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COMMENTARY

Type specimens in modern ornithology are necessary and irreplaceable

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ABSTRACT
Recent years have seen a series of new species descriptions in which no type specimen or fragmentary type specimen material was provided as documentation. These descriptions have been controversial, but the Code of Zoological Nomenclature makes clear that such nondiagnostic types are not acceptable specimen documentation. A more appropriate approach is documentation of the discovery, but without formal naming of the species, until suitable specimen documentation can be assembled.

Keywords: description, documentation, new species, type specimen

Los especímenes tipo en la ornitología moderna son necesarios e irremplazables

RESUMEN
Los años recientes han visto una serie de descripciones de nuevas especies para las cuales no se ha provisto espécimen tipo o se ha provisto material fragmentario del espécimen tipo como documentación. Estas descripciones han sido controvertidas, pero el Código de Nomenclatura Zoológica deja claro que esos tipos no diagnósticos no son documentación aceptable del espécimen. Un enfoque más apropiado es la documentación del descubrimiento, pero sin un nombramiento formal de la especie, hasta que la documentación adecuada del espécimen pueda ser juntada.

Palabras clave: descripción, documentación, espécimen tipo, nuevas especies

The concept of type specimens as documentation of new species taxa has seen considerable discussion in ornithology in recent years. Specifically, some in the field have questioned whether a type specimen must be, in essence, a dead bird in a museum, or whether photographs, illustrations, and/or tissue samples might suffice (Donegan 2008). In a world of advanced genomics, this debate might seem to be ornithological taxonomic trivia, but it turns out to be important in establishing a consistent, biologically based, and stable list of birds of the world.

Donegan (2008) made a series of arguments that practicalities (e.g., permitting, conservation endangerment, setting positive local examples) may frequently preclude collecting specimens. He suggested that alternatives (photographs, blood samples, etc.) may provide richer documentation of phenotypes and genotypes. As a consequence, his conclusion was that norms for description of new species should be softened to allow more descriptions to proceed without awaiting full specimen documentation. While these ideas may appear compelling, they lose sight of the principal motive for type specimens: detailed documentation of diagnostic characteristics of species taxa, permitting comparisons not just with known taxa, but also with other taxa that may yet be discovered.

The first challenge in understanding these points is the formal, legal language of the *Code of Zoological Nomenclature*, which is a summary of the rules of order of the International Commission on Zoological Nomenclature (ICZN 1999). Among many other points, the Code makes a series of statements about types and their role in modern taxonomy: that only an animal or part of an animal is eligible to serve as a type (Article 72.5.1), and that, when illustrations or descriptions are provided, it is the individual or individuals illustrated or described that are the type, and not the illustration or the description (72.5.6). When a type is insufficient to diagnose a taxon (i.e. when the taxon cannot be discriminated from other taxa on the basis of the type material), a neotype can be justified and designated (75.3.2). Finally, the Code provides recommendations about types: that they be labeled clearly and unmistakably as types (recommendation 72D); that all label information associated with the type be published (72E); and that the institution housing the specimen ensure that types are clearly marked, carefully preserved, accessible for study, and known to

the community (72F). These principles establish what a type specimen should be in comprehensive, near-legal terminology, but provide a set of rules that ensure that ornithological nomenclature will be a documented, stable, and evidence-based platform from which bird diversity can be understood.

A Cautionary Tale

Twenty-two years ago, a new bush-shrike species was described from Somalia, and the authors of the description made the decision to set the "type" individual free without preservation; they stoked the flames of controversy by naming the species *Laniarius liberatus* (Smith et al. 1991). Indeed, the abstract of the description reads as follows:

> The type material comprises moulted feathers, blood samples and DNA extracted from feather quills. . . . Comparisons of base sequences from the cyt-b gene of mitochondrial DNA support the judgement that the bird represents a full species and is not a colour morph or hybrid of examined taxa. This procedure confirms that, in situations where collecting is not desirable, tissue from live individuals can be used to define taxa, and for comparisons with DNA from museum specimens of other taxa.

This description provoked a series of discussions and debates (e.g., Peterson and Lanyon 1992, Prinzinger et al. 1997a, Collar 1999, Collar 2003, Bates et al. 2004), in which it emerged that decisions about what to do with the individual were based on the idea that only a single individual had been noted of a putatively new species, such that the species must be quite rare and probably endangered. Indeed, Collar (1999), who was consulted by those who had captured the odd individual, defended his recommendation to liberate the "type" as follows:

> My same-day reply . . . was: "We urge you to keep bird alive. Photograph it from every angle, video it, tape its voice, measure everything and, if possible, seek a blood sample: but do not kill it." It must, I hope, be obvious that a conservation organization is in a particularly delicate position when it comes to instigating the killing of the only known representative of an apparently new, apparently very rare species.

The result of this decision-making was that a name was applied to this individual, apparently a new species (Smith et al. 1991). A later paper (Nguembock et al. 2008), however, with a list of authors including one of the authors of the original description, published the following retraction and change of tune:

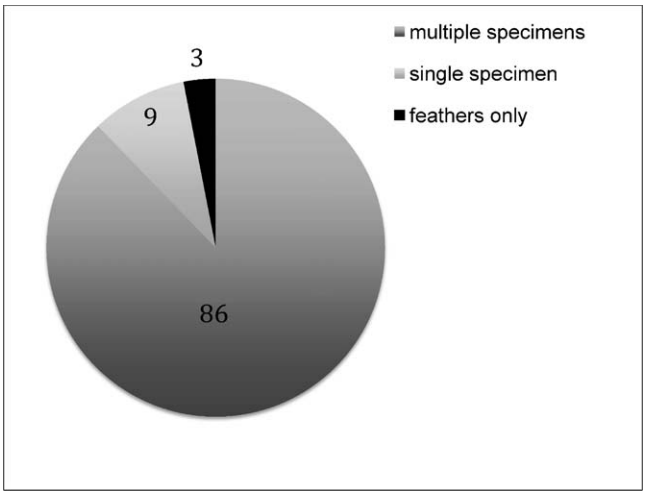

FIGURE 1. Summary of degree of documentation of new bird species described during 2000–2013, separating species into those documented by multiple specimens, those based on single specimens, and those based on partial (nondiagnostic) specimens.

> We also find that *L. liberatus*, described in 1991 based on the only known live individual, is identified as an unusual colour morph from *L. erlangeri*.

Quite simply, the species that was stated as "not a colour morph or hybrid of examined taxa" (Smith et al. 1991) turned out to be a color morph of another taxon (not examined in the original description, for some reason). Had a full specimen been preserved from the type individual, the speculation that ensued regarding this species (e.g., Prinzinger et al. 1997b, Harris and Franklin 2000) might have been based on firmer evidence, detailed and controlled comparisons could have been made, and the truth might have been understood sooner.

Three Recent Examples

Figure 1 shows a breakdown of new species taxa of birds described from 2000 through mid-2013. Most (88%) were based on multiple individuals as holotype and additional individuals (paratypes, allotypes, "comparative material"). Descriptions of a smaller number of species (9%) were based on single individuals, sometimes owing to rarity or difficulty of collection, but sometimes because the researchers opted not to collect multiple individuals. Three new species taxa, however, were based on partial individuals with only fragmentary type material; these cases were as follows.

Description of *Ninox sumbaensis*. This species was described in 2002 (Olsen et al. 2002). The description of the "holotype" was as follows:

> The adult specimen (sex unknown) was collected on the night of 30 December 2001, from degraded forest . . . by a local bird hunter. The body was left with villagers on Sumba. Feathers and photographs are lodged at Heidelberg University (Accession No. IPB-20415).

The new owl was compared in detail with other relevant *Ninox* taxa, and apparently no major doubts about its validity have been raised. However, the specimen documentation of its phenotype is only very fragmentary, so comparisons with other, similar taxa will forever be difficult.

Description of *Liocichla bugunorum*. This species also was unambiguous as to its validity, in that it is well-marked and broadly disjunct geographically from its congener species (Athreya 2006). The description was clear and straightforward but was based on a set of feathers taken from a single individual:

> The holotype is the bird from which a few feathers were obtained and which is the subject in a series of photographs presented in this paper. The holotype was captured, photographed, measured, and released on 25.v.2006 at Lama Camp. . . . Rectrices from the distinctive tail, which distinguish it from its congeners, one secondary flight feather from the wing, and the photographs included here have been deposited in the collection of the Bombay Natural History Society, Mumbai, India (D.B.No. 3/2006, Reg. No. 28981).

A subsequent paper argued that known populations of this species are unlikely to be the only populations of this species, given that ecological niche models indicate broad suitable areas close to known occurrence points, but not accessible from roads (Peterson and Papeş 2007). Conversations with the author of the description indicate that no specimen was collected because government regulations made collection of a more complete specimen impossible at that time.

Description of *Grallaria fenwickorum*. This description (Barrera et al. 2010) is perhaps the most problematic of the three recent species explored here, because the feathers on which the description was based were not diagnostic of the new taxon. Indeed, this description had a plethora of associated problems (some not treated herein). The full set of data associated with the specimen was not reported, the specimen was not designated as a type, and it was not deposited appropriately in a scientific collection. More fundamentally, the authors did not ponder in sufficient detail the point in the Code that the holotype is the individual animal, and not the illustrations or the description, such that the parts of the animal that were preserved were not diagnostic and the description was woefully incomplete.

Recently, the *Bulletin of Zoological Nomenclature* published a proposal that I submitted regarding the *G. fenwickorum* issue (Peterson 2013), setting a clear example regarding these minimal- or partial-type descriptions. My proposal is based in part on frustration with the terribly inadequate information provided in the description to document and identify the actual type specimen, but in largest part on the point that the parts of the animal that were preserved were not sufficient to be diagnostic. The proposal suggested that *G. fenwickorum* be considered a *nomen dubium*, in light of its indeterminate type, and proposed designation of a neotype that was available (Carantón-Ayala and Certuche-Cubillos 2010), which consisted of a full traditional study skin that indeed presents all of the characters needed to distinguish it from other species in the genus.

Conclusions and Recommendations

Donegan (2008) and others have argued that provision of a full, dead-specimen type in a museum is not necessary under the provisions of the Code, in light of illustrations, photographs, or molecular sequences. This idea has been negated clearly and unequivocally by the Code, which states that a material holotype must be identified that represents the traits of the species that are diagnostic and that distinguish it from other species. For modern descriptions, the Code makes it clear that illustrations or photographs do not suffice in the role of type.

The argument that a photograph, or even a few strategically plucked feathers, might be enough to distinguish a new species from other species, however, fails to appreciate the true, complete role of a type specimen. Type specimens serve not only as a material illustration or catalog of distinguishing traits, but also as an authoritative documentation of the phenotype (and, increasingly, genotype as well) of the species, in ways that should be maximally comparable with other species. That is, perhaps a species can be distinguished on the basis of tail coloration, such that pulling a couple of rectrices for preservation would serve for diagnosis (as in the case of *L. bugunorum*), but some other trait may be of interest that can only be examined and compared on a traditional museum specimen—what if some investigator needed to see the coloration of the inner vane of the distal half of the fourth secondary?

A vivid recent example is the description of the barbet *Capito wallacei* (O'Neill et al. 2000), based on a full holotype. With the discovery of yet another, closely related, new barbet (*C. fitzpatricki*; Seeholzer et al. 2012),

the second description and subsequent discussions would have been greatly handicapped if only a few diagnostic feathers of *C. wallacei* had been preserved. Indeed, with partial typification, an interesting detail of sexual dimorphism would have been missed. What is more, despite collection of several individuals of a species with a very restricted range (at the time of collection, known from only the type locality), this species is doing fine and has become a ''destination bird'' (i.e. the place to go to see the species) for serious birders. Such a key role of type specimens in permitting future comparisons and insights is negated almost entirely by photographs, even if taken ''from every angle'' (Collar 1999; as in the case of *Laniarius liberatus*).

What is the solution to Collar's dilemma, then? That is, one is concerned about the conservation status of a species, but one knows that a formal description of a new species requires a full type specimen—so, what to do? In many cases, such concerns are obviated by a focus on population ecology. A bird collected for scientific purposes is one or a relative few out of what is generally a much more extensive population. Sacrificing single or a few individuals will very rarely change the conservation status of a population.

However, if the situation were indeed as Collar imagined, the clear answer is that a species should not be described on the basis of such partial evidence: A much more responsible approach is to report the existence of a putatively undescribed form, providing clear and detailed information, but refraining from applying a name. See, for example, the recent detailed photographic ''description'' (not formal) of a likely new species of flowerpecker from Borneo (Edwards et al. 2009); the authors are much to be congratulated for not creating another zero-type species to confuse nomenclature and taxonomy, while making the discovery known to the broader community. In this way, when an appropriate type specimen can be collected in good conscience, the species can be described appropriately. While it is true that the person who reports the form without a formal description loses some of the ''glory'' of the discovery, she or he earns the respect of the community for not having created new sad messes of nomenclature (e.g., *Laniarius liberatus*) or of typification (e.g., *Grallaria fenwickorum*). This idea of informal reporting of the putative undescribed form is responsible, appropriate, and science-based, rather than self-serving and impetuous.

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