

Describing new species in the absence of sampled specimens: a taxonomist's own-goal

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Abstract. Photographs of individuals of new species have been used recently as a proxy for physical holotypes when specimens could not be or were not sampled. The arguments that have been presented in favour of this practice are discussed and shown to be ill-founded. The absence of physical specimens may be the source of considerable controversy and the effects of describing new species without physical holotypes are considered detrimental to the future of taxonomy and maintenance of scientific collections.

Keywords. Nomenclature; taxonomy; designation of holotypes; Diptera; Aves; illustrations; specimens.

A recent description of a new species based on an insect retained in a photograph only (Marshall & Evenhuis 2015) raises problems that concern taxonomy and question its scientific foundation. As in all sciences, published information has to be at least potentially verifiable. Unverifiable information is in the domain of belief. The Code (1999) ensures a link between published taxonomic information and the reality on which it is based (Article 61.1.): *'Each nominal taxon ... has actually or potentially a name-bearing type. The fixation of a nominal taxon provides the objective standard of reference for the application of the name it bears.'*

The objectivity of established names is, however, weakened by Article 73.1.4: *'Designation of an illustration of a single specimen as a holotype is to be treated as designation of the specimen illustrated; ...'*, for example because of the fact that any photograph can easily be modified or misinterpreted. An underlying message of Article 73.1.4 is the absence of distinction between specimens produced by natural processes and illustrations produced by humans, at least as far as descriptions of new species-group taxa are concerned. Although the issue was discussed in detail by Dubois & Nemésio (2007), a new case calls for new reactions.

A concrete case of complications and confusions in taxonomy produced by the application of Article 73.1.4 is shown by the recent description of a bird species from the Middle East. In 2013, a team of ornithologists discovered an unknown population of desert owl

in Northern Oman (Robb et al., 2013). This bird was first heard and its call recorded, and later the team obtained several photographs. It differed in morphology and sound from the only known species of owl in the region (*Strix butleri*). Based on the available evidence, the team described a new species (*Strix omanensis*) but they refrained at that time from collecting or even capturing a specimen, because of the taxon's rarity. However, Kirwan et al. (2015) analysed the type specimen of *Strix butleri* using genetic and morphological characters, and revealed that it differs significantly from all other specimens previously ascribed to this species. The geographical provenance of the type was unfortunately uncertain. Kirwan et al. (2015) considered that two species-level taxa were involved, *Strix butleri* for the type and the newly described *Strix hadorami* (holotype BMNH 1965.M.5235 from Israel) for the other specimens from the Middle East. The lack of a type specimen for *Strix omanensis* left them unable to compare this taxon to its congeners. However, they pointed to clear evidence of morphological congruence between the type of *butleri* and the phenotype described as '*omanensis*', and recommended that this name be considered as a synonym of *butleri*. Their hypothesis was finally supported by a new analysis of Robb and colleagues (unpublished manuscript available on BioRxiv), in which they obtained genetic material from an Oman population of *Strix* and compared the sequences to those published by Kirwan et al. (2015). These sequences proved to be the same as those of the type specimen of *Strix butleri* and of another bird sampled in Iran.

Owls are very well known and not as diverse as many invertebrate taxa, but still the use of Article 73.1.4 by Robb et al. (2013) had unforeseen negative effects. Unlike birds, many undescribed species remain to be sampled in megadiverse groups, such as Diptera and other insects. Taxonomists describing new species in such groups can eventually predict but never exclude the existence of other, similar sympatric species. The history of taxonomy is a long chain of such discoveries, paralleled by discoveries of new characters that enable more reliable discrimination of the ever increasing number of recognized taxa. The absence of specimens, as in the new species of *Marleyimyia* described by Marshall & Evenhuis (2015), prevents the discovery of additional characters and is foreseen as a source of future problems.

The discovery of unexpected, spectacular new species is doubtlessly an event that requires publication. Such discoveries may also be important to support conservation of sites and/or may have positive political impact. No doubt, such publications are desirable, and nothing in the world impedes authors to write about them. However, the necessity to establish new binomens is doubtful when provisions of the ICZN are not met, or if the available information about the respective taxa is considered too incomplete. Taxonomists currently have ways to denote such taxa informally. Conservationists, ecologists and others may use published information about unnamed taxa just as well as if they would have been denoted by available binomens.

Marshall & Evenhuis (2015) advocate their action and the possibility of using illustrations instead of specimens to describe species by: (a) the increasing number of 'digital collectors' building collections of images; (b) the 'extreme' rarity of the illustrated taxon; (c) the quality of high-resolution photography; (d) loss of primary type material; (e) the increasing difficulties in sampling physical specimens.

We consider these arguments weak for the following reasons:

(a) Taxonomy might be threatened because of the increasing power and availability of digital photography, improving one's chances of quickly capturing images of animals, without carefully studying the animal themselves.

(b) The notion of 'rarity' has meaning when sizes of populations are known. This is certainly not the case in *Marleyimyia*, nor in the bulk of other animal species. Such 'rarity' only points to a lack of knowledge.

(c) In our view only physical specimens (or parts of specimens) provide the possibility of positively identifying biological species and revealing their characters, apart from external morphology, which is the only one set of characters available from photographs. Examination of physical specimens may reveal biological characters that cannot be captured solely by photography, precluding adequate comparison with closely related taxa.

(d) Physically lost primary types may be replaced by neotypes if necessary. However, it is not entirely clear if a neotype can be proposed when a name was established in the absence of a physical type. For example, can a neotype be established without recourse to the Commission if the illustration used as a proxy is lost or damaged or found to be inadequate or tampered with?

(e) As Marshall & Evenhuis (2015) stated, there are 'vanishingly few examples of scientific collecting having a detrimental effect on populations or species . . .'. In fact, it may be reasonable to protect the few thousand larger vertebrate species by particular legislation, but the bulk of animal species consists of invertebrates and every hour the number of invertebrates dying naturally or accidentally by human means, not counting purposeful destruction of unique habitats, probably exceeds that of all the specimens ever collected for scientific purposes around the world. Nevertheless, the legislations adopted as a consequence of inadequate information and side-effects of the Nagoya Protocol have added notable additional difficulties in sampling specimens. By bureaucratic requirements and uncertainties they discourage field research, and hamper the increase of knowledge about forms of life that evolved and occur on our planet. According to estimates, less than half, possibly only a fifth or sixth of the extant species have been so far sampled and reported in publication. The ongoing anthropogenic pressures on habitats threaten most of both the described and the not yet sampled species. The problem is largely political and it should be approached carefully and considered and monitored at all levels, before establishing multiple new taxa under Article 73.1.4.

(f) Taxonomists admittedly have sufficient common sense not to use Article 73.1.4 frequently, but this does not mean that the problem is not there. Publications such as those of Marshall & Evenhuis (2015) or Minter et al. (2014) may also stimulate non-experts to describe new species based on photographed specimens. As good quality photography is quite common while taxonomic expertise is becoming rare, a major threat may be foreseen if Article 73.1.4 remains applicable and is routinely used. The unrestricted use of this article of the Code may affect institutions, which are already facing difficulties depending on sponsors with a poor understanding of the need for keeping physical specimens. With dwindling financial support, natural history collections will encounter further difficulties if decision-makers consider scanning specimens to be an acceptable proxy for physical specimens.

This paper is an invitation to a discussion, which we hope will be useful for a new edition of the Code.

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