

(009) A proposal to solve a paradox when neotypifying names of fossil-taxa

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History has given us too many examples where types of the names of taxa have been lost. For example, the destruction of the Berlin Herbarium (B) after a bombing raid in 1943 was a severe blow for the botanical world. A major part of one of the world's largest collections and most extensive neotropical type collection was damaged or destroyed, together with many type specimens from all over the world that were on loan in Berlin at the time. Even today, unfortunate events can cause the loss of scientifically valuable type specimens.

If a holotype is lost or destroyed, the *Code* (Turland & al. in Regnum Veg. 159. 2018) has provisions that govern its replacement. Typically, a lectotype must be selected from the surviving original material, but in the absence of the latter a neotype can be designated “to serve as nomenclatural type **if no original material exists**” (Art. 9.8, emphasis added). However, there is a problem for fossil-taxa because Art. 9.4 clauses (a) and (b) specify that original material includes illustrations, but Art. 8.5 requires that the type (epitypes excepted) “of the name of a fossil-taxon at the rank of species or below is always a specimen”. It is therefore impossible under these rules to designate a neotype for the name of any fossil-species or infraspecific fossil-taxon when the protologue includes an illustration. Furthermore, this paradox also makes any such previously designated neotypes for fossil taxa ineffective.

This problem is substantial because new names of all fossil-taxa at the rank of species or below published on or after 1 January 1912 must be accompanied by an illustration or figure, or by a reference to one previously and effectively published, in order to be validly published (Art. 43.2). The problem also applies to any names published prior to this date that included an illustration in the protologue, which was common practice well before becoming a requirement in the rules of nomenclature. Numerous examples could be cited to illustrate the scope of this problem, but undoubtedly no field can surpass palaeopalynology for missing or destroyed holotypes. Traverse (in *Taxon* 59: 666. 2010) estimated that the types of about 25,000 palaeopalynological names are mostly not available, either through loss or degradation of specimens on microscope slides, or are impossible to relocate in a mixed sample with hundreds or thousands of other grains, even if the original slides, from which they were described, are still available. In palaeopalynology, it is also very common for new fossil-species (or infraspecific fossil-taxa) to be described based on just a single specimen of a fossil spore or pollen grain, plus an accompanying illustration.

For many palaeopalynological names described in the 1930s and 1940s in Germany, type specimens are missing. Our attempt to

resolve the taxonomy of a disputed Rhaetian palynomorph illustrates the problems perfectly. We enquired for several type specimens for names of fossil-taxa designated by the prolific group of R. Potonié and co-workers, who described more than 300 new species and later authored the *Synopsis der Gattungen der Sporae dispersae* I–V (in *Beih. Geol. Jahrb.* 23–87. 1956–1970). Except for a few samples from the Upper Carboniferous, Tertiary of the Geiselal and A. Ibrahim's doctorate material from the Ruhr Basin, neither the institutes in Berlin and Krefeld, where Potonié worked, nor the Federal Institute for Geosciences and Natural Resources could account for the whereabouts of the requested types or any other of Potonié's material. As Traverse predicted, the majority of Potonié's types are most likely lost.

In the absence of the type and other specimens, the palaeobotanist or palynologist is left with only the illustration depicting the original type, but this does not solve the problem because the illustration cannot serve as the lectotype, although some authors may treat it as such even though it is not permitted. The illustration could be used to guide selection of an appropriate neotype, ideally from the same fossil locality or geological strata that was the source for the original specimens, either from existing museum collections or newly collected material. However, the inclusion of the illustration in original material as currently defined in the *Code* prevents the designation of a neotype. As a result, these names are left unresolved, and increasingly contribute to taxonomic and nomenclatural instability.

This absurd dilemma binds the hands of palaeobotanists and palynologists attempting neotypifications when no original material other than the illustrations are still available. We conclude that the current definition of “original material” has to be considered defective, at least with respect to its application to names of fossil-taxa. We therefore propose the following amendments to Art. 9.4. to clarify the definition of “original material” for names of fossil-taxa at specific or lower rank.

(009) Amend Art. 9.4(a) and (b) (new text in bold):

“9.4. For the purposes of this *Code*, original material comprises the following elements: (a) those specimens and illustrations (both unpublished and published prior to publication of the protologue; **illustrations of fossils excepted: see Art. 8.5**) that the author associated with the taxon, and that were available to the author prior to, or at the time of, preparation of the description, diagnosis, or illustration with analysis (Art. 38.7 and 38.8) validating the name; (b) any illustrations published as part of the protologue (**fossils excepted: see Art. 8.5**); ...”