When zoological type specimens are lost: ICZN-compliant guidelines for when and when not to designate neotypes

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The recent fire in the Museu Nacional in Rio de Janeiro (Brazil) has resulted in the simultaneous loss of millions of irreplaceable biological and paleontological specimens, and among them were thousands of name-bearing types for nominal taxa whose names are governed by the International Code on Zoological Nomenclature (hereafter, "the Code"; ICZN 1999). The scope of the loss of type specimens is presumed to be the largest in a single event since World War II, and we grieve for this loss and the impact it will have on our colleagues around the world. Given that there are hundreds of active taxonomists whose work is affected by this event, and the desire to rebuild this museum and its collections, the Commission feels that it can offer some guidance regarding what should and should not be done with respect to the designation of neotypes, because while the Code allows for the replacement of types that have been lost or destroyed, this only is possible when certain conditions are met. We will focus on three aspects: (1) When neotypes are needed; (2) When neotypes are prohibited; and (3) Code-compliant and ethical practices for designation of neotypes. At the end of this document we append the relevant text—Article 75—of the Code.

(1) WHEN ARE NEOTYPES NEEDED TO REPLACE LOST TYPES?

Under Art. 75, an author should designate a neotype:

(A) ONLY when there is no existing name-bearing type ("primary type") of the species or subspecies involved (e.g., no holotype, lectotype, syntypes, or prior neotype), and

(B) ONLY when the lack of a name-bearing type renders it impossible to objectively associate a published species or subspecies name with a known form, or if the lost type had an incorrect or ambiguous type locality.

For clarification: An author can unilaterally replace a lost primary type, but not an existing type. Existing types can only be replaced with the Commission's approval (Art. 75.5 or Art. 75.6). Essentially, a neotype is needed only when having a specimen objectively linked to a name is essential for solving a complex zoological problem, such as the confused or doubtful identities or provenance of closely similar species.

(2) WHEN ARE NEOTYPES PROHIBITED?

(A) Under Art. 75.2, a neotype designation proposed simply to replace a lost type is not valid; explicit justification is required.

(B) Under Art. 75.3, there are several criteria to be met, but the primary criterion used to decide whether or not to proceed with a neotype designation is the express need for justification, as given in Art. 75.3.1; namely, that replacing a type cannot be justified if (a) it is still possible to unambiguously associate a published species or subspecies name with a known form (i.e., to reliably tell it apart from all other similar species or

subspecies), and (b) its type locality does not require explicit correction or clarification (as noted above).

(C) any neotype designation that fails to fulfill any of the other requirements listed within that Article (75.3.2 through 75.3.7; see below) is NOT a valid neotype designation.

For clarification: there are already thousands of species and subspecies for which the name-bearing type is lost, and the recent event has resulted in thousands more. However, unless the lack of a name-bearing type renders it effectively impossible to distinguish a named species or subspecies from all others similar to it, or to be certain where it lives, a taxonomist cannot validly designate a neotype for that taxon. Any manuscript or publication claiming to designate a neotype must be carefully examined, at the very least during the process of peer review (in keeping with Recommendation 75B), and this criterion must be applied stringently to prevent the dissemination and acceptance of invalid neotype designations.

(3) WHAT ARE THE REQUIRED AND RECOMMENDED PROCEDURES IF A NAME-BEARING TYPE IS LOST?

(A) First and foremost, it is crucial to establish that the absence of a name-bearing type (or types) has indeed made it impossible to recognize a given species or subspecies due to ambiguities in taxonomic status or type locality, and to be able to explain the reasoning and provide evidence supporting any such claim. This is imperative in order to satisfy Art. 75.3 (and 75.3.1 in particular). Without such justification, the designation is not Code-compliant.

(B) The second step, in keeping with Appendix A of the Code (Code of Ethics), is to contact the original describer(s) of a species **before** attempting to designate a neotype, and to collaborate with them or to get their feedback.

(C) If the original describer(s) are deceased, then anyone who is considering designating a neotype should communicate their intention to other specialists in the taxonomic group (Recommendation 75B) and discuss any concerns they may have. Such consultations will help confirm that the type is truly lost, ensure there is a need to clarify taxonomic status or type locality, and reduce the chance that different workers designate separate neotypes independently. While the Principle of Priority does apply to neotype designations (Art. 75.4), it is far simpler for everyone if a lost type is replaced only once rather than multiple times.

(D) It is advisable for anyone who is designating a neotype to do so in a widely-read, peer-reviewed, and Code-compliant venue.

(E) Paratypes have **no special consideration or nomenclatural standing under the Code**; while it is a general recommendation that—all other things being equal—selecting a paratype to become a neotype is preferable (Recommendation 75A), bear in mind that, in many cases, all other things are NOT equal. Unless a paratype is from the same locality as the lost holotype, and in good condition, it may NOT be the best available candidate for a neotype, given the criteria in Art. 75.3 (especially 75.3.6).

(F) Given that the explicit fulfilment of each and every subordinate portion of Art. 75.3 is mandated by the Code (below), anyone who is designating a neotype is advised to do so

by listing each subordinate portion explicitly, and giving the necessary statements to satisfy them all. Very briefly: Art. 75.3.1 requires an explicit statement of **justification**; Art. 75.3.2 requires an explicit statement of **diagnostic characters**, or citation of such; Art. 75.3.3 requires **unique identifying information** associated with the neotype itself; Art. 75.3.4 requires an explicit statement of evidence **that the original type is lost**; Art. 75.3.5 requires an explicit statement of evidence that the neotype represents **the same species** as the lost type it replaces; Art. 75.3.6 requires an explicit statement of evidence that the neotype came from **as near to the original type locality as possible**; Art. 75.3.7 requires an explicit statement that the neotype is **the property of, and deposited in, a recognized scientific or educational institution**, referred to by name, that maintains a research collection and makes it available for study. Again, violation of **any** of these clauses invalidates the neotype designation.

(G) **For clarification of Art. 75.3.6**: One may foresee cases in which a taxonomist makes a limited attempt (or no attempt at all) to locate or obtain a potential neotype from the original type locality, and publishes a work designating a neotype from a different locality (e.g., by arbitrarily selecting a paratype), whereupon someone else, with fresh material from a closer location, claims that the first neotype designation was not valid and proposes to replace it with a different neotype. This is particularly problematic if genetic work subsequently reveals that the population a neotype came from represents a different taxon from the one occurring at the original type locality. We urge taxonomists to exercise due diligence to avoid such situations (Recommendation 75A), even if it means engaging in public solicitation to locate a genuinely topotypical specimen.

(H) So long as it does not conflict with compliance to any of the preceding (especially Art. 75.3.6), we suggest that anyone who is designating a neotype should select, if possible, a specimen for which molecular data are available, or has been suitably preserved for subsequent collection of molecular data. Note that this is another reason one might wish to avoid designating a paratype as neotype.

CLOSING NOTE:

If there is still confusion as to the proper course of action, or a desire to have the provisions of the Code set aside in a particular case, we encourage authors, reviewers, and editors to consult with the Commission in a timely manner.

TEXT OF ARTICLE 75:

Article 75. Neotypes.

75.1. **Definition.** A neotype is the name-bearing type of a nominal species-group taxon designated under conditions specified in this Article when no name-bearing type specimen (i.e. holotype, lectotype, syntype or prior neotype) is believed to be extant and an author considers that a name-bearing type is necessary to define the nominal

taxon objectively. The continued existence of paratypes or paralectotypes does not in itself preclude the designation of a neotype.

75.2. **Circumstances excluded.** A neotype is not to be designated as an end in itself, or as a matter of curatorial routine, and any such neotype designation is invalid.

Example. If an author designates a neotype for *Xus albus* Smith, a species about whose identity there is no doubt and which is not involved in any complex zoological problem at the time at which it was designated, the purported "neotype" has no name-bearing status.

75.3. **Qualifying conditions.** A neotype is validly designated when there is an exceptional need and only when that need is stated expressly and when the designation is published with the following particulars:

75.3.1. a statement that it is designated with the express purpose of clarifying the taxonomic status or the type locality of a nominal taxon;

75.3.2. a statement of the characters that the author regards as differentiating from other taxa the nominal species-group taxon for which the neotype is designated, or a bibliographic reference to such a statement;

75.3.3. data and description sufficient to ensure recognition of the specimen designated;

75.3.4. the author's reasons for believing the name-bearing type specimen(s) (i.e. holotype, or lectotype, or all syntypes, or prior neotype) to be lost or destroyed, and the steps that had been taken to trace it or them;

75.3.5. evidence that the neotype is consistent with what is known of the former name-bearing type from the original description and from other sources; however, a neotype may be based on a different sex or life stage, if necessary or desirable to secure stability of nomenclature;

75.3.6. evidence that the neotype came as nearly as practicable from the original type locality [Art. 76.1] and, where relevant, from the same geological horizon or host species as the original name-bearing type (see also Article 76.3 and Recommendation 76A.1);

75.3.7. a statement that the neotype is, or immediately upon publication has become, the property of a recognized scientific or educational institution, cited by name, that maintains a research collection, with proper facilities for preserving name-bearing types, and that makes them accessible for study.

75.4. **Priority.** The first neotype designation published for a nominal species-group taxon in accordance with the provisions of this Article is valid and no subsequent designation, except one made by the Commission under the plenary power [Art. 78.1], has any

validity (also see Article 75.8 for the status of a neotype if a former name-bearing type is rediscovered).

75.4.1. If a validly designated neotype is lost or destroyed, a new neotype, if one is designated to replace it, must satisfy the provisions of this Article.

Recommendation 75A. Choice of neotypes. Authors are advised to choose neotypes from any surviving paratypes or paralectotypes unless there are compelling reasons to the contrary, such as data inadequate to meet taxonomic requirements, the poor condition of the specimens, or probable mixture of taxa. All things being equal, topotypic specimens (see Glossary) from the type series should be given preference.

Recommendation 75B. Consultation with specialists. Before designating a neotype, an author should be satisfied that the proposed designation does not arouse serious objection from other specialists in the group in question.

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