TECHNIQUES FOR PREPARING BIRD EGGS AND NESTS

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INTRODUCTION

Bird eggs are used in a broader array of biological disciplines than any other type of avian specimen. Researchers in such divergent fields as toxicology, ecology, systematics, and anthropology have found museum egg collections to be a rich source of ready made data. In contrast, bird nests have been used as raw materials by surprisingly few researchers, and they represent a largely untapped source of potential new directions for research.

Formerly, the interest in collecting and describing bird eggs and nests was largely by hobbyists, and most natural history enthusiasts learned how to prepare eggs in their childhood. As egg collecting fell into disfavor with professional ornithologists and conservationists in the 1940s and 1950s, fewer young people learned how to prepare eggs as a rite of passage. With the renewed interest in egg collections as legitimate research materials, it has become clear that information on preparation techniques would be useful to a generation not exposed to traditional egg collecting. This summary is intended to cover only aspects of egg preparation. Details of data recording, shipping methods, and curatorial techniques for egg collections will be presented in a future report.

EGGS

General Considerations

As is the case with all types of natural history specimens, standard preparation methods yield eggshell specimens with the most comparative value and with the broadest range of research applications. The preparation methods outlined here are time-honored ones, for the most part, and they will result in specimens which can be compared directly with others over 150 years old. Indeed, the fact that eggshells of the latter age even exist and that they are at least superficially identical to specimens taken in the last decade can be taken as a verification of the soundness of the method.

A museum eggshell specimen is a largely inert object composed of calcium carbonate crystals arranged on a protein matrix. All or most of the eggshell membranes usually remain attached to museum specimens. Only eggshells that are completely clean and empty have a potential for lasting indefinitely. Those containing residual conglomerations of yolk or albumen generally crumble within a few years, perhaps as the results of enzymatic reactions from the yolk. Unblown eggs invariably decay and often explode from the pressure of internal gases resulting from the processes of decomposition of their contents. Museum specimens are conventionally blown with a single blowhole, which leaves both ends and three sides of the eggshell intact for study or photographic purposes.

Unblown eggs are far more fragile than empty eggshells. Empty eggshells will break, however, if they come into rough contact with any object harder than themselves. Therefore, it is advisable to never pick up an egg specimen unless there is some good reason to do so.

Preparation Tools

Blowpipe: The type used in general chemistry labs, or a hypodermic syringe attached to a piece of rubber tubing.
Metal drills or finishing burrs: These are the sorts of drills used by dentists. The flame-tipped varieties are best. Those sold by biological supply houses are very inferior. Ideally, the drills should be cleaned with an ultrasonic cleaner between uses and coated with WD-40 while in storage, since they tend to rust badly.
Plastic bowl: Eight inches in diameter or larger.
Wash bottle
Paper towels
Thin stiff wire hook: This can be made from a bent insect pin.
Marking pen: "Crowquill" type for smaller eggs; fine-pointed "Rapidograph" type for larger eggs.
Permanent black (India) ink

Preparation Procedure for Fresh Eggs

Hold the egg between the thumb, forefinger, and middle finger of the left hand (right hand, if left-handed) over a plastic bowlful of water at all times during the blowing process. Eggs often become very slippery during preparation, and they are much less likely to break if they fall into a container of water than onto a work table.

With the free hand make a small puncture in the eggshell near the center of the egg with the sharp point of a small drill. The hole should be made on the side of the egg with the fewest markings.

Place the point of a small drill in the puncture hole and, by hand, rotate the drill slowly in a clockwise direction, taking care not to release it. On small eggs do not push the drill, as this may cause the side of the egg to collapse. A certain amount of pushing force is necessary to drill through the shells of larger eggs.

After the drill cuts completely through the shell, the ragged edges of the eggshell membrane should be cut away by rotating the drill lightly in both directions just under the inner lip of the blowhole. Otherwise, the projecting edges of the membrane will impede the free flow of the contents out of the egg. (A flame-tipped drill is ideal for this purpose).

After a clean round hole has been made, hold the egg so that the hole is downward. The tip of the blowpipe should be held a few millimeters away from the hole -- the blowpipe does not enter the hole. The egg contents are removed by alternately forcing jets of air into the egg through the blowhole, then allowing the egg contents to drain out of the same hole.

Air may be introduced by mouth, or by a squeeze bulb on the end of the blowpipe. The former method is preferable for small eggs, since it allows one to gauge the amount of air entering the egg more easily (too much pressure can easily cause a small egg to explode). The squeeze bulb technique can be used safely with large eggs, and it saves a good deal of wear and tear on one's cheeks.

Often, a bead of liquid initially forms at the blowhole, and the flow of this material (generally albumen) can be enhanced by stroking one's thumb across the blowhole. It is inadvisable and unnecessary to attempt to pull liquid contents directly out of the hole.

After the contents have been completely removed (which can be confirmed by flotation, determining if the egg rolls to one side when placed on a flat surface, or by "candling" the eggshell against a strong light), the empty eggshell should be rinsed repeatedly with clean water. Water can be introduced into the egg by using a water bottle equipped with a nozzle, or by sucking up water in the blowpipe and forcing it through the hole.

Place freshly-blown eggs hole downward on a blotter or paper towel to dry. The blotting surface should be inside a shallow container, since the slightest draft may blow an empty eggshell off a work table. In warm climates or in field situations eggshells should be protected from flies while they are drying.

Notes on Hole Size

The size of the blowhole should depend upon how far incubation has progressed. Incubation stage can be roughly determined by placing the egg in a container of water -- fresh or slightly incubated eggs sink, while heavily incubated eggs float. Alternatively, clear albumen generally first appears in the blowhole of fresh or slight incubated eggs, whereas the appearance of a dark yellowish yolk at a newly made hole is an ominous sign, since it usually signifies a well developed embryo. All fresh eggs, regardless of size, can be blown successfully with a hole 1 mm in diameter. Eggs containing developing embryos must be blown with proportionately larger holes. If a larger hole is necessary, it is safest to make the hole progressively larger by using a graduated series of drills. If the edge of the hole becomes chipped, it is exceedingly difficult to prevent further extensive fracturing of the shell. Do not try to "round out" a chipped hole, as this is usually impossible.

It is important to use a small blowhole, if possible, since eggs become progressively weaker as the hole is made larger, and specimens with very large holes are less useful to researchers wishing to obtain eggshell weights. Never sacrifice a specimen, however, by attempting to remove the contents through too small a hole.

Procedures for Removing Large Embryos

Small and intermediate-sized embryos can be removed from eggshells without much difficulty, and even very well developed embryos can eventually be extracted with patience. Embryos larger than the diameter of the blowhole must be removed from the egg piece by piece. This means that the embryo must be disarticulated while in the egg, so that the various appendages can exit end first through the blowhole. The ultimate limitation to minimum blowhole size is probably the diameter of the largest hard bone in the embryo.

After first removing as much of the liquid component as possible, introduce water into the egg. When it is nearly (but not completely) refilled, the egg should be placed in the upturned palm of one hand (beware of rings!) with the fingers closely tightly over it. While holding the specimen in this manner, pound the wrist briskly with the other fist. This produces a turbulent confrontation between the egg contents and the water which was introduced into the egg, resulting in the gradual disarticulation of the soft-bodied embryo. Repetition of this process, alternating with blowing, will generally result in the removal of all but the largest embryos.

Very large embryos may be removed from eggs by the use of pepsin, a protein-digesting enzyme. Formerly sold under the brand name "Caroid", a suitable source of pepsin is now papaya extract, or even commercial meat tenderizers. An aqueous solution of the enzyme should be injected through the blowhole into the actual embryo using a hypodermic syringe. Pepsin will not damage the calcium carbonate portion of the eggshell, but it will break down the eggshell membranes and also any superficial pigments on the eggshell surface. For this reason, it is important to avoid letting any of the enzymatic solution fall onto the surface of the egg.

An egg injected with pepsin should be filled as full as possible and placed in a container with the hole upward. At daily intervals an attempt should be made to blow the egg again, and any decomposed material should be extracted. The enzyme works gradually, so the repeated blowing process will remove a little more of the embryo each time. Eggs with embryos near hatching may require two or three weeks to clean in this fashion. During this period it is important to ensure that the egg contents remain moist to prevent the contents from solidifying and stimulating a process of shell decomposition. I have not yet found a satisfactory method for removing the dried contents of eggs without damaging the shells.

The most difficult portions of any large embryo to remove through the blowhole are the pectoral and pelvic girdles, especially if they have developed beyond a soft cartilaginous stage. In extreme cases, such bony structures can be teased out of the blowhole by the use of a thin, stiff wire hook. This is a risky process, and it may result in a chipped hole. Other than this specific situation, or when injecting embryos with a pepsin solution, I do not recommend placing any instrument inside of the eggshell during the preparation procedure.

Marking

All eggshell specimens should be inscribed with some distinctive notation so that they can be identified in case they become separated from others in the set or from the original data. Unmarked eggs easily become mixed up with other unmarked specimens, rendering them all scientifically useless.

Eggs should be marked with permanent black ink (or, in the case of extremely darkcolored eggs, with permanent white ink). Pencil marks are difficult to read and less permanent, and "magic markers" or felt tip pens tend to produce messy, overlarge marks. A "crowquill" pen point, the smallest that can be obtained, is ideal for marking passerine eggs, no matter how small the specimen. "Rapidograph"-type pens are useful for marking larger specimens, e.g., crow egg-sized or larger.

Egg marks should be as small and neat as possible, so as to interfere with the least amount of egg surface. The marks should be unique for each "set", or clutch of eggs, and they should always be made around the blowhole. It is best to avoid such traditional notations as "1/4" or "2/5" since they are too non-specific. Most large museum collections contain many presently unidentifiable eggs with such generic markings.

Other than providing some sort of unique tag, there is no "correct" way to mark eggs. Among the types of information which can be marked on the egg are the following:

Catalog number: One's own catalog number. Chronological numbering systems are probably the best for this purpose, as they insure that each set will have a unique mark.

Number of eggs in the set: This is often recorded beneath a slash mark with the catalog number on top.

Date: Year only, or the whole date. In the latter, case, it is advisable to indicate the month with a Roman numeral because of the perennial confusion between Old and New World notations.

AOU number: This is available only for those forms treated by the first five editions of the "AOU Check-list of North American Birds", but has traditionally been a standard portion of the marks on the eggs of these species. The AOU number provides a quick means of identifying specimens to species.

Personal mark: This may take the form of an initial or other symbol, which is marked on all the eggs taken by a particular collector.

Egg number: If whole egg weights are taken, or if the laying sequence is known, it is useful to identify individual eggs in the set by number. This may be done by placing the egg number immediately beneath the blowhole.

NESTS

General Considerations

Bird nests come in such a diversity of forms and sizes that it is not surprising that few comprehensive nest collections are maintained. Although most natural history museums cannot spare the space to store bird nests in large series, it is useful to maintain at least a basic reference collection for local species. Given care in handling and protection from dust, such specimens can retain a relatively fresh appearance for decades.

Preparation and Collecting Tools

Tree clippers
Handsaw

Toilet paper or paper towels
Thread
Aluminum foil

Preparation Procedures

The procedures described here are mainly applicable to the typical cup-shaped or pensile nests of passerines and some families of non-passerines. Ground nests, burrow nests, and cavity nests all present special problems which cannot be adequately discussed in this brief summary.

It is useful to decide at the outset whether the nest is being collected for display or research purposes. Display specimens should be accompanied by a relatively large portion of the substrate, whereas specimens taken for research use should as compact as possible without a loss of biologically significant information. Regardless of their intended use, however, all nests should be collected in a manner that preserves the point of their attachment to the substrate, as practical. Tree nests should be collected with a piece of the branch supporting them, i.e., they should not be plucked bodily from the supporting limb.

A padding of paper towels or toilet paper should be placed in the nest cup to retain its shape during transport from the field. The nest should then be wrapped fairly lightly in toilet paper or paper towels. The intent of this procedure is to "capture" all the loose ends of the nest and to make it less vulnerable to damage during handling. The nest should then be wrapped with thread, but not so tightly as to disrupt the natural shape. Finally, the whole affair should be wrapped very loosely with aluminum foil. The resulting compact package can then be readily transported from the field in a sturdy cardboard carton. Fresh nests packed and transported in this manner should be unpacked as soon as possible and restored to their original shape.

I recommend strongly against the use of cotton anywhere in the vicinity of bird nests, since it tends to leaves wisps which are almost impossible to remove later. Since some bird species actually use cotton in nest construction, the remnants of cotton packing material can leave a misleading impression with later collection users. Recently, commercially available plastic netting has been wrapped by some researchers around nests to hold them together in shipping. While this is effective in preserving the nest shape during transport, the later removal of the netting can be quite tedious and cause serious damage to the specimen. Another deleterious procedure recommended in some older texts is to apply shellac or some similar coating to the nests to preserve their structural integrity. We have not found this to be necessary, and such coating results in an artificial appearance and can obscure structural details.

A field label should be attached to the nest at the time of collecting, and this should ideally be sewed right through the nest wall.

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NOTES

FROM A

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