquor). According to Dr. Michael Adams, FDA polymer chemist (pers. comm., Dec 1998), the FDA tests involved exposure of containers with ethanol (not whiskey, gin, or rum, etc.) concentrations of 50% to 95% at an elevated temperature and normal day/night cycle equivalent to approximately one year of shelf time. A negligible amount of chemical residue was found in the ethanol at the end of the experiment, and thus PET was approved, but it cannot be inferred that the PET incurred no structural damage (Dr. M. Adams, pers. comm., Jan 1999). Other chemical reactions cannot be discounted. Our own small experiment at Scripps Marine Vertebrates Collection exposed PET containers to 95% ethanol and 99% isopropanol. After two years the fluids and containers are perfectly transparent and the containers are flexible and cannot be induced to crack, even after repeated squeezing. (Other transparent plastics are too brittle for our purposes, even without exposure to alcohol.) Dr. Albert van der Heiden (avdhj@servidor.dgsca.unam.mx, Mazatlan, Sinaloa, Mexico) has been using PET jars in his collection (70% ethanol) for eight years with no problems. For additional data, see table below.

Chemical Resistance of Transparent Plastic Resins* at 20°C (left) and 50°C (right) after 30 Days Exposure

	Ethanol (95%)	Isopropanol (99%)	Formaldehyde (10%)
PETG	EG	EE	EG
PS	FN	EG	FN
PC	EG	EE	EG
PMP	EG	EE	EG

E=no damage; G=little or no damage; F=some effect after 7 days; N=not recommended.

PETG=polyethylene terephthalate copolyester; PS=polystyrene; PC=polycarbonate;

PMP=polyethylpentane.

*Source: Nalge Nunc International, Nalgene Brand Products.

Oxidation is probably the leading cause of long-term degradation of fluid-preserved specimens and PET is the least oxygen-permeable of the available plastics, ie., plastics formed into bottles or jars. For example, PET is 10 times less permeable than PC (data from Nalge Nunc International, Nalgene Brand Products, 3 May 1999).

A cost comparison obtained from a local vendor revealed a substantial savings for PET, paragon-style jars. For example, the PET jars cost (per thousand) \$170 for the 4-ounce and \$300 for the 16-ounce; the glass jars cost \$270 for the 4-ounce and \$380 for the 16-ounce. In addition the standard polypropylene lids with F217 triseal liners are used with PET jars. All vendors we would normally contact for our glass jars had PET jars in stock or could order them. Potential buyers need to check for sizes and styles.

The weight advantage of PET over glass is remarkable. An 8-ounce, paragon, PET jar weighs approximately 23 grams and the glass jar, 207 grams. The glass is roughly the weight of 8 ounces of 50% isopropanol, 206 grams, or 8 ounces of 70% ethanol, 202 grams.

Because PET has not been tested over decades, we cannot recommend its use in place of glass for permanent storage of specimens in alcohol. However, PET probably can be used for periods up to ten years and would be the better choice for teaching collections when jars and specimens are handled every year, or more frequently. In this situation oxidation would not be a concern. In addition PET would make an ideal container for protecting fragile specimens during shipping.

MECHANICAL AND MANUAL PRODUCTION OF LABELS FOR COLLECTIONS STORED IN FLUIDS: A FEW EXAMPLES OF PAPERS, INK AND PRODUCTION PROTOCOLS

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Many curatorial tasks in collections of natural history are accomplished by using computers. Most notable is the production of specimen labels for dry collections (skins, insects, skeletons) or wet (fishes, amphibians, and reptiles) in preservatives such as alcohol or glycerin. In the past, staff working with collections of fishes, amphibians, and reptiles produced labels manually, either in handwritten form or typed. Higgins Eternal No. 813, technical pens, and Byron Weston Resistall linen ledger paper #36 were the standard, producing very acceptable labels for specimens in alcohol, formalin and glycerin. Also used were preprinted labels on paper with a high cotton rag content, which were filled out using manual typewriters with cloth ribbons impregnated with a high carbon ink.

The current practice of producing container and specimen labels by electronic/mechanical means is favored because of affordable technology, a drastic reduction in time spent to make labels, and the legibility of the machine printed label. However, in the last 15 years, we have learned that not all methods of mechanical label production make labels that endure in wet conditions or for long periods of time. For example, it has been shown that laser (toner) printed labels have not held up well to abrasion and the lettering tends to "lift off" or float off the paper, especially when used in alcohol containing oils leached from specimens. It has also been found that not all of the inks used with impact printers or for handwriting labels are suitable for use in wet collections. Some inks are very acidic (not good for the long-term conservation of specimens in alcohol) and other inks fade or bleed out excessively. Nothing is known about the use of inkjet printers for wet label production in terms of ink chemistry and types of water/chemical proof paper that can be used with this printer. It has also been shown that the ribbons used in impact printers must be

cloth (not the plastic film variety) or the lettering will also lift-off. Finally, there are differences in the letter quality between impact and laser printers. Impact printed labels do not appear as "crisp" or as dark as the laser printer labels and smaller fonts (6-8 point) may not be as legible for impact printer labels as they are for laser printer labels.

The type of paper used has become as varied as the methods of label production. Many collections use such papers as Resistall linen ledger #36, a 100% cotton fiber paper impregnated with formaldehyde for durability and therefore, not acid free, Tyvek (also sold as Polypaper), an olefin material that is inert and commonly used for disposable hospital gowns, and Forbon, a waterproof vulcanized material that is also pH neutral and extremely durable.

Choosing a method and the materials for wet label production involves some trade off, such as the availability of funding for supplies and labor, computer/printer expertise, availability of materials and collection growth. Therefore, no one method can be strictly recommended over another and it is not the purpose of this short article to do so. But, regardless of the method chosen, a couple of issues must be addressed: 1) the label paper and ink will in no way compromise the long term conservation of the specimens in the jar or tank. Please check the references at the end of this article on inks and papers for recommendations on low acidic inks and suitable label paper. 2) The catalogue number must remain, forever, physically associated with the specimens. To depend on jar labels as the sole link between the specimens and their catalogue record (field data) is fool hardy. If those labels degrade, the catalogue number disappears with the paper. The specimens no longer have associated data and their scientific value is drastically decreased.

To insure that the catalog number remains with the jar of fish or the single lizard specimen, a permanent number tag must be included with the specimens or tied on the specimen. Some collections still use tin tags (stamped with the number) or Dymo Tapewriter 1500 tape embossing writers to make small catalogue numbered tags. Tin tags placed in formalin will corrode and Dymo tags tend to bleed out their color and become brittle over time. Both tags can alter the fluid's pH, one through corrosion and the other due to off gassing.

The currently recommended product for a permanent, back up tag is the Forbon White Tag, a .010 pt. vulcanized fiber paper (pH neutral) which comes in rolls with preprinted catalogue number series and institutional codes (per Leviton, et al. 1985). Each tag measures 1-1/4" x 5/16" and has a left hole punch for tying to the specimen. We recommend tags produced by Allen-Bailey Tag & Label, Inc. in Massachusetts. Contact Lilian Larrabee at 1.800.724.1069 for prices and examples. My experience with National Tag in Ohio, a long time supplier, reveals many production problems, quality that is not up to standard, and a lack of good customer service.

The following represent a variety of methods and materials used for label production. These descriptions were contributed by members of the 1997/98 ASIH Supplies and Practices Subcommittee. It is hoped that the reader will get ideas for producing labels or re-evaluate their own methods and standards for label production. I have included the email addresses of Collection Managers so that they can be contacted for further details.

I would like to thank the members of the ASIH Supplies and Practices Subcommittee for sharing their ideas and taking the time to write these descriptions. I would also like to thank the ASIH Newsletter Subcommittee for reviewing this note, especially John Simmons, University of Kansas, for providing references on inks and comments that helped shape the ideas in the article.

A Sampling of Label Production Methods in Current Use

Tulane University Museum of Natural History, Fish Collection (TU). 185,000 catalogued lots. 40% of collection is stored in ethanol alcohol, 60% of collection is stored in isopropanol. Henry L. Bart, Jr., Curator & Michael S. Taylor, Collection Manager (Mike@museum.tulane.edu).

COMPUTER PROGRAM: MUSE, output via Xtrieve Plus and exported to a standard data exchange format file. The records are imported into FoxBase+/Mac using a custom database program written by the Collection Manager. This program automatically tracks incoming records until jar labels and catalog pages have been printed. The plotter is driven by a Macintosh Chooser-level printer device called PLOTTERgeist (Infowave Wireless Messaging Inc., British Columbia, CANADA).

PAPER: Curtis Parchment Parchkin 25 X 38 inches vellum Basis 120 pound stock, item no. 55-11-20 Curtis Paper Division, James River Corporation, Southhampton PA 18966. PH. 800. 441.9292 This paper has been used in the TU collection for 30-35 years. As of 30 June 1995, cost was \$488.13/case. Case=500 25 X 38 inch sheets.

PRINTER & INK: E-size plotter, Hewlett-Packard DraftMaster MX Plus. The plotter uses rapidograph nibs (00 to 1-size nibs) filled with Koh-i-noor 3080-F India ink.

PRODUCTION PROTOCOL: Labels are printed in groups of 70 and trimmed to size with a rolling-blade paper cutter. (Alignment marks insure that all labels are cut to same size.) Labels are left to dry for one week before placing them in the jars. Soluble ink used for alignment marks dissolves without discoloring the alcohol, leaving only the label information. Design for these labels is taken from the existing (old) labels.

OTHER NOTES: The FoxBase+/Mac is compatible with the DOS version of FoxPro.

Field Museum of Natural History, Division of Fishes (FMNH). 103,547 catalogued lots. 100% of collection is stored in ethanol alcohol. Barry Chernoff & Mark Westneat, Curators. Mary Anne Rogers, Collections Manager (rogers@fmpr.fmn.org).

COMPUTER PROGRAM: MUSE. Output via Xtrieve.

PAPER: Domtar Wet Strength Laundry Tag 70; at one time available from MUSE, Natural History Museum, Dyche Hall, University of Kansas, Lawrence KS 66045-245 PH. 913.864.3803. Contact Domtar at Columbia Centre 1, 5600 N. River Rd. Site 760, Rosemont IL 60018.

PH. 847.698.9700.

PRINTER & INK: Hewlett Packard LaserJet 4 Si and toner.

PRODUCTION PROTOCOL: Jar labels are printed on HP LaserJet 4 Si. Most of the collection has pre-printed permanent FMNH tags in the jars. If no number tag is present, a permanent label in the form of a small paper label with a handwritten catalog number on it is inserted in the jar along with the laser-printed label. These hand printed "backup" labels or any notes included in the jars of specimens are written on Byron Weston Resistall paper with KOH-I-NOOR Universal #3080-F Black India ink.

OTHER NOTES: The HP LaserJet labels are very nice looking labels. The lettering is crisp and remains dark compared to other labels. These labels do not perform well in some oily alcohols or if they are subject to a lot of handling or used as loan labels. The print tends to "lift off" of the paper and will disappear completely if subject to abrasion. At one time, FMNH staff used a spray fixative to hold letters to paper but found it to be too troublesome and not much of an improvement when compared to leaving the labels "bare." The bottomline for FMNH staff is to always include a permanent backup label with the catalogue number on it with each loan or jar of specimens.

University of Michigan, Museum of Zoology, Division of Reptiles and Amphibians (UMMZ). 410,000 catalogued specimens. 100% of collection is stored in ethanol. Arnold Kluge & Ron Nussbaum, Curators. Greg Schneider, Collections Manager (ges@umich.edu).

COMPUTER PROGRAM: Foxpro.

PAPER: Gummed labels (Cummings Label Co. Kalamazoo, MI); Byron Weston 100% Cotton Bond paper (University Products, MA); Forbon paper tags (.010 imperv fiber), 1/4" x 1-1/4" preprinted with UMMZ and catalogue number (Allen-Bailey Tag & Label, Inc.).

PRINTER: Hewlett Packard LaserJet 4 and impact printer with transfer (plastic) ribbon.

PRODUCTION PROTOCOL: Catalogue numbers are typed on gummed labels using an impact printer with transfer (plastic) ribbon. These labels are moistened and attached to the outside of jars or skeleton boxes. Each specimen (alcoholic or skeletal) has a permanent catalogue numbered tag tied on to it. Labels used for glycerine-stored specimens are printed on Byron Weston 100% Cotton Bond paper. The information printed on them, in 5 point type using a Hewlett Packard laser printer, is queried from the database and formatted using Foxpro's label application. Again, each glycerine-stored specimen has a permanent (catalogue numbered) tag enclosed with it.

OTHER NOTES: There has been no fading of labels used in glycerine nor have the letters "lifted off" as reported for wet labels in alcohol collections. Each glycerine specimen has a permanent catalogue numbered tag as well. It should be noted that in herpetological collections each specimen has a permanent number tag tied on to it. The UMMZ Division of Amphibians and

Reptiles uses permanent number tags (field and specimen) produced by the Allen-Bailey Tag & Label, Inc. in Massachusetts.

Atlantic Reference Centre (ARC). 11,200 catalogued lots. 90% of collection is stored in isopropanol alcohol. Lou Van Guelpen, Collections Manager (arc@sta.dfo.ca).

COMPUTER PROGRAM: MUSE (used for cataloguing, but not label production).

PAPER: Byron Weston Resistall 36#.

PRINTER & INK: A local print shop pre-prints jar labels to ARC specifications. Labels are filled out by hand using Staedtler Marsmagno 2 disposable pens.

PRODUCTION PROTOCOL: Jar labels are pre-printed on Resistall paper. (Domtar Wet Strength Laundry Tag 70# was used in past, but is no longer available in small batches.) Labels are filled out by hand, using Staedtler Marsmagno 2, disposable pens with 0.25mm nibs. Cartridges are replaceable.

OTHER NOTES: An alcohol-proof ink is used on pre-printed labels provided by a local print shop. The name or type of ink used is unknown. However, for 19 years these pre-printed labels have been in use without any problems. The Staedtler Marsmagno pens and ink work well for all preservatives and there is no bleeding of ink when immersed in fluid. Occasionally the narrow 0.25mm nibs break during writing.

National Museum of Natural History, Smithsonian Institution, Division of Fishes (USNM). 292,932 catalogued lots. 100% of the collection is stored in ethanol. G. David Johnson, Lynne R. Parenti, Victor G. Springer, Richard P. Vari, and Stanley Weitzman, Curators. Susan L. Jewett and Jeffrey T. Williams, Collections Managers (jewett.susan@nmnh.si.edu).

COMPUTER PROGRAM: Mainframe database program. Due to switch to PCs and a commercially available database management program, like MUSE, within the next year.

PAPER: Byron Weston Resistall 36#, cut to continuous rolls of 6" width with pin feed holes and side perforations.

PRINTER & INK: Genicom 3840 E, a dot matrix impact printer on a simple printer network. Non-bleeding, ethanol resistant ink (special formula) available from Automated Office Products Inc., Lanham MD, is used on printer ribbon cartridges.

PRODUCTION PROTOCOL: Labels are printed on the continuous rolls of Resistall paper and then cut crosswise to make a variable length label. No pre-soaking is required.

OTHER NOTES: The USNM has been producing these labels for 20 years and for the last 10 years has used a special, non-bleeding ink formula. The following are listed as pros for this

method: variable lengths can be produced so that all label data can be included, there is minimal paper waste, lettering can be large and bold which mimics the jar neck labels, generating and replacing labels is easy, and pre-soaking the label is no longer necessary due to the ink being used. The following may be considered as drawbacks to this method of label production: printer is loud, the label can sometimes be too long and must be folded to fit in the jar, the time expended in maintaining the software and hardware used for label production can be bothersome, and perhaps cutting each label may be more time consuming compared to splitting perforated labels.

Museum of Southwestern Biology, University of New Mexico, Division of Fishes (MSB). 42,636 catalogued lots. 85% of the adult and larval fish collection is stored in ethanol and 10% in isopropanol; larvae and all eggs (5% of collection) are stored in buffered 5% formalin. Thomas F. Turner, Curator, Steven P. Platania, Associate Curator. Alexandra M. Snyder, Collections Manager (amsnyder@unm.edu).

COMPUTER PROGRAM: Paradox 4.1 for Windows98. Output in either 3" x 5" jar labels or 3" x 2.5" vial labels. Other labels produced are shipping/loan labels, id labels and accession labels; these labels are 1" x 3" printed 16 labels on 8" x 11" single fed sheets of linen Resistall paper.

PAPER: Byron Weston Resistall 36# Fan-fold, perforated, pin feed 3" X 5" labels (old stock from University Products) 500 labels per pack. Also purchased, 18"x23" sheets (100 sheets per pack) of Byron Weston Resistall for preprinted accession labels and shipping/loan labels.

PRINTER & INK: Epson LQ-870 impact printer (cost \$500.00 in 1993) with re-inked nylon cloth ribbons using special formula non-bleeding ink from Automated Office Products, Inc. Lanham MD. Re-inked ribbons cost \$8.00 each and produce about 200-300 labels.

PRODUCTION PROTOCOL: Labels are printed on fan-fold, pin fed packets of Resistall paper in two sizes: jar and tank labels (3" x 5") and vial labels printed 2 per 3" x 5" labels, then cut by hand. Lettering is set to double strike (bold) setting, 6 to 12 points. No pre-soaking is required. Labels are inserted in jars and vials along with permanent, pre-numbered MSB catalogue tags (1" x 1/4" with left hole punch) purchased from National Tag in Ohio. (Overall quality of National Tag specimen tags has become very poor in the last 5 years. Customer service is non-existent.) These tags were produced on Forbon paper (.010 imperv fiber) with black permanent ink. In the future, the MSB will purchase these tags from Allen-Bailey Tag and Label, Inc. of Whitinsville, MA.

OTHER NOTES: The MSB Division of Fishes has been using this method for 6 years. Although we are generally satisfied with the quality of the jar and vial labels, there can be some variability in boldness or intensity of the lettering on the labels. It is important to set the font on double strike when printing these labels. Three years ago, a bad batch of ink was used on the ribbons and thus bled out, leaving about 400 labels very faded. Staff has also observed mottled lettering on a few labels in 5% phosphate buffered formalin. This will be monitored and labels replaced as needed. We also maintain a shelf of experimental jars, labels and inks. This shelf includes examples of the Resistall/non-bleeding ink/impact printer-produced labels in our collection and

from casual observations we feel confident that the labels currently used in our collection will hold up for a number of years.

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- Note: Some of the product and vendor information can be found on the ASIH web site, Supplies and Practices database (<http://www.utexas.edu/depts/asih/coms/ihcc/supplies/supplies.html>) or email amsnyder@unm.edu for information.

COMBINATION JARS

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Most specimens in the Scripps Institution of Oceanography Marine Vertebrates Collection, like other fish collections, are relatively small and housed in 4- or 8-ounce jars. And like other growing collections, shelf space for individual species is generally at a premium. Rather than re-arranging entire shelf banks (which might include changing many species' locations) when growth occurs on an already tight shelf, we often will employ combination jars. This is one of the best methods for curating fish larvae, juveniles and small adults. In our collection these jars are larger (32- or 16-ounce) containers which typically house 8-30 lots. A large label, easily seen and specifying each lot, is included within. Each large label also is prominently identified (ie, "Combo 1") and an additional master listing is maintained of the combo jar number and the lots involved in order to quickly locate the appropriate jar. Depending on the situation, we use either polystyrene vials with polyethylene caps or borosilicate glass tubes with preferably cotton plugs for individual lots. The size of glass tube used most often is 15 x 85 mm. We recommend the use of cotton plugs (less than 100% is fine) because synthetic materials do not form as tight a seal and occasionally have fallen out. We have had virtually no problems with these inexpensive techniques after more than 10 years exposure in 50% isopropanol. However, we have encountered problems, such as alcohol discoloration and odors of apparent plastic deterioration, using bakelite (phenolic plastic) closures within combination jars and these should be avoided.

MULTI-LOT JARS: A SPACE SAVER

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The UMMZ, in addition to the combination jars described in the preceding article, is now using what we call "multi-lot jars" for larger specimens. This storage method is widely used in herpetology collections, but is not common practice in fish collections.

At the UMMZ a durable tag, bearing the catalogue number, is sewn to the fish specimen (generally around the caudal peduncle). The specimen is then placed into a jar with other members of the same species from the same geographic locality; e.g., *Alectis ciliaris* from Thailand. A regular jar label is dropped into the jar for each catalogued lot in the jar, and an easily readable "summary" label is placed inside the jar. The comment "multilot 1-gal. jar" is entered into the "Storage" field of the catalogue database to provide a search image for specimen retrieval.

This method has distinct space-saving advantages for single specimens of deep-bodied fishes, which usually require a 1-gallon, wide-mouth jar, e.g., flatfishes, piranhas, chaetodontids. Several specimens can easily be accommodated in an uncrowded fashion in a single jar, rather than several.

LARVAL FISH PRESERVATION: ETHANOL ACIDITY FROM BYRON WESTON RESISTALL LABEL PAPER

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The Atlantic Reference Centre routinely processes ichthyoplankton from plankton samples for government agencies, universities, and private industry. Usually, fish larvae are placed in 15 ml vials of 70% ethanol along with a small vial label (measuring 50 mm x 14 mm) of 36# Byron Weston Resistall label paper with the ARC name and address preprinted at a local print shop, and containing sample and identification data handwritten in ink. Also inserted is a smaller (26 mm x 14 mm) preprinted "Ethanol" label of the same paper. In February 1999, representative vials of larvae from one cruise (herein called Group 1) were found to have pH values ranging from 5.6-6.9 (average 6.4, N = 10). These larvae were collected 24 months and sorted/vialed 13 months prior to reading pH. They had not been fixed in formalin, but were immediately preserved in 70% ethanol upon collection. Relative volume of the larvae in each vial compared to that of the ethanol was extremely small. Acidity in these vials was surprising since 70% ethanol is reported to have a favorable pH for specimen preservation (Taylor 1981; Lavenberg, et al. 1984). For comparison, representative vials of larvae (Group 4) from a more recent cruise were examined. These were collected 10 months and sorted/vialed 4 months prior to reading pH, had the same preservation protocol as Group 1 larvae, but had pH values from 6.0-7.5 (average 6.9, N = 11). Clearly, acidic ethanol was a problem and would be detrimental to calcified structures in the fish larvae. A preliminary investigation was done to characterize potential causes of acidified ethanol, and is reported here. A more in-depth study was planned, however, Andrei and Genoways (1999) have just published an informative paper pinpointing the likely cause of the acidity--the internal vial labels made from Byron Weston Resistall paper. My preliminary investigation is detailed here to support and complement the findings of Andrei and Genoways.

Factors investigated individually in the current study were: 1) source 95% ethanol (samples from four drums at the factory and one sample from an ARC drum), 2) distilled water used to dilute the ethanol, 3) resulting 70% ethanol from the lab carboy (used to fill all vials except those containing larvae in this study, which were filled from earlier batches in the carboy), 4) the vial and cap (capped vial of 70% ethanol only), 5) an ARC label with no handwritten data in 70% ethanol, 6) an ARC label with data handwritten in ink in 70% ethanol, 7) the Ethanol label in 70% ethanol, and 8) hand-writing ink alone, ca. one drop, in 70% ethanol. Also tested were 9) an on-hand vial of 70% ethanol containing test labels to check new label shipments for bleeding of printer's ink (latest addition many months before pH testing), 10) two vials of larvae (group 2, collected 15 months and sorted/vialed 12 months previously) from a different program, but processed at approximately the same date as group 1, 11) two more vials of larvae (group 3, collected 20 months and sorted/vialed 9 months previously) from the initial program and processed at a date intermediate to groups 1,2 versus 4. Factors 1 (ARC drum only) through 8 were prepared five days prior to pH testing; factors 2-9 consisted of one vial each. Results are given below. pH measurements were repeated nearly one month later, and paralleled these results.

Factor:	pH:
Group 1 larvae	5.6- 6.9
Group 4 larvae	6.0-7.5
1) factory and ARC 95% ethanol samples	8.2-8.7
2) distilled water	5.9
3) 70% ethanol from lab carboy	7.8
4) vial/cap	7.8
5) ARC label with no handwritten data	5.5
6) ARC label with data handwritten in ink	5.3
7) Ethanol label	6.5
8) hand-writing ink alone	8.7
9) on-hand vial of 70% ethanol to test new labels	6.0
10) group 2 larvae	6.0, 6.6
11) group 3 larvae	6.2, 6.7

The pH of 70% ethanol from the carboy, used to fill test vials and the normal source during laboratory operation, was somewhat alkaline. This was because the more strongly alkaline 95% ethanol overcame the acidity of the distilled water used to dilute it. The vial and cap had no effect on pH. Hand writing ink seemed to make the ethanol more alkaline. Values for all vials containing label paper, but no larvae, ranged from 5.3-6.5; the highest value belonged to the vial with the Ethanol label, the smallest of the labels. Thus, in testing strictly physical parameters, the label paper appeared to acidify the ethanol, and in a period of only five days. These findings agree directly with those of Andrei and Genoways (1999). Groups 1,2, and 3 larvae support this finding. However, the picture is muddied by the Group 4 larvae, of which approximately half of the vials had a pH of 7.0-7.5. These larvae were the most recently collected and processed. In fact, there was a trend toward decreasing pH over time in the vial for Groups 1-4 larvae (as was found by Andrei and Genoways 1999 over 30 days with no specimens present). Also, perhaps presence of larvae in a vial slowed the process of ethanol acidification caused by the labels (compare Group 4 larvae to factors 5,6,and 7, which acidified in five days). But numbers of replicates used in this experiment were too small to draw definitive conclusions regarding time and effect of larvae.

Though 70% ethanol has been recommended for specimen preservation by some authors, in part because of its favorable pH (Taylor 1981, Lavenberg, et al. 1984), preservative acidity can still be a problem. In a study of the herpetological collection of the University of Kansas Museum of Natural History, Simmons and Waller (1993) found that the pH of 70% ethanol in jars of specimens (and labels) ranged from 5.4-8.2, similar to this study. The findings of Andrei and Genoways (1999) and this study point to internal jar labels made from Byron Weston Resistall paper as a source of acidity. This brand of label paper is in common use in fish and herp collections, and its acidic properties were thoroughly discussed by Andrei and Genoways (1999) and mentioned by Sims (1990). Researchers who must avoid acidic pH values to preserve otoliths or other calcified structures in fish larvae preserved in 70% ethanol should consider using acid-free paper as an alternative to Resistall for internal labels (test the pH over time to be

sure), or attaching labels to the outside of their vials. However, if the latter practice is adopted, label detachment likely will become a problem in long term storage.

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