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CATEGORIES OF SPECIES NAMES IN ZOOLOGY

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IT is a remarkable fact that zoological taxonomists have persisted for many years in maintaining an oversimplified classification of names for animals, in spite of the diverse kinds of names revealed by the Rules and Opinions of the International Commission on Zoological Nomenclature. For nearly two hundred years taxonomists have commonly referred to species names, or subspecies names, or names not qualifying as either, with rare reference to the fact that these names can differ widely in the application of rules to them. Only one category of the several that exist has been popularly recognized (*nomina nuda*), yet it is clear that not all other names are on a par with each other. Some are valid, some invalid; they may be available or not; there are synonyms and homonyms; some are clearly diagnosed, others not. Names in these and other categories are not treated exactly alike by the rules; each may have a distinct procedure outlined for it. For instance, new names proposed with an acceptable but inadequate diagnosis are to be treated in an almost entirely different manner than names accompanied by adequate diagnoses. In spite of the existence of these several different categories, they have never been clearly defined or named. It is my belief that their clarification will greatly simplify the consideration of taxonomic problems. The present discussion suggests a possible scheme of classification.

I

Briefly, the classification suggested is as follows[1]:

A. *binomialia*[2] (binomial names)
1. *nomina nulla* (taxonomic non-entities; unacceptable names)
   a. *nomina mythologica* (names for mythical species)
   b. *nomina defecta* (unscientific names)
2. *nomina naturalia* (scientific names; taxonomic entities; acceptable names)
   a. *nomina prelinnaeana* (prelinnaean names, unavailable)
   b. *nomina nuda* (nude names; entities without taxonomic standing (unavailable)
   c. *nomina specialia* (species names; entities with taxonomic standing, available)
      1′. *nomina clara* (names at least originally identifiable to species or subspecies by original diagnosis)
         a′. *nomina valida* (valid names)
         b′. *nomina invalida* (invalid names)
            1″. *homonomata*[3] (homonyms)
            2″. *synonomata* (synonyms)
               a″. *synonomata natura* (zoological synonyms)
               b″. *synonomata regula*[4] (nomenclatural synonyms)
      2′. *nomina dubia* (names unidentifiable even originally to species or subspecies by original diagnosis)

II

Binomials are names used in the accepted Linnaean manner, consisting of two categories (one of which may include two terms [species and subspecies]). They need not be acceptable, even though formed in the proper manner. Unacceptable names are *nomina nulla* and belong to the vast reserve of possible *nomina nova*[5]; important among these are *nomina mythologica,* names for mythical species, and *nomina defecta,* names occurring in non-taxonomic literature through error or chance. In taxonomic procedure *nomina nulla* have no significance whatever; they are complete non-entities so far as scientific nomenclature is concerned.

III

Acceptable scientific names are *nomina naturalia;* they are *binomialia* proposed after 1757 in acceptable literature for existing animals or their remains or indications. All such names have special status under the Code. Two groups of names, however, have very little significance; they can not be used as names for species, and in that sense are unavailable. These two groups are *nomina prelinnaeana* and *nomina nuda.* Prelinnaean names have received special comment in Opinion 6, which states in part:

> A pre-Linnaean name, ineligible because of its publication prior to 1758, does not become eligible simply by being cited or reprinted with its original diagnosis after 1757. To become eligible under the Code, such names must be reinforced by adoption or acceptance by the author publishing the reprint. Examples: The citation, subsequent to 1757, of a bibliographic reference to a paper published prior to 1758 does not establish technical names which may appear in said reference; synonymic citation of pre-Linnaean names, as in the tenth edition of Linné's "Systema Naturae," does not establish such names under the Code.

Thus prelinnaean names may be used in postlinnaean literature, without becoming available, unless special indication is given by the author. This is not true of any other names, with the exception noted below.

Nomina nuda are names proposed after 1757 in such a manner as not to fulfill the requirements of Article 25 (see Opinion 126). They heretofore have been considered by the commission as complete non-entities (see Opinions 48, 97, 126, etc.). They would ordinarily be placed among *nomina nulla* in the present classification. In this one respect, of all associations and definitions presented in this article, have I taken the liberty of differing with the commission's implied conclusion. It is apparent that prelinnaean names can be discussed in scientific literature without danger of unwittingly making them available, but this is not so with regard to *nomina nuda,* under the commission's statements to date. They are to be treated exactly like *nomina nova* upon citation subsequent to their first appearance, whether in casual reference, inclusion in synonymy, guesses as to identity or definite adoption as a name. Thus authors are practically denied the right of effectively mentioning *nomina nuda,* which in some cases may have considerable importance. It is my belief that the commission not only should countenance discussion of *nomina nuda* by authors, without automatic availment of the name, but can do so without endangering the norm

[1] I am indebted to Dr. Robert A. McLean, professor of classics at the University of Rochester, for his advice in construction of the terms proposed.

[2] No Greek or Latin word appears to convey the exact meaning which has been associated with the English term binomial (=binary), as opposed to *binominal.* To avoid possible misunderstanding, it is regarded advisable to latinize the English word in the form here cited.

[3] This category may apply also to *nomina dubia.*

[4] This category may apply also to *nomina dubia.*

[5] A newly proposed scientific name (*nomen naturale*) may be termed a *nomen novum* or a *species novum;* it is to be recommended that *species nova* be restricted to new names for newly distinguished species, that the term *nomen novum* in a narrow sense be restricted to new names for "old" species (previously described under other names), and that the latter term in a broad sense be used to cover both categories. It may be recommended also that the terms *nomina nova* and *species nova* be restricted for use only with names qualifying as *nomina naturalia.*

of other procedures. It is here suggested that *nomina nuda* are not to be considered complete non-entities in the field of scientific nomenclature, since they may and do occur in accepted scientific literature subsequent to 1757; the necessity of dealing with them, of discussing them, of determining the status of borderline cases, is apparent. It is an error to regard names that may be so discussed in the same light as mythical names and like names (*nomina nulla*) that have no place in postlinnaean scientific literature; *nomina nuda,* as here defined, are actually a part of that literature, though to be sure the most lowly part. That different action might be incumbent upon this difference in status is not unreasonable; and to deny audience to the special requirements of *nomina nuda* as opposed to *nomina nulla* is to deny the existence of a distinction between the literature of the postlinnaean scientific world and that of either the prelinnaean or the unscientific world.

The recognition of *nomina nuda* as entities in scientific nomenclature provides for their consideration in post-original citations as something different from *nomina nova* (*sensu lato,* as defined in the preceding footnote), but it does not necessarily entail a revision of established policy concerning them. Having such recognition, however, the request that they become available only upon subsequent clear allocation by an author does not, as it would otherwise, involve all kinds of *nomina nova.*

As a minimal action, it is to be recommended that an Opinion on Article 18 clarify that *nomina nuda* are distinct entities that may attain the status of species names only upon clear allocation and adoption or acceptance of them as species names; and that the first worker to so treat them becomes their author. This recommendation is not to be construed as a precedent for like action regarding *nomina nova,* which even if proposed provisionally may acquire status if accompanied by adequate indication.

It should be made clear that I am not defending either the proposal of *nomina nuda* in modern literature or the adoption of them, where possible, by present-day students. It is to be hoped that modern taxonomists know correct usage of their nomenclatorial rules and would avoid such unfortunate circumstances. Errors do occur, however, and the present suggested ruling would outline what is to be done with them. Primarily, however, the proposed ruling is suggested as a means for treatment of *nomina nuda* and their subsequent citations in past literature. It is for the earlier taxonomic literature that a guide for procedure is especially needed.

As an example of the effect of this ruling, suppose an author A inadvertently or otherwise puts into print a *nomen nudum, X-us albus.* A subsequent author (B), perhaps through acquaintance with A, knows what species A meant by *X-us albus,* and thus includes the name *X-us albus* in the synonymy of a species given another name, *Z-um nigrum.* Now suppose it is discovered later that the name *Z-um nigrum* is not available, and no other name for that species is available unless *X-us albus* is used. By the procedure under the present Rules, *X-us albus* B could be used, being available; by the interpretation recommended here it would not be available; author C could use the name for the species, but he would then be the accepted author of it; author C could also propose an entirely new name, and the *X-us albus* of authors A and B would have no effect upon it since it would be considered unavailable; furthermore if author D uses the name *X-us albus* for a completely different species, being unaware of the use by A and B, his name would not be invalidated by homonymity so far as A and B are concerned, by the recommended interpretation, although by the present Rules it would be invalidated.

IV

The preceding discussion has concerned only unacceptable and unavailable names that ordinarily can not be used as species names. Use of them as species names ordinarily would change their category to that of available names; and they can attain the status of available names only by that method.

All available names are here termed *nomina specialia.* They may (or may not) likewise be valid (*nomina valida*), depending upon whether or not they (1) can be identified within a reasonable probability (as of the date of the description) without reference to esoteric materials, (2) are not synonyms, and (3) are not homonyms. In considering any given *nomen speciale,* it is of prime importance to determine first its status as a *nomen clarum* or *nomen dubium. Nomina clara* are names whose diagnoses are originally adequate for identification and are likewise acceptable (as species names) under the terms of Article 25; such names are thus subject to all the Articles of the Code and Opinions thereon. They may be valid (*nomina valida*), homonyms (*homonomata*), or synonyms (*synonomata*); the latter may be *synonomata natura* or *synonomata regula,* according to whether zoological or nomenclatural reasons furnish ground for making the names synonyms. *Nomina dubia* differ from *nomina clara* only in having diagnoses originally inadequate for identification (see Opinion 126). Through the impossibility of definite specific allocation *nomina dubia* seldom can be (or can have) synonymic or homonymic names; they can never be *nomina valida* so long as they remain in their status of *nomina dubia.* They can be-

come valid only upon attaining the status of *nomina clara* (by procedures outlined in the following); and of course the attainment of that status can make them synonyms or homonyms instead of valid names, depending upon the circumstances. It may be recommended (1) that, unless it is the desire to fix the name and thus render it a *nomen clarum,* such names (*nomina dubia*) should be cited in conventional species-synonymies only with a question mark, and are thus to be placed with any species that seems a possible synonym; and (2) on the basis of the original description a name should be considered a *nomen dubium* rather than a *nomen clarum* only when originally the probability of correct association, after consideration of all generally available evidence (excluding esoteric information, as for instance, that furnished by a study of the type specimens) is reasonably low.

V

Except for *nomina clara* and *nomina dubia,* the proper taxonomic procedure in reference to the above categories is evident, at least for most cases. The procedure in reference to these two exceptions is somewhat complicated, but may be summarized:

I. *Nomina clara.* If a name has a diagnosis originally (*i.e.,* at the time of its proposal) adequate for identification, it is a *nomen clarum.* If a name is so considered, it can never be regarded as a *nomen dubium;* in other words, once a *nomen clarum,* always a *nomen clarum,* no matter how intricate the subdivision of the original species concept becomes. Under all circumstances the original author's name is retained. The name should always be allocated with some species, whether as a valid name, a synonym, or a homonym. Yet, it must be recognized that because of finer discrimination or for other reasons a diagnosis originally satisfactory may become inadequate for specific (or subspecific) determination.

A. Names based upon diagnoses which remain adequate.

1. Composite diagnoses. In case several species are clearly diagnosed with the name, the first reviser's restriction fixes the identity.
2. Single-species diagnoses.
   a. Type series of more than one species. As the diagnosis clearly refers to one species rather than to any other, the name can be applied only to the species diagnosed.
   b. Type series of one species. The object of legitimate taxonomy—a clear-cut, adequate diagnosis based upon a single species.

B. Names based upon diagnoses which later become inadequate for identification. All such names retain their original authorship, as of the original date of publication, regardless of subsequent history; and they suppress all homonyms, whether of the same species or not.

1. If holotype available and identifiable. Name to be restricted to the species to which it belongs.
2. If holotype (or other type material) available but unidentifiable. The name is to be restricted to any likely species; the allocation of the first reviser who places the name with an identifiable and likely species is to be accepted in preference to any others.
3. If there are several types, all alike, and identifiable. As in B1, above.
4. If there are several types, of different species. The name is to be restricted as of the first reviser to any identifiable specimen or material, or if none is identifiable, procedure as in B2, above.
5. If there are no types. As in B2, above.

II. *Nomina dubia.* If a name is accompanied by a diagnosis inadequate for identification even originally, it is a *nomen dubium,* and as such it is subject to very different rules from those that apply to *nomina clara.* They are to be treated practically like *nomina nuda,* save that they can suppress homonyms applied to species different from any of those to which the *nomina dubia* could reasonably apply, while homonyms based on what may be the same species are not suppressed unless they follow an earlier allocation. They can be restricted to a given species (becoming *nomina clara*) but then carry the name of the restrictor as senior author, that of the original author as junior (*e.g.,* Brown ex Green).[6] Moreover, *nomina dubia* may remain in that category as long as taxonomists care to avoid their definite allocation; they need never be rendered *nomina clara.* Fixation of them as *nomina clara* follows the same rules that govern availment of *nomina nuda,* within the following limits:

1. If a holotype is available, and identifiable: the name must be restricted, if at all, to the species of the holotype.

[6] This plan of double authorship follows Opinion 126 (p. 21). I rather doubt the wisdom of it. More in keeping with zoological practice would be simply to allow coauthorship of the usual type: Green and Brown, or Brown and Green, depending upon the decision of the International Commission. This question of multiple authorship is to a certain degree similar to that faced by botanists, whose procedure is to cite authors of any combination used. Fortunately zoologists have avoided that cumbersome procedure. Citation of multiple authors for *nomina clara* that have once been *nomina dubia* is not by any means the same, but it is possibly an entering wedge of complexity. The advisability of retaining only the original author's name (*e.g.,* Green) is seriously to be considered, in spite of the fact that Brown is the person who has fixed the name and made it of some use.

2. If a holotype (or other type material) is available but not identifiable: the name may be used for any species to which it may belong, and the allocation is to be that first proposed.
3. If there are several types, all alike and identifiable. As in II–1 above.
4. If there are several types, of different species: (a) the name is to be restricted as of the first reviser to any identifiable specimen or material; (b) or if none is identifiable, the name may be used for any species to which the diagnosis may belong, as of the first reviser.
5. If there are no types: as in II–4b, above.

Although *nomina dubia* can, as suggested here and as is generally practiced, remain forever without allocation, the proposal here put forth does jeopardize arrangements of any author (say A) who had neglected to allocate a *nomen dubium* that applies to a group of species all or some of which bear names of more recent date than the doubtful one. Another author (B) by reasonable allocation could invalidate one of A's names, and in fact would necessarily do so if the *nomina dubium* antedated all other names in the group and is otherwise available.

Recognition and allocation of *nomina dubia* is the most debatable of all procedures outlined here. Without question the entire matter of the status and treatment of them requires careful attention of taxonomists. In my suggestions I have merely followed and expanded in a seemingly logical manner the statement of Opinion 126, the only definite official discussion to date of this problem. Because of the lack of a clear ruling authors in the past have not always agreed upon allocation of *nomina dubia,* since many interpretations, all reasonable at least to some extent, are possible. Adoption of some procedure such as that outlined above would at least coordinate the actions of taxonomists, even though some might consider other procedures more useful for the greatest number of cases that may arise.

VI

The establishment of precise categories such as those suggested above may at first appear as unnecessary definitions of only academic importance. This is not so. No new concepts are suggested in these categories; they are merely concrete expressions of ideas long in common use by taxonomists but not well unified. Had the distinctions between them been made long ago, many of the difficulties encountered in the consideration of doubtful cases—either by individuals or by the commission—might well have been avoided. The existence of the concept of a *nomen clarum,* for instance, would have simplified markedly the discussion of genotypes in Opinion 65. The advantage of having categories in common use by taxonomists clearly stated, defined, limited and named, instead of hazily, incompletely or differently conceived or treated by them is beyond question a great one. While the definitions given are clearly unofficial, except for the acceptability of *nomina nuda* they reflect the opinions of the commission as revealed by study of the Code and Opinions. It is to be hoped that some official action along these lines may be forthcoming in the near future.

OBITUARY

HORACE CLARK RICHARDS

PROFESSOR RICHARDS died on May 20, 1945, in his seventy-eighth year. Since July 1, 1938, he had been emeritus professor of mathematical physics of the University of Pennsylvania. Except for two years, one spent at the Johns Hopkins University and the other at Bryn Mawr College, he had been associated with the university continuously since 1884, as undergraduate and graduate student, as Tyndale fellow in physics and as member of the staff of the department of physics. He was appointed professor of mathematical physics in 1914 and director of the Randal Morgan Laboratory in 1931.

Professor Richards's father was the first professor of architecture at the University of Pennsylvania. He designed the greenstone buildings erected on the present campus when it was established during the 1870's. The only brother of his father was an artist of distinction, whose canvases hang in America's leading galleries. Among the children of these two brothers there were three university professors, all in scientific fields, one at Columbia, one at Harvard, one at Pennsylvania, one of them a Nobel laureate.

Professor Richards was elected to the American Philosophical Society in 1907 and took an active part in its affairs until the end of his life. He contributed to its programs and served for many years as chairman of its library committee.

Early in his career Professor Richards saw that physics must reach out into ever-widening human associations. Accordingly, he took a leading part in the establishment of the Physics Club of Philadelphia in 1909. This club brings together teachers of physics in schools, colleges and universities, and physicists employed in industries of all kinds, and in laboratories connected with hospitals, schools of medicine,