

Standard Operating Procedure for Destructive Sampling

Background

Within the [Canadian Museum of Nature \(CMN\)](#) Collection Management Framework each of the scientific specimens is categorized within one of 5 levels¹. The value of each specimen is assessed using a broad range of considerations in providing a context for ongoing care and use. While each specimen may be considered for destructive sampling, the possibility and level of access varies considerably with the rank. These procedures give detailed instructions that are provided for the optimal care and use of the national collections.

Definition

Destructive sampling involves invasive methods. It applies to any procedure that results in the permanent destruction or alteration (sometimes invisible) of all or a part of a natural history specimen for the purpose of performing scientific analyses. It can consist of removal of tissue fragments, part of a specimen or complete destruction of a whole specimen. Studies requiring destructive analyses encompass anatomical or microscopic observations, age determination, DNA sequencing and isotopic analyses.

The Vertebrate Collection

Five levels of invasiveness are recognized; examples of each level are given:

- Level A - Benign methods. Includes sampling procedures such as removal of fragments of soft tissue on bones, epithelium or surface tissue (moult, dead cells), and soft tissue fragments preserved for the express purpose of destructive analysis.
- Level B – Minor or invisible damage. Picking of breast feathers, hair, or fish scales, removal of embedded parasites from a host, slight incision in toe pads for removal of a small amount of internal tissue.

¹ Price, J.R. and G.R. Fitzgerald. 1996. Categories of specimens: a collection management tool. *Collection Forum*, 12(1): 8-13.

- Level C – Moderate damage. Removal of small clips from skin, fin, claws on hides, and toe pads, sample of an ear punch, clearing and staining, removal of a loose tooth for a subsample, coring a postcranial bone, dissections.
- Level D – Severe damage. Destruction of unique specimen features such as canines, removal of a deeply anchored feature with damage to surrounding tissue for a subsample, sample of maxilloturbinal bone material, picking of rectrix or remix feathers for a subsample, sectioning postcranial bones, removal of a toe.
- Level E – Terminal damage. Destruction of an entire specimen or loss of scientific integrity.

Principles

The CMN is a public institution with fundamental goals of preserving collections of natural history objects for future generations, and of increasing knowledge of the natural world. Destructive sampling for scientific purposes when performed by highly qualified scientists can result in increasing the scientific value of specimens as vouchers, and hence of the CMN collections.

The CMN Collection development and management policy #4001 under section 5.2.2 stipulates that “*Decisions regarding the use and care of collections (up to and including destructive sampling of a specimen) will be guided by the principles of permanence and preservation*”. This policy identifies five categories of specimens and regulates destructive samplings as follow:

- Category 1: Primary types and extinct recent species. Destructive testing or sampling is strictly regulated and rarely permitted.
- Category 2: Secondary types, historically very important specimens, extinct, rare or endangered recent species and specimens of exceptional scientific value. Destructive testing or sampling is stringently regulated.
- Category 3: Vouchers or historical specimens. Destructive testing or sampling is permitted with review.
- Category 4: Identified specimens and specimens of relatively low scientific value. Usually accessioned and catalogued. Destructive testing or sampling is permitted.
- Category 5: Working material – usually accessioned but not catalogued. Destructive testing or sampling is permitted. The material must first be identified and catalogued to ensure preservation of data.

Key criteria:

1. Destructive sampling performed on CMN specimens of categories 1 to 4 shall be allowed under limited circumstances, and shall require prior approval.
2. Destructive sampling of historically significant specimens shall be permitted only if the relevance of the particular specimens to the proposed study can be clearly demonstrated.
3. Destructive sampling of specimens must yield information that shall benefit the research community. The higher the category of specimen(s) to sample and the more severe the damage, the more stringent the conditions of sampling will be, and the higher the expectations as to publishing the results.
4. Only those techniques using proven, minimally invasive procedures that ensure keeping as much of the specimen as possible in the original condition and scientific value shall be approved. CMN staff may conduct or supervise the destructive sampling to ensure that damage is limited.
5. Permission for destructive sampling of CMN specimens will follow the prescribed signing authorities and shall be granted in exchange for data obtained during subsequent analysis.

Procedures

These procedures aim at responsibly balancing collection value lost with knowledge gained by establishing guidelines for ethical destructive sampling of CMN specimens.

Approval & Conditions

1. Requests for destructive sampling shall be submitted in writing directly to the manager of the collection in question and a minimum of eight weeks prior to sampling.
2. The proposal shall detail the purpose and potential benefits of the study to the scientific community. An application form (Request for destructive sampling of collection objects) describing the research project and justifying why CMN material is especially needed, the sampling approach and quantity of material required, and the analytic methods to be used shall be completed.
3. To prevent waste of sampled CMN material, applicants shall provide sufficient evidence that they have mastered the methodology they propose to execute using CMN specimens.
4. As for loans, permission for destructive sampling is granted to institutions through permanent staff. Postdoctoral fellows and students shall have the application for destructive sampling form signed by their academic supervisors. Normally, only

those students completing a graduate degree will be granted access to destructively sample CMN specimens. Other scientists not permanently affiliated with a scientific or academic institution shall be required to obtain written support from an authorized permanent staff member.

5. In all instances, the applicant's home institution shall be held fully accountable.
6. Applicants shall commit to return unused material and to pay all shipping costs, if applicable, prior to their access to CMN specimens.
7. The manager of the CMN collection in question shall assess the risks and shall closely examine the options suggested by the applicant to minimize the risks of damage. The nature of the sampling shall be fully documented in the catalogue books and in the electronic database.
8. Decision to approve the destructive sampling request shall be based upon the scientific value or the uniqueness of the specimens in question, the judiciousness of the proposed sampling technique, the degree of destruction, the potential of the sampling to yield significant scientific benefit, the possible needs of other prospective users, and any legal or ethical issues regarding these specimens.
9. Approval of destructive sampling of specimens of categories 1 and 2 aforementioned shall be granted under exceptional circumstances. Following recommendations from the Curator of the CMN vertebrate collections, the Vice President, Research & Collections, or a designated representative shall make the final decision.
10. The CMN Curator shall approve the destructive sampling of specimens of categories 3 and 4 in consultation with the Section head of Zoology.
11. Destructive sampling for scientific, non-commercial use may be permitted free of charge. Commercial sampling, when permitted, shall be subject to an access fee decided on a case by case basis and protecting the intellectual property of the CMN. In all cases, destructive sampling of Category 4 may be subject to extra costs to allow for timely cataloguing.

Sampling

12. The CMN staff do not provide sampling services. The applicant shall be responsible for professionally conducting sampling in compliance with the terms and conditions. In exceptional circumstances, CMN staff may perform the destructive sampling at duly approved costs or following special agreements.
13. Sampling shall be done at CMN facilities, or off-site under exceptional circumstances as decided by CMN staff.

14. Only pre-approved CMN specimens shall be destructively sampled.
15. Only one sample from each specimen for the same study shall be granted as part of the same agreement.
16. Destructive sampling shall be done by minimally invasive methods, and in accordance with current health and safety practices.
17. The samples remain the property of the CMN at all times. Any unused portion of samples shall be returned to the CMN upon completion of the study. No transfer of samples, in part or in total, to a third party shall be done without written permission from the CMN according to our authorities for loaning specimens.

Public and scientific benefit from specimen material and data

18. The applicant shall indicate the anticipated timeframe for the analyses to be conducted on the CMN samples, for the return of any unused material, for the depositing of data in an accessible repository for others to examine and use, and for the prospective publication(s).
19. The CMN Registrar's office shall ensure follow-up on item 17 in conjunction with the CMN Curator.
20. The data derived from the analysis of the sample is the property of the researcher.
21. The applicant shall commit to provide the CMN Curator with the analysis results in the form of raw data within six months of concluding the study, and a copy of any publication or report derived from the material as soon as it is published. This data shall remain confidential for a period of two years, when it shall become part of the object's permanent record. A Destructive Analysis Agreement Form shall be signed by the applicant at the time the request is approved.
22. The CMN is the owner of and repository for all specimen material derived from the sampling project. All samples – including remains or residue from extraction – shall be returned to the CMN within six months of the conclusion of the study.
23. The applicant shall acknowledge the CMN in any publication or report that result from the samples obtained from the CMN specimens. Data obtained from CMN specimens shall be referenced in databases and publications using CMN catalogue numbers.
24. Failure to comply with these terms will lead to denial or cancellation of approval. The CMN reserves the right to deny approval for destructive sampling of CMN specimens without further justification.