

Synonymies and related lists in zoology: general proposals, with examples in herpetology

Alain DUBOIS

Laboratoire des Reptiles et Amphibiens,
Muséum national d'Histoire naturelle,
25 rue Cuvier, 75005 Paris, France
E-mail: dubois@mnhn.fr

So-called "synonymies", usually presented at the beginning of taxonomic accounts, play a major role for the storage and retrieval of taxonomic information (nomenclatural history of a taxon and of names once used to designate it, references to studies of this taxon, etc.). This paper is devoted to a careful study of the concepts of synonym and synonymy, and of related ones. Many traditional so-called "synonymies" are in fact heterogeneous lists, which convey both nomenclatural information on scientific names (nomina) and bibliographic information on publications. Proposals are offered regarding the terms to be used to designate the various kinds of nomina and nomen uses that may appear in such lists, and the designation and presentation of these different kinds of lists. Proposals are also given concerning the use of various other terms related with these matters, and formal definitions are provided for all these terms, whether new or of traditional use. It is suggested that adoption of such precise technical terms and standardization of the presentation of lists would greatly enhance communication between animal taxonomists and with other members of the scientific community, especially within the frame of the development of international electronic connections which encourage the creation and world-wide diffusion of large computerized data-bases dealing with the nomina of animal species.

CONTENTS

Introduction	35
Information storage and retrieval in zoological taxonomy	35
Taxonomy, nomenclature and onymology	36
Synonymy	38
Synonyms and relationships among them	39
Basic rules and terms in zoonymology	39
Name, nomen, substantive, epithet, nominal-complex, onomatophore	39
Taxon and taxomen	40
Spelling, onymorph, rank, morphonym	41
Synonymisation	42
Lists of synonyms and of references	43
"Suppression" of nomina by the International Commission on Zoological Nomenclature	45
Proposals concerning the terminology of nomina, nomen uses and lists	49
Introduction	49
Availability and validity of nomina	50
Changes in spelling, rank and onymorph	51
Correctness and current use of morphonyms	53
Kinds of synonyms and homonyms	55
Kinds of lists of nomina and references	58
Conclusion	59
Appendix 1 - Some examples of logonymies	60
Appendix 2 - Suggestions for the presentation of logonymies	62
General suggestions	62
Authors' names	62
Heading of logonymy	65
Order of nomina	66
Protonyms	66
Aponyms	67
Chresonyms	67
Anoplonyms	68
The use of <i>nec</i> and <i>non</i>	68
The use of <i>partim</i>	69
The use of query	70
The use of "equals"	70
Appendix 3 - Examples of presentation of logonymies	71
Examples in the family-series	72
Examples in the genus-series	75
Examples in the species-series	76
Acknowledgements	78
Literature cited	79
Additional comments of the Editorial Committee	87
Table 1 and figures 1-8	89
Figures 1-8	96

INTRODUCTION

INFORMATION STORAGE AND RETRIEVAL IN ZOOLOGICAL TAXONOMY

The real number of animal species on our planet is unknown, but probably higher or much higher than eight million, of which less than two million have yet been collected, studied and named (HAMMOND, 1992). Despite this incompleteness of the work, the information accumulated by biologists and paleontologists over more than two centuries about animal species has become gigantic, and the need of efficient systems of storage and retrieval of this information is now overwhelming. Computerization of data-bases, electronic connections, and other recent technical developments may offer good material conditions for such efficient systems, but the latter also require, beside technical progress, pertinent conceptual frameworks. If biologists proved unable to devise and organize such frameworks, a great deal of the information accumulated on the organisms might become unavailable to the scientific community, which would almost amount to the same as if this information had never been gathered at all.

All the information concerning the diversity of animal species is currently arranged and stored under a *taxonomic system*, i.e. a system of classification of animal taxa. Continuity through time of storage and retrieval of all information (whether biological, biogeographical, evolutionary, etc.) once collected on any animal taxon is maintained owing to the existence of a unique *nomenclatural system*, presented in the *International Code of Zoological Nomenclature* (ANONYMOUS, 1999; cited below as "the Code") [a]. This system has force of law for all zoologists worldwide, and its rules can be modified or suspended only by an official international body, the International Commission on Zoological Nomenclature (cited below as "ICZN").

Zoological nomenclature has a rather bad reputation among zoologists. Many of them consider this discipline, at best, as a "necessary trouble", and, at worst, as a purely useless game of maniacs. The rules of zoological nomenclature are often viewed as an obscure forest of arbitrary juridical regulations, which are considered so complex that many professional zoologists never read them and that many institutes and researchers have not found it useful to have a copy of the *Code* in their libraries. As a result, in the recent years, quite numerous zoological taxonomic papers were published that contained minor or even major nomenclatural mistakes in regard of the current *Code* (see e.g., in the group of Amphibia: DUBOIS, 1987a-c, 1995, 1998a-b, 1999a-c; DUBOIS & OHLER, 1995a-b, 1997a-b, 1998, 1999): these errors point to the existence of a bad knowledge or understanding of the *Code* not only by taxonomists but also by editors and publishers of many zoological books and periodicals; unfortunately, in the recent years, this tendency has been reinforced by the failure of ICZN to play correctly its role

of "Keeper of the Law" (for more details, see e.g.: DUBOIS & OHLER, 1997a; DUBOIS, 1999b). However, if zoological taxonomy is to remain a non-ambiguous universal system of reference, it cannot do without precise and stringent international rules of zoological nomenclature.

TAXONOMY, NOMENCLATURE AND ONYMOLOGY

Two possible reasons for the poor understanding and rating of the *Code* among zoologists can be suggested. The first may be that, perhaps in order to appear "simpler" or "more accessible to all", the *Code* contains few "technical terms" and rather uses "common-language terms", such as "name", "valid" or "type": this may be an important source of confusion if these terms are understood by some in their "trivial" sense, not as strictly defined terms with very precise technical meanings and uses. The second reason may be the confusion, made by some zoologists but also entertained, in some respect, by the *Code* itself (see below), between *zoological taxonomy* (classification of animals in a hierarchical system of taxa) and *zoological nomenclature* (international rules for non-arbitrary and non-ambiguous attribution of names to these taxa).

I suggest that one possible way to reduce both these sources of confusion is for zoological nomenclature to clearly claim its being a well-defined technical field, with its own concepts, terms and techniques. This requires the development of a *specific discipline*, that is better recognized if given also a specific technical designation. The term *nomenclature* is a common-language term that applies to various situations. In biology, the meaning of this term can be restricted to the designation of the system of scientific names used by taxonomists, but excluding the "provisions for their formation and use" (ANONYMOUS, 1999: 111) and the theory that underlies these rules and uses. In order to designate the study and theory of concepts and terms related to the scientific nomenclature of living beings, I proposed (DUBOIS, 2000a) the term *onymology* (from the Greek *onymos*, "name" and *logos*, "speech") [b]. According to the organisms studied, this field can be divided in various subfields, including *zoonymology* (from the Greek *zoon*, "animal") for the theoretical study of zoological nomenclature. The present paper is a contribution to the latter subfield. It proposes a specific terminology for precise technical concepts of zoological nomenclature that have until now remained unclear for many zoologists, possibly in part for their lacking precise technical terms: as is often the case in science, and particularly in biology (see e.g.: MAYR, 1997; DUBOIS, 1997c), such a lack is a major source of confusion in communication between scientists and therefore of mistakes.

Given this aim of the present paper, it is bound to propose a number of new terms, or of new definitions for terms already used by zoologists, but sometimes in a loose, imprecise sense. An important question must be fully addressed here. Several

readers of an earlier manuscript of this paper suggested to drop the proposal of the new terms, although keeping the part dealing with the clarification of concepts. These readers feared that these numerous neologisms might lead to a global rejection of my proposals. They suggested that part of the resistance of some members of the zoological community to zoological nomenclature takes its roots in the “complexity” of the *Code* and they think that the best should be done to “simplify the rules so that practising zoologists will follow them”. I fully disagree with this analysis. For the group of Amphibia, I have repeatedly provided elsewhere (see e.g. references above) detailed information showing that currently many zoologists and editors worldwide *do not follow the rules of zoological nomenclature, irrespective of these rules being “simple” or “complicated”*. I do not think that the solution to this problem will come from nomenclature trying to make itself artificially “simpler”, at the expenses of its rigour and precision. Quite to the contrary, I think that the current trend for some zoologists, including some members of ICZN, to accept a quickly growing number of nomenclatural errors in zoological publications, is an encouragement for carelessness and lack of respect for the *Code*, which in the long term might have dramatic consequences for the unity of zoology (DUBOIS, 1999b). I think that taxonomists should not feel ashamed of being careful about nomenclatural matters, and that the role of ICZN should be to help them in this respect. Most probably, accepting to “simplify” the *Code* would only lead to its being still less respected by those who today ask for this simplification. Quite frankly, the *Code* is not so “complicated”, at least as compared with many other intellectual or scientific activities: its good use only needs care, rigour and patience. Contrary to the trend just evoked, I think that zoological nomenclature would have much to gain, not to lose, from claiming being *a well-defined technical field, needing a special training and competence*, rather than trying to give the misleading image of a simple domain easily accessible to all. One of the ways for zoonymology to claim its specific technicity is to use precisely defined technical terms, rather than “common-language” terms which *seem* to be easily understandable by anyone without a proper training. For this reason, I think that if the clarification of concepts here proposed is useful, it should also be accompanied by a proper terminology, for “the importance of a phenomenon is not recognized unless it has a special name” (GOULD & ELDREDGE, 1977: 139).

A final comment may be added here. Quite often I have wondered, when I found severe nomenclatural mistakes in papers of some colleagues, whether these mistakes were isolated, or whether in a way they might not express a general careless attitude in scientific work, then casting some doubt on the trust that can be put on some of the published results or conclusions. Despite the tendency of some of these colleagues to declare that nomenclatural problems are unimportant and that scientists should not lose their precious time on such trivial matters, I tend to find it difficult to believe that someone who lacks rigour, care and patience in the nomenclatural part of a taxonomic work will show these qualities when it comes to electrophoresis, anatomy or cladistic

analysis. In my opinion, a high quality of the nomenclatural analysis in a taxonomic paper is not a negative, but a positive sign regarding the overall quality of the work.

SYNONYMY

The current nomenclatural system in zoology has two important characteristics that allow it to play correctly its universal role regarding information storage and retrieval: (1) the Fundamental Principle of the *Code*, the Principle of Priority, ensures that ultimately, and automatically, each animal species or higher taxon receives a single, unique and non-ambiguous name, even if it has been described several times and under several names by different authors (see e.g.: HOLYNSKI, 1994; DUBOIS & OHLER, 1997a); (2) all such distinct names once given to the taxon, with all the information once attached to them, remain connected to the valid name of the taxon through the process of *synonymy*.

Most taxonomic publications in zoology, and particularly works presenting new taxa, revisions, catalogues and checklists, include “taxonomic accounts”, i.e. chapters or subchapters devoted to the historical presentation, diagnosis, description, study and/or discussion of individual taxa, such as species, genera or families. Very often, any such taxonomic account starts with a *synonymy* (usually printed in small letters), i.e. a list of names regarded as applying to the studied taxon, each name being followed by a single reference or by a list of references to its use. Such synonymies provide information on the nomenclatural status of the names listed, but also, often, bibliographic information on publications where these names were used. Although this is a common practice, few discussions have been devoted to the principles of construction of synonymies and to the different kinds of “synonymies” that exist in zoological literature. This is the main purpose of this paper. As shown below, close examination of this question points to the existence of several confusions and to the need of a precise, technical terminology, which is wanting for the time-being. Before we enter in full in the age of zoology when most taxonomic data on organisms are computerized and available to all users worldwide in data-bases, it may be useful to devise a precise system of classification and terminology of concepts related to synonymies.

The *Glossary* of the current *Code* (ANONYMOUS, 1999: 118) acknowledges the existence of two distinct meanings of the term *synonymy*: “(1) The relationship between synonyms. (2) A list of synonyms.” Let us consider these two meanings successively.

SYNONYMS AND RELATIONSHIPS AMONG THEM

BASIC RULES AND TERMS IN ZOONYMOLOGY

The term *synonym* has a precise technical meaning in zoonymology. Two scientific names are to be considered synonyms if both apply to the same *zoological taxon*, as currently understood by taxonomists, i.e. to the same *taxonomic taxon* as defined by the *Code* (ANONYMOUS, 1999: 119). In the *Code*, the term *scientific name* also has a precise technical meaning, which makes it distinct from a *vernacular name*. A scientific name may be either *available* or *unavailable* in zoological nomenclature (see e.g. ANONYMOUS, 1999: 108, 123). An available scientific name is either a single Latin (or pseudo-Latin) word (for *family-group* and most *genus-group* scientific names) or an association of two or three words (for *species-group* and some *genus-group* scientific names) *published* after 1757 and meeting a number of *criteria of availability*; any available name has its own *author* and *publication date*, and its (real or potential) *name-bearing type*, the latter being either a *specimen* in the case of species-group names, or a *nominal taxon* in the case of genus-group and family-group names (see DUBOIS & OHLER, 1997a).

Before going further, some liminar terminological clarifications may be useful. First of all, as in previous papers (DUBOIS & OHLER, 1997a-b), the technical expressions which are used in the *Code* or derived from expressions used therein, will always be written below with dashes, in order to show that they are well defined formulae with a precise technical meaning: e.g., *type-specimen*, *type-species*, *type-locality*, *first-reviser*, *nominal-taxon*. For the sake of brevity, in this paper I will always refer to *author* in the singular, although of course a publication or a nomen may have several authors. Further clarification is also needed regarding the terms *name* and *taxon* and related ones.

NAME, NOMEN, SUBSTANTIVE, EPITHET, NOMINAL-COMPLEX, ONOMATOPHORE

As already suggested elsewhere (DUBOIS, 2000a), in order to avoid possible confusions with the general term *name* as used in common language, and also in nomenclature to designate the name of the author of a scientific name, in the course of this paper I will use the Latin term *nomen* (plural *nomina*) to designate the precise technical concept of *scientific name* as defined by the *Code*. This is consistent with the use of the term *nomen* in the *Code*, although the latter does not use it alone, but combined, either in expressions like *nomen dubium*, *nomen novum*, *nomen nudum* or *nomen oblitum*, or in compound terms like *binomen* or *trinomen*. As defined here, a *nomen* may be composed either of a single word (*uninomen*, for family-group and genus-group *nomina*) or of two or more words (*binomen* or *trinomen*, for species-group

nomina). In the latter case, I will here use the terms *generic substantive*, *subgeneric substantive*, *specific epithet* and *subspecific epithet* to designate the different words composing the *nomen*. Besides, I will use the new formula *nominal-complex* to designate the complex [*nomen* + *its author* + *its date*] when these three pieces of information are given together as a single expression, which in this context can be viewed as an indissociable unit.

Replacement of the *Code*'s formula *scientific name* by the term *nomen* entails some other changes, e.g. replacement of the formula *name-bearing-type* by *nomen-bearing-type*, or better, more concisely, by *onomatophore* (SIMPSON, 1940; DUBOIS & OHLER, 1997a: 303; DUBOIS, 2000b), or of the formula *new replacement name* by *new replacement nomen*: for this latter concept, the *Code* uses also the Latin formula *nomen novum*, which is liable to cause confusion and would better be replaced by *nomen substitutum* (see DUBOIS, 2000b), but other, still simpler, proposals in this respect will be made below in this paper. Besides, for reasons also explained in more detail elsewhere (DUBOIS, 2000b), I propose to use the general term *nominal-series* to designate any of the three sets of *nomina* applying to one of the three categories of taxa of the *species-series*, *genus-series* or *family-series* recognized, as "groups", in the *Code*, and also of the *class-series*, i.e. the "class-group" as defined by DUBOIS (1984a, 1987c).

TAXON AND TAXOMEN

As for the term *taxon*, as defined by the *Code* it is an ambiguous term, that designates both a taxonomic and an onymological concepts. The *Code* first defines "taxon" as "a taxonomic unit, whether named or not" (ANONYMOUS, 1999: 118), which clearly points to a taxonomic concept. However, just below, the *Code* recognizes under this general term both a taxonomic concept, that of "taxonomic taxon" (a taxon as recognized by a zoologist) and an onymological concept, that of "nominal taxon" (a "concept of a taxon", denoted by an available nomen). The concept of "zoological taxon", defined in the *Code* as "a natural taxon of animals", is most unclear, especially as the term "natural" is not defined: I suggest to simply abandon it. The term "taxonomic taxon" is not only tautological and highly unpalatable, but also unnecessary as distinct from the simple term "taxon". To clarify this matter, I proposed (DUBOIS, 2000b) to restrict the meaning of the term *taxon*, when used alone, to the taxonomic concept, and to use the formula *nominal-taxon* (with a dash), or better, more concisely, the new term *taxomen* (from *taxon* and *nomen*; plural *taxomina*) for the onymological concept. Besides, in order to distinguish them for the taxa species, genus, family, etc., I suggested to designate the corresponding taxomina as *nominal-species*, *nominal-genus*, *nominal-family*, etc., always written with a dash, or better, more concisely, to use the following new terms: *speciesomen* (plural *speciesomina*) for any taxomen of the species-series, *generomen* (plural *generomina*) for any taxomen of the genus-series,

familiomen (plural *familiomina*) for any taxomen of the family-series, and *classomen* (plural *classomina*) for any taxomen of the class-series. More detailed clarifications on this matter were given elsewhere (DUBOIS, 2000b).

Contrary to what some zoologists seem to believe, a taxomen is not a class of individuals that would include at least one member (the onomatophore) and possibly others (individuals or taxomina subjectively referred to the taxomen). A taxomen has neither a content nor a diagnosis, it is only a bridge between language and reality. Whether or not an author included other individuals in the taxon when proposing the new nomen is of no relevance for the further taxonomic status of this nomen: this status is only determined by the taxonomic status of the onomatophore. The role of the taxomen is merely, but very importantly, to provide an *objective* and *permanent* connection between the nomen (or nomina, in case of existence of nomina substituta) and the onomatophore, and, consequently, between the nomen (or nomina) and a taxon: this allows the latter to be unambiguously and universally designated by the same label for all zoologists worldwide.

SPELLING, ONYMORPH, RANK, MORPHONYM

In the original publication where it is created, any new nomen is established under a particular *spelling*, designated in the *Code* as the *original spelling*. Furthermore, but only in the case of species-series nomina, any new nomen is first published as a particular *association* between several words, at least two (generic substantive and specific epithet) and sometimes three (generic substantive, specific and subspecific epithets); additionally, it may also be associated with other words, interpolated between the generic substantive and the epithet or between two epithets, which are not counted by the *Code* in the number of words of the binomen or trinomen, but which are nevertheless part of the nomen, such as subgeneric substantives or epithets for aggregates of species or subspecies (see Article 6 of the *Code* and BERNARDI, 1980). As the *Code* (Article 48) expressly restricts the use of the term *combination* to a given association of a generic substantive and an epithet, irrespective of the other words of the nomen, SMITH & PÉREZ-HIGAREDA (1986) provided the more general new term *onymorph* to designate every unique word association between genus-series substantives and species-series epithets: this term is of a more general meaning than the term *combination* as defined in the *Code*, which is only a particular case of this larger category. The original association of words in the original publication of a new nomen may be therefore called the *original onymorph*. Finally, in the original publication the new nomen is afforded an *original rank*: the latter is explicit from the nomen itself only in some cases, but in other cases the situation is less clear. Thus, a new epithet published as the third word of a trinomen is clearly of subspecific rank, and a recent new family-series nomen ending with the suffix *-idae* is clearly of familial rank, but a

genus-series nomen first published without being included in a combination may be either of generic or of subgeneric rank, and a family-series nomen first published in the early days of zoology (e.g. 1850) with a suffix like *-idi* or *-idea* is of unclear rank: in the latter cases, this rank, if not given in full words in the original publication, must be established through indirect inference from other elements of the original text.

It may be useful to designate collectively by a single term the three aspects of the original nomen in which it may subsequently be modified, i.e. its spelling, onymorph and rank. For this I suggest to use the already existing term *morphonym*, initially proposed by SMITH & SMITH (1993: 5) as a strict synonym of SMITH & PÉREZ-HIGAREDA's (1986) term *onymorph*, but which is more useful to designate a more general category.

As a matter of fact, any nomen, once established, is liable to be modified subsequently to its original publication. Such changes may concern any aspect of its morphonym, i.e. either its spelling (mandatory changes, justified and unjustified emendations, incorrect subsequent spellings), and/or its rank (subgenus raised to genus rank, etc), and/or, but for species-series nomina only, its onymorph (new generic allocation, raising of subspecies to species rank, downgrading of species to subspecies rank, change in generic or subgeneric rank, taxonomic recognition of aggregates of species or subspecies, etc.). However, in onymological terms, despite all these possible changes, in most of these cases the nomen remains essentially *the same*, as according to the *Code* it keeps its *original author*, *date* and *onomatophore*: all these distinct spellings, onymorphs and/or ranks must be viewed only as different morphonyms, without independent and distinct nomenclatural status. I will here designate the person who first published such a modified subsequent nomen as the *first-user* of this modified nomen, in order to stress the difference with a genuine *author* in the precise, technical and restrictive sense of this term in the *Code* (in cases of possible doubt or uncertainty, the latter can also be designated by the longer formula *nomenclatural author*). The sole exception to this rule is the case of *unjustified emendations*, which have an independent status in nomenclature and therefore their proper authors and dates, and which for this reason must be clearly distinguished from other kinds of subsequent spellings (see DUBOIS, 1987c: 31-48).

SYNONYMISATION

Discovery by any taxonomist that two distinct nomina apply in fact to the same taxon gives rise to the process of *synonymization*: statement of the synonymy between two nomina and of the valid one for the taxon. Validity among two competing synonyms is determined by the Principle of Priority: the first published nomen remains the valid one for the taxon, whereas the nomen published later becomes invalid as a

junior synonym of the former. In some rare cases, the *Code* allows to retain the junior nomen as the valid one, either because of special rules (see e.g. Article 40 of the *Code*), or through an action of ICZN making use of its Plenary Powers, usually to protect a "well-known" nomen "threatened" by an "obscure" senior synonym (but see DUBOIS & OHLER, 1997a).

The term *synonym* is another term with an ambiguous meaning, both onymological and taxonomic. According to the *Code*, two nomina are *objective synonyms* if both are based on the same onomatophore: this is an onymological concept, which is clearly acknowledged in the botanical code (GREUTER et al., 1994) by their designation as *nomenclatural synonyms*. In contrast, two nomina are *subjective synonyms* (*taxonomic synonyms* in botany) if they are based on different onomatophores but subjectively considered by a taxonomist to apply to the same taxon. Whereas objective synonymies, once determined, are definitive, subjective synonymies depend on the judgement of taxonomists and are therefore liable to change as taxonomic research progresses. We will come back below to the problems posed by this existence of two rather distinct meanings of the term synonym, and also of the different kinds of *homonyms*.

LISTS OF SYNONYMS AND OF REFERENCES

Synonyms, as defined above, are *different nomina* (in the precise technical sense of the latter term defined above) originally created for seemingly different taxa (or by different authors ignoring each other's work), but that are now considered to apply to the same taxon, either for objective or for subjective reasons. Strictly defined, therefore, and in the sense of the second definition of the *Code's Glossary*, a *synonymy* is a list of such nomina, each one being mentioned only once, with its author and date (i.e., reference to the original work where it was first published) and under its original morphonym. Although some published synonymies conform to this definition, many other so-called "synonymies" do not. In such "synonymies", beside "true synonyms" as defined above, other kinds of nomina appear, including the same nomina as above but under different morphonyms, and sometimes also other nomina, not considered as "true synonyms" but as "misidentifications" of the studied taxon (i.e., when this taxon was mistakenly mentioned under a nomen that in fact applies to another one). Furthermore, each nomen, onymorph or spelling of this list may be followed by more than one bibliographic reference, instead of only the reference to the original publication where the new nomen was proposed. Such lists, which may be very long, provide mostly *bibliographic information on references* to nomina, spellings and onymorphs used in the past to designate a given taxon, rather than *nomenclatural information on nomina*, as does a genuine synonymy. Mixing all these kinds of information, nomina and nomen

uses under the same general term of "synonymy" is a source of confusion and some clarification is needed.

SMITH & SMITH (1973) provided useful proposals in this respect. They created the term *chresonymy* (from the Greek *chresis*, "usage") to designate a list or "summary of occurrences of usages of any given scientific name or set of names". A chresonymy is therefore not a list of nomina, but a list of subsequent uses of already existing nomina to refer to a taxon. Such a list may include both the original morphonyms of the currently valid nomen of the taxon and of its synonyms, and other, subsequent morphonyms of all these nomina; it may also include the nomina of other, distinct taxa, which are not genuine synonyms of the studied taxon, but which have been applied by mistake in the past by some authors to this taxon. Chresonymies therefore do not provide nomenclatural information on nomina but bibliographic information on the history of the study and biological understanding of the taxon. Notwithstanding this difference, in many cases this information may be quite valuable for users of revisions, checklists or catalogues, and presentation of both nomenclatural and bibliographic information as a set of references at the beginning of a taxonomic account often appears justified. It is however important: (1) to recognize that any such list is not a *synonymy sensu stricto*, but a *synonymy and chresonymy* (SMITH & SMITH, 1973) or a *chresonymy*, either *complete* or *partial*; (2) to clearly identify and distinguish *chresonyms* (DUBOIS, 1982a: 267), which in fact are not nomina but references, from true synonyms, e.g. by use of a colon, a semicolon or a hyphen between the nomen and the name of the author of the cited work. Although many authors and editors tend to follow spontaneously such a distinct presentation for synonyms and chresonyms, only a few zoological journals give express recommendations in this respect in their *Instructions to Authors* (e.g. DUBOIS, 1997a: 184-185).

A further clarification appears justified here. Citations of nomina in a chresonymy may be of two distinct kinds. They may include mere citations of nomina (both the valid nomen of the taxon and its synonyms) under their original morphonyms, and citations of other morphonyms, i.e. slightly different but derived versions of these nomina (modified subsequent spellings, onymorphs or ranks). These two kinds of chresonyms must be distinguished. Except unjustified emendations, the "slightly modified versions" of nomina just mentioned have no independent status in nomenclature, but it may be useful, for a better and quicker understanding of the nomenclatural history of a taxon, to identify them as such and to have information on their first-users and on the dates of these first-uses. Even further, it would seem justified to consider the possibility of including this information in the presentation of the currently valid nomen of any given taxon, as this would facilitate information storage and retrieval concerning the nomenclatural history of a nomen. As a matter of fact, as was aptly stressed by NG (1994), help to information retrieval is the major purpose of adding the author and date of a nomen after the latter (thus forming together the nominal-complex as defined here), and this function could also be extended to other

information. Such data would particularly be useful in large computerized data-bases, the importance of which will be growing in the future, especially as they will be made available to the world community through electronic connections, and as they will tend to replace, for many purposes, paper printed lists. Detailed proposals in this respect are made below in app. 2.

Even if one does not wish to follow these proposals, it seems useful to identify changes of spelling, onymorph or rank in the set of references at the beginning of a taxonomic account. This requires a slight increase of the complexity of chresosynonymies and recognition of several new categories of nomina. Before going into this question, however, let us discuss another terminological problem, regarding the use of the term "suppression" in zoological nomenclature.

"SUPPRESSION" OF NOMINA

BY THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

Zoological taxonomists tend to have a very living perception of nomina which they are using in their scientific activity. Hence the use to deal with nomina of terms which would be appropriate to designate living beings, such as "protection", "conservation", "suppression" or "resurrection". Zoological nomenclature would probably benefit from using more precise and specific technical terms that would not be liable to cause confusion. Thus the term "conservation" has now a precise meaning in biology (e.g. in the title of the journal *Conservation Biology*), and many non-taxonomists may sometimes be troubled or mistaken when they read in the *Bulletin of Zoological Nomenclature* about the "conservation" of, e.g., "Phrynobatrachinae Laurent, 1941" (DUBOIS, 1994): what is at stake then is not conservation of the populations of the biological species of the subfamily Phrynobatrachinae, but continuation of use of the nomen Phrynobatrachinae for this subfamily, although according to the *Code* it should bear another nomen.

In order to clarify the matters concerning definite nomenclatural actions, some terminological changes may be considered. Thus, it appears improper to use the term "suppression" for the action sometimes taken under the Plenary Powers by the International Commission on Zoological Nomenclature. In common language, something "suppressed" does not exist any more, whereas nomina "suppressed" by ICZN continue to exist, not only outside but also inside zoological nomenclature: hence the enclosing of the term "suppression" between quotation marks, first used by DUBOIS & OHLER (1995a: 141, 1997a). As a matter of fact, in most cases, "suppression" by ICZN only affects validity, not availability of a nomen.

Availability of nomina applies regarding three distinct purposes: *priority*, *homonymy* and *typification*. Thus, any nomen published respecting the rules of the *Code* for publication of nomina: (1) competes for priority for the taxon it denotes; (2) competes for homonymy against all other potential nomina of same spelling; (3) can be used to denote the taxomen being the onomatophore for a taxomen of the immediately higher nominal-series. These three aspects of availability are independent, and each one of them can be "suppressed" by ICZN.

Most *Opinions* issued by ICZN result in the "suppression" of a nomen for the sole purpose of the Principle of Priority. These "suppressed" nomina continue to have an existence in zoological nomenclature for three distinct reasons, beside a purely historical interest: (1) just like normal junior synonyms and homonyms, these nomina must still be cited, although as invalid, in synonymies and related lists, nomen catalogues and checklists, etc. (see DUBOIS & OHLER, 1995a: 141); this is very important: otherwise, all the information once attached to these nomina would be lost (actually, avoiding this loss is the major function of synonymies and related lists); (2) unless specifically "suppressed" for this purpose (which is rare), they still compete for homonymy; (3) although rarely, and unless specifically "suppressed" for this purpose (which quite possibly never occurred), they can still denote the onomatophores of taxomina of the next higher nominal-series.

For these reasons, I suggest that the action of ICZN which has until now been called "suppression" of nomina would more appropriately be qualified as an *invalidation* of these nomina, which remain *available* in nomenclature but do not remain the *valid* ones for the taxa they designate. This invalidation is generally pronounced by ICZN in order to allow the "conservation" or "protection" of well-known nomina which according to the *Code* are in fact invalid, usually because they are junior synonyms or homonyms. Beside its better appropriateness, the term "invalidation" may have another small advantage over "suppression". Invalidation often has been made necessary, not because of mistakes made by the original author of the nomen, but because of the action (or absence of action) of subsequent authors. The term "invalidation" means that, but for this action of ICZN, the nomen would remain the valid one for the taxon it denotes. It may therefore carry a less depreciatory connotation than the term "suppression", which, as very aptly stressed by DUPUIS (1995: 273), may throw some shadow on the works of the authors of the invalidated nomina, who are often some of the leading zoologists of the past.

Invalidation of a nomen by ICZN can be *total* or *partial*. *Total invalidation* of a nomen is rare: it applies to nomina "suppressed" *for all nomenclatural purposes*, i.e. altogether for priority, homonymy and typification; this is e.g. the case of nomina created in publications that have been "suppressed" altogether by ICZN. *Partial invalidation* is the usual situation. A nomen may be "suppressed" for the purposes of both Principles of Priority and of Homonymy, or only of the former. Although

theoretically possible, I am not aware of cases where ICZN would have pronounced a partial invalidation of a nomen for the purposes of typification only. However, this latter aspect has remained unclear until now, at least for some authors (e.g., DUBOIS, 1981: 250-251, 1987e; POYNTON & BROADLEY, 1985b: 135; DUELLMAN, 1993: 251), who have considered that a nomen "suppressed" for the purposes of both priority and homonymy (such as *Rana fasciata* Burchell, 1824 or *Xenophrys monticola* Günther, 1864; see CHINA, 1964 and ANONYMOUS, 1994, respectively) could no longer be used to denote the onomatophore of a higher taxon. This interpretation is not supported by the current ICZN Secretariat (TUBBS & GENTRY, personal communication), which has important consequences in some precise nomenclatural cases like the two frog cases just mentioned (see DUBOIS, 1997b; DUBOIS & OHLER, 1998). In order to avoid further discussions or uncertainties in this respect, this point should be made quite clear in further editions of the *Code*.

Total invalidation of nomina by ICZN amounts to suppressing nomenclatural availability of nomina, and is usually needed when the work where these nomina were published is, or may be interpreted as, not following the basic principles of Linnaean binominal nomenclature. As for partial invalidation of nomina by ICZN, two major categories can be distinguished. (1) Partial invalidation for the purposes of both priority and homonymy is needed in order to "conserve" a nomen which is a *junior objective synonym* or a *junior homonym* (a *junior primary homonym* in the species-series) of the former: such an invalidation is *absolute* and *permanent*, and cannot be reverted (except by another action of ICZN). (2) Partial invalidation for the purposes of priority alone is usually called upon when a *junior subjective synonym*, or a *junior secondary homonym* in the species-series, is at stake. In such cases, ICZN simply proceeds to a *reversal of the order of priority between nomina*: this can also be referred to as the *seniorization* of one nomen and the *juniorization* of the other one. Such an invalidation by reversal of priority is not only partial, it is also *conditional* and can be only *temporary*: the invalidation of the *juniorized nomen* stands only as long as both nomina are considered synonyms (or secondary homonyms), but in case of taxonomic change this nomen can be validated again.

The modest terminological changes suggested above could allow clearer communication between taxonomists and with non-taxonomists. If adopted in the *Code*, they would have a bearing on the wording of most *Opinions* issued by ICZN. The standard formula with which many *Opinions* start would have to adopt the following formulation (which should of course be adapted to the kind of invalidation pronounced by ICZN): "Under the Plenary Powers, the nomen XXX is hereby partially invalidated for the purposes of the Principle of Priority but not for those of the Principle of Homonymy or of the Principle of Onomatophores"; or, more shortly: "Under the Plenary Powers, the nomen XXX is hereby partially invalidated for the purposes of priority but not for those of homonymy or typification".

It should be clear that invalidation of a nomen never results in the *validation* of another one (the "conservation" of which had justified the action of ICZN). All ICZN can do is to take an action that will have the consequence to make a nomen *potentially valid*, an equivalent in zoological nomenclature of the term *legitimate* in botanical nomenclature (GREUTER et al., 1994), but decision to consider a nomen as valid is a taxonomic judgement and is not of the competence of ICZN or of the *Code*. Invalidation of a nomen does not constitute by itself a definitive "protection" of another nomen: even after inscription on an "official list", a nomen can be threatened by rediscovery of an overlooked senior synonym, or for other reasons. This is well exemplified by the case of the amphibian generic nomen *Kassina* Girard, 1853, which had to be "conserved" twice by invalidation ("suppression") of two senior synonyms (MELVILLE & CHINA, 1968; MELVILLE, 1985).

Of course, invalidation of a nomen can occur without active intervention of ICZN using its Plenary Powers. By far, the most common cases are those of automatic invalidation of a nomen whenever it is found to be a (subjective or objective) junior synonym or a (primary or secondary) homonym of another nomen. Such an invalidation is permanent in the case of objective synonyms and primary homonyms, and conditional in case of subjective synonyms and secondary homonyms.

Finally, in some rare cases invalidation of a nomen may result from a normal, automatic application of some exceptional rules of the *Code*: e.g., in the case of a family-series nomen replaced before 1961 for being based on a generic nomen rejected as a junior synonym, and having won general acceptance since then, which remains invalid, unless taxonomy changes, by virtue of Article 40.2; or in the case of a junior secondary homonym replaced before 1961, which according to Article 59.3 is permanently invalid if taxonomy has not changed since then. In both cases, application of these exceptional rules results in the "automatic invalidation" of nomina which otherwise would be the valid ones for their taxa according to the general rules of the *Code*. This situation was quite rare under the third edition of the *Code* (ANONYMOUS, 1985), where it applied only in very special cases. However, the number of situations where simple application of the *Code* will result in such an automatic invalidation of nomina will be much more numerous under the rules of the fourth edition of the *Code*, where a new "*nomen protectum* rule" was introduced, but this matter will not be discussed further here, as it would deserve a long discussion by itself (see DUBOIS, 1999b).

PROPOSALS CONCERNING THE TERMINOLOGY
OF NOMINA, NOMEN USES AND LISTS

INTRODUCTION

The precise designation of the different kinds of nomina and of nomen uses distinguished above, as well as of the different kinds of nomen and nomen-use lists, requires the existence of several technical terms. For the sake of consistency, I suggest to use a set of terms of similar form. To coin them, I used prefixes derived from Greek words, combined with the suffix *onym* (from the Greek *onymos*, “name”) that was already used for the construction of related terms (synonym, homonym, chresonym, etc.). Definitions of these and other terms, as well as references to their use in the sense suggested here, are provided in tab. 1, and the relationships among some of these terms are illustrated in fig. 1-8.

In order to have a single set of terms based on the same suffix, in some cases I had to coin replacement terms for already existing ones, such as *gymnonym* for *nomen nudum*. It is clear that such terms are less necessary than those which are here proposed for concepts or categories identified here for the first time. However, as stated above, one of the aims of the present proposals is to provide a set of concepts and of terms that can be used universally for the computerization of all information available on zoological nomina and for its worldwide distribution through electronic channels. For such a purpose, we need a set of well-defined technical terms for fields and attributes in zoological data-bases. My feeling is that it is better to have a homogeneous set of all similar terms, based on related stems or suffixes, rather than an heterogeneous list of terms of different shapes and origins, some Latin (like *nomen nudum*), some derived from Greek (like *synonym*), some English or from other languages (like *new replacement name* or *nouveau nom de remplacement*), as is the case in the current *Code*. For this reason I provided similar terms for all related concepts, even for some of those that had already other designations. I also managed to have a single term for all identified categories of nomina and nomen uses, rather than double or multiple terms (such as *objective synonym*). I did my best to coin terms as short and euphonious as possible, while being based on roots allowing them to carry the needed information on their meaning. I finally tried to propose terms sufficiently different in their aspects to avoid confusions between them simply because of their similarity. The set of terms proposed below is not viewed, however, as a closed “system” that should be adopted or rejected as a whole. Subsequent followers of my proposals will be free, of course, to adopt them altogether, or in part only.

AVAILABILITY AND VALIDITY OF NOMINA

Let us now present these concepts and terms. Regarding any given nomen or morphonym, its usability in zoological nomenclature may be considered in the light of four different qualifications: *availability*, *validity*, *correctness* and *current use*. The first and second of these terms concern *nomina*, and the third and fourth ones concern *morphonyms* of nomina; the first and third terms refer to purely onymological concepts, while the second and fourth imply both onymological and taxonomic considerations.

The first important distinction concerns the *availability* and *validity* of nomina. A nomen published but nomenclaturally unavailable according to the *Code*, either because it is excluded under Article 1.3 or because it is not conform to the provisions of Articles 10 to 20, cannot be used as the valid nomen of a taxon. The same is true for a nomen totally or partially invalidated (as defined above) by ICZN or through use of the standard rules or of some special rules of the *Code*. Only a nomen available under the *Code*, and not invalidated by ICZN or by such rules, can be potentially valid for the taxon it denotes. I propose to designate a nomenclaturally available nomen by the term *hoplonym* (from the Greek *hoplon*, “arm, weapon”), and to call a nomen published, but nomenclaturally unavailable under the *Code*, an *anoplonym* (from the Greek *anoplos*, “unarmed”).

Nomenclatural unavailability of a published nomen may be due to various kinds of causes, so that there are several kinds of anoplonyms. A well-known kind is that for which the *Code* uses the designation of *nomen nudum*, the Greek-derived equivalent of which is *gymnonym* (from the Greek *gymnos*, “naked”): according to the *Glossary* of the *Code* (ANONYMOUS, 1999: 111), it is a nomen first published without fulfilling the requirements of Articles 12 (if published before 1931) or 13 (if published after 1930). But other kinds of anoplonyms do exist, although they are less often encountered, e.g. a nomen: (1) first published as a junior synonym (a) either after 1960, or (b) before 1961 but not having been treated as an available nomen before that year (Article 11.6); or (2) published anonymously after 1950 (Article 14); or (3) proposed conditionally or as the nomen of a “variety” after 1960 (Article 15); or (4) published after 1999 without being explicitly indicated as intentionally new or without some other pieces of information (Article 16).

Among hoplonyms, the distinction must be made between *valid* and *invalid* nomina. *Validity* of a nomen may depend on both nomenclatural and taxonomic conditions. A nomen may be rendered permanently invalid for being an objective junior synonym or homonym of another nomen, or for having been invalidated by ICZN or by special rules of the *Code* (see above). It may also become conditionally invalid for being a subjective junior synonym or a secondary junior homonym of another nomen: in these cases, its status is liable to change if taxonomy changes.

I propose to call a valid nomen a *kyronym* (from the Greek *kyrios*, “proper, correct”), and an invalid nomen an *akyronym* (from the Greek *akyros*, “improper, incorrect”). Two subcategories can be recognized among akryonyms: a *permanent akryronym* or *exoplonym* (from the Greek *exoplos*, “disarmed”) is permanently invalid (e.g. in the cases of junior objective synonyms or primary homonyms, of total or partial invalidation of a nomen by ICZN, or of junior secondary homonyms replaced before 1961 and made permanently invalid by Article 59.3 of the *Code*); a *conditional akryronym* or *hypnonym* (from the Greek *hypnos*, “sleep”) is liable to be reinstated if taxonomy changes, e.g. if a subjective synonymy is rejected (e.g. in the cases of junior subjective synonyms and secondary homonyms, of juniorization of subjective synonyms by ICZN, or of family-series nomina rejected by virtue of Article 40.2 of the *Code* for being based on generic nomina considered as junior synonyms).

Anoplonyms, i.e. nomina which are not nomenclaturally available, have no author, date and onomatophore in the sense of the *Code*, and do not compete for synonymy or homonymy. In many cases, a nomen first published as an anoplonym was later used as a valid nomen by the same or another author (this is in particular often the case with gymnonyms); in some other cases, this nomen was never used by subsequent authors and never obtained a status in nomenclature. Anoplonyms are therefore quite special chresonyms, which have no proper author in the sense of the *Code* but do not derive from valid original nomina as do “normal” subsequent spellings (see below) and chresonyms. In lists of nomina and nomen uses, they should therefore be clearly distinguished from other kinds of nomina.

An akronym, on the other hand, was made available in zoological nomenclature like any hoplonym, it has an author, a date and an onomatophore, but, having been invalidated for being a junior synonym or homonym, or because of some articles of the *Code*, or by ICZN, it cannot be used as the valid nomen of a taxon.

CHANGES IN SPELLING, RANK AND ONYMORPH

Any given nomen may exist in the taxonomic literature under different morphonyms (which may sometimes be quite numerous). The original hoplonym as published in the original publication, with its *original spelling*, *rank*, and, if relevant, *onymorph*, has until now received no special technical designation. I am therefore led to propose the new term *protonym* (from the Greek *protos*, “first”), to designate the original morphonym of a nomen in the original publication where it was first made nomenclaturally available. Genuine synonymies should only list protonyms, as these are the nomina to which the author, date and onomatophore are attached.

On the other hand, I propose the new term *aponym* (from the Greek *apo*, “coming from”) to designate any morphonym resulting from a subsequent change, either justified or unjustified, introduced in a protonym after the original publication. Such changes may concern only spelling (following mandatory change, justified emendation, incorrect subsequent spelling), only onymorph (following new generic allocation, raising of subspecies to species rank, downgrading of species to subspecies rank, change in subgeneric status, taxonomic recognition of aggregates of species or subspecies, etc.), or both (e.g., mandatory change of ending of epithet following new generic allocation), or even simply the rank of the nomen without spelling change (e.g., when a generic nomen is downgraded to subgeneric rank, or when a family-series nomen is used with the same suffix as in a previous work but for a taxon of different rank). The concept of aponym is akin to but wider than those of *nomen translatum* and of *nomen correctum* sometimes found in zoology or paleontology. Thus, in the *Treatise on Invertebrate Paleontology*, the formula *nomen translatum* is used for nomina of the family-series and of the class-series (as defined here) that have had a change of rank in the taxonomic hierarchy, whether or not this change of rank was followed by a change in spelling (see e.g. KAESLER, 1997: xi, xiv), and the formula *nomen correctum* is used to designate family-series or class-series nomina whose spelling had to be modified either in its stem or in its ending (see e.g. KAESLER, 1997: xi-xii, xiv). The concept of aponym is a combination and extension of these two concepts, as it applies to nomina of all nominal-series and to all kinds of changes (in spelling, onymorph and/or rank), whether justified or unjustified. At this stage, I do not think it useful to distinguish all these various kinds of changes by different terms.

Among the various kinds of changes that can affect nomina, changes of spelling deserve particular attention. After the original publication of a nomen, the latter may be used in subsequent works either under a spelling identical to the original one, or under different spellings. These subsequent spellings may be referred to several categories, which are sometimes difficult to distinguish (for more details, see DUBOIS, 1987c: 31-48). Only some of them are aponyms of the original nomen, while others represent new nomina. Thus, a *new replacement nomen* (*nomen novum*), in the precise sense given to this term in the *Code*, is available in nomenclature with its own author and date, and is therefore a protonym. The same is true of an *unjustified emendation*, which is but a particular case of new replacement nomen, but not of a *justified emendation*, which is a mere aponym of the original nomen. For more clarity, I propose the general term *neonym* (from the Greek *neos*, “new”) to designate collectively all new replacement nomina. Two subcategories can be recognized among neonyms: an *autoneonym* (from the Greek *autos*, “same”) is a neonym directly derived from a protonym through unjustified emendation, whereas an *alloneonym* (from the Greek *allos*, “other”) is a brand new nomen, not directly derived from a protonym. As I have already stressed (DUBOIS, 1985, 1987c), in some cases allocation of a nomen to one of these two subcategories may be difficult, if not arbitrary. A neonym has its own author and date,

but, by definition, its onomatophore is the same as that of the replaced nomen and it denotes the same taxomen as the latter (see DUBOIS, 2000b).

The concept of protonym is distinct from that of *basionym* used in the botanical code (GREUTER et al., 1994). The basionym is the *correct spelling* (in the precise onymological sense of this term) of the original hoplonym, while the protonym is the *original spelling, rank and onymorph* of the latter. In many cases, the original spelling is correct, so that the basionym is also the protonym, but in the cases where the nomen as published in the original publication is incorrect under our current *Code*, the basionym will correspond to one of the aponyms of the hoplonym. Thus, for example, the amphibian familial nomen *Ranae* published by GOLDFUSS (1820) is incorrect under our current rules, but it remains nevertheless the protonym of the familial nomen *Ranidae* currently in use. As understood here, the concept of aponym applies to *all* changes in spelling, even very slight, e.g. bearing on a single letter or considered by the current *Code* (Article 58) as “variant spellings deemed to be identical”. However, in agreement with the botanical code (GREUTER et al., 1994: 73), the use of an initial capital or small letter is not here considered a different spelling, this being a matter of typography, not of orthography¹.

Altogether, the protonym and its aponyms (and sometimes also its anoplonyms) constitute the set of morphonyms that have been used, at a given time, for a given nomen. Only the protonym has an *author* in the sense of the *Code*, whereas aponyms and anoplonyms can only be ascribed *first-users*. I propose to designate collectively all these related forms as *paronyms* (from the Greek *para*, “beside”). The term *paronym* exists in common language, where it can be defined as “a word cognate with another” (THOMPSON, 1995: 994), and “cognate” as “related to or descended from a common ancestor” (THOMPSON, 1995: 256), which corresponds to the use here proposed for the term, but other meanings of the latter can also sometimes be found. The use of this term here proposed is a technical, restricted meaning for the purpose of zoological nomenclature, a situation similar to that found for many other terms used in science in a special sense, just like synonym and homonym in zoological nomenclature.

CORRECTNESS AND CURRENT USE OF MORPHONYMS

Both protonyms and aponyms can be either *correct* or *incorrect* according to the *Code*, and they can be *in current use* or *unused* in zoological nomenclature according to the taxonomy followed by authors.

¹ Nevertheless, as outlined by Annemarie OHLER (personal communication), for a German reader, usage of capital or small letter is also a question of orthography, not only a question of typography.

Correctness of a morphonym depends only on nomenclatural rules. Any nomen may have been used in zoological nomenclature under different spellings, onymorphs or ranks, some correct and others incorrect according to the rules. Anyhow, among all these variants, only one may be the correct one for a given taxon in a given taxonomy. Any given spelling, for example, cannot be stated to be “correct” by itself, it can be so only under a given taxonomy: e.g., an epithet’s spelling may have to be changed if the epithet moves from a genus whose nomen is masculine to a feminine one, or the spelling of a family nomen will have to change if this taxon is downgraded to subfamily rank, etc. Therefore, for a given taxon, there is only one “correct” nomen, which may be either the protonym or one of the aponyms of the kyronym. An incorrect original or subsequent spelling, the use of a wrong grammatical gender for a species-series epithet, the use of a binomen or trinomen including an akronym (e.g., a specific binomen whose generic substantive is invalid), or the subsequent use of an infrasubspecific rank for an epithet first validly published as of species or subspecies rank, are to be considered incorrect morphonyms. I propose the term *eunym* (from the Greek *eu*, “well, easily”) for any correct morphonym of a nomen, and the term *nothonym* (from the Greek *nothos*, “wrong, illegitimate”) for any incorrect morphonym of a nomen.

Incorrect subsequent spellings are quite different from unjustified emendations (autoneonyms as defined above). The distinction is based on the *intentionality* of their proposal. Incorrect spellings may be original (including any spelling rejected by the first-reviser in case of multiple original spellings) or subsequent. Incorrect spellings are morphonyms that were introduced by inadvertence either by an author, or by an editor or a publisher (see examples in Article 32 of the *Code*). Quite unlike neonyms, they have no nomenclatural status and cannot be used to designate taxa: according to the *Code*, whenever necessary, any such spelling must be replaced by the correct spelling of the same nomen. I propose to designate such morphonyms under the term *ameletonym* (from the Greek *ameles*, “inattentive, careless”). In contrast, any spelling, either original or subsequent, proposed intentionally by an author (i.e., a correct original spelling, a justified or unjustified emendation, or a mandatory change), may be known as a *meletonym* (from the Greek *melete*, “attention, care”).

Current use of a morphonym may depend on both nomenclatural and taxonomic factors. A nomen may be available and valid, and its morphonym may be correct, but the nomen may nevertheless not be used under a given taxonomy. This is the case for example of a trinomen designating the nominotypical subspecies of a species, whenever the species is considered by taxonomists to be monotypic; or of a family-series morphonym ending by an unusual suffix, such as *-ina* or *-oidae*, if it is used to designate e.g. a family or a tribe (but the same suffix may be used in some cases to designate other family-series taxa, if additional categories are recognized above or below the rank family: see e.g. BOUR & DUBOIS, 1985, 1986). To designate any eunym currently in use in zoological taxonomy, I propose the term *ergonym* (from the Greek *ergon*, “work,

action”), and for any eunym currently unused in zoological taxonomy the term *argionym* (from the Greek *argia*, “idleness, inaction”).

To sum up, a morphonym in use in zoological taxonomy must be altogether a hoplonym, a kyronym, an eunym and an ergonym. All other morphonyms are never to be used in zoological publications to designate a taxon, a fact to which authors and editors should pay attention.

KINDS OF SYNONYMS AND HOMONYMS

Proposing still new terms for some of the concepts covered by the terms *synonym* (from the Greek *syn*, “with, together”) and *homonym* (from the Greek *homos*, “same, similar”) might appear useless and arrogant, as these concepts have been used for a long time and would not seem to be liable to raise problems, being well-known by all zoologists. Unfortunately, this is not true. Both these terms are used in two, and actually two really different, senses. As mentioned above, the current *Code* recognizes two kinds of synonyms, *objective synonyms* (*nomenclatural synonyms* in botany) and *subjective synonyms* (*taxonomic synonyms* in botany), and several kinds of homonyms, including “simple homonyms” in the family-series and in the genus-series, and *primary homonyms* and *secondary homonyms* in the species-series. Despite the long existence of these concepts and of the formulae used to designate them, and their being clearly defined in all editions of the *Code*, these four concepts are not fully understood or mastered by all zoologists, as will be shown by two recent examples in frog taxonomy.

LYNCH (1996) recently pointed to three cases of homonymy between the following frog species-series nomina, all currently referred to the genus *Eleutherodactylus*: (1) *Lithodytes gaigei* Dunn, 1931 and *Syrhropus gaigeae* Schmidt & Smith, 1944; (2) *Syrhropus nebulosus* Taylor, 1943 and *Eleutherodactylus nebulosus* Henle, 1992; (3) *Tomodactylus petersi* Duellman, 1954 and *Eleutherodactylus petersorum* Lynch, 1991 (new replacement nomen for *Eleutherodactylus petersi* Lynch & Duellman, 1980). Let us first note that two of these three cases are not genuine cases of homonymy. Both under the third (ANONYMOUS, 1985) and the fourth (ANONYMOUS, 1999) editions of the *Code*, *gaigei* and *gaigeae* are not homonyms, nor are *petersi* and *petersorum*. LYNCH (1996) stated that the *Code* (Article 58) considered such spellings as homonyms because they were variants “of the same origin and meaning”, but what Article 58 says is different. Of course, not all nomina of the same origin and spelling are to be considered homonyms, because then homonymy would have a very wide application (e.g., between *chinensis*, *sinensis* and *sinicus*, *montana* and *monticola*, or *vitianus* and *vitiensis*), which would lead to many invalidations of nomina in zoology. In its last edition (ANONYMOUS, 1999: 61), the *Code* rightly recommends not to introduce such similar nomina in zoological nomenclature, but this is only a recommendation, not

a rule. According to the *Code*, homonymy is established between nomina that are not only “of the same origin and meaning” (ANONYMOUS, 1985) or “of the same derivation and meaning” (ANONYMOUS, 1999), but also “that differ in spelling only in any of the following respects” (ANONYMOUS, 1985, 1999). This is followed by a *closed list* of cases of variant spellings of species-series nomina deemed to be identical, that include e.g. use of *-i* versus *-ii*, or of *-ae* versus *-iae*, or of *-orum* versus *-iorum*, but not between these different possibilities: thus, *-i* and *-ae* or *-i* and *-orum* are not deemed identical, so that the two cases (1) and (3) above are not cases of homonymy and the two nomina erroneously replaced by LYNCH (1996) in these two cases should be reinstated as valid nomina. But this paper contains another striking mistake. The three cases above, if they were genuine cases of homonymy, would clearly be cases of secondary homonymy. However, LYNCH (1996) considered so only the cases (1) and (3), but the case (2) to be one of primary homonymy. Had this latter statement been written only once in the paper, it might be considered a misprint, but it appears on two occasions, at the bottoms of both p. 278 and p. 279. One is then forced to admit that, in this paper, LYNCH was using his own concepts of primary and secondary homonymies, different from those of the *Code*, and which are difficult to understand. This example is all the more striking as it was published in a major international journal, by an excellent taxonomist, and with the advice of several other experienced authors (mentioned in the acknowledgments): this suggests that misunderstandings around the meaning of these terms are more widespread among zoologists than one would at first be prepared to believe.

This interpretation is supported by the second example, which also concerns a paper (DUELLMAN & WIENS, 1993) co-authored by one the best frog taxonomists of our times. This example was discussed in more details elsewhere (DUBOIS & OHLER, 1997a: 307) and won't be so again here: it involved in particular the creation of the strange category of “junior objective homonym”, clearly a lumping between “junior primary homonym” and “junior objective synonym”.

These examples suggest that the concepts mentioned above, and their current denominations by double terms, are currently not well mastered by all taxonomists. Once again, I repeat my conviction that the absence in zoonymology of technical terms and the use of seemingly simple, trivial terms, is a factor of misunderstanding of the concepts denoted by these terms. My opinion is that the use for these onymological concepts of precise technical terms, even if, or even rather because, they may be disheartening for the layman, would contribute to a better understanding and more proper use of these concepts by taxonomists.

In both cases, the same term may be used both for a purely onymological concept and for a concept that straddles taxonomy and nomenclature. I considered the possibility of showing this similarity by using the same roots for the two categories in both cases, but I finally refrained from doing so in order to avoid offering a new possible cause of semantic confusion.

The concept of *objective synonymy* is a purely onymological one, that has nothing to do with taxonomy. Two nomina are objective synonyms simply if they have the same onomatophore, a fact that is irreversible and is not liable to change according to one's opinion. On the other hand, the concept of *subjective synonymy* relies on a taxonomic judgement: two nomina are subjective synonyms if, within the frame of a given taxonomy, their onomatophores are considered to belong in the same taxon. A subjective synonymy is therefore not irreversible: it is liable to disappear if taxonomy changes. In order to stress this difference between these two kinds of synonyms, I propose the term of *isonym* (from the Greek *isos*, "equal") for the concept of objective synonymy, and the term of *doxisonym* (from *isonym* and from the Greek *doxa*, "opinion") for the concept of subjective synonymy.

The situation is rather similar, although a bit more complicated, for the different kinds of homonymies. The *Code* provides different definitions of homonymy in the three nominal-series. According to its *Glossary* (ANONYMOUS, 1999: 105-106), two nomina are homonyms: (1) in the family-series, if they have exactly the same spelling, or spellings that differ only in suffix: in other words, and more briefly, if they have exactly the same stem; (2) in the genus-series, only if they have exactly the same spelling; (3) in the species-series, if their epithets are exactly identical or "deemed to be identical" under Article 58 of the *Code*, either originally (*primary homonymy*) or after a change of generic allocation (*secondary homonymy*). Despite this apparent complexity, all these cases can be referred to two major categories: (1) that of homonyms which remain so whatever the taxonomy is; (2) that of homonyms which are liable to change if the taxonomy changes. Just like in the case of synonymy, the first situation corresponds to a purely onymological concept. It occurs in all cases of homonymy in the family-series and genus-series ("simple homonymy"), and in all cases of *primary homonymy* in the species-series: both simple homonymy and primary homonymy are irreversible and cannot change with the evolution of taxonomy. The concept of *secondary homonymy*, on the other hand, that only applies to nomina of the species-series, has something to do with taxonomy, not only with onymology. It designates the situation where identical epithets, or epithets "deemed to be identical" under Article 58 of the *Code*, and that had been originally published in combination with different generic nomina, are now considered to apply to congeneric taxa. A secondary homonymy is therefore not irreversible: it may disappear if taxonomy changes. Here also, in order to stress this difference between these two major kinds of homonyms, I propose two new terms: *hadromonym* (from *homonym* and from the Greek *hadros*, "robust") for both the onymological concepts of "simple homonymy" and of primary homonymy, and *asthenonymy* (from *homonym* and from the Greek *asthenes*, "weak") for the concept of secondary homonymy.

KINDS OF LISTS OF NOMINA AND REFERENCES

According to these proposals, a so-called "synonymy" in the traditional sense is a list of *synonyms*, i.e. of different nomina referring, either for onymological (*isonyms*) or for taxonomic (*doxisonyms*) reasons, to the same zoological taxon, to which can also be added a number of references to the use of these nomina. Any such list can be referred to one of the three following kinds of lists of nomina and references:

(1) a *synonymy sensu stricto*, i.e. a list of nomina and references including only protonyms with their authors and dates (and sometimes anoplonyms with their first-users);

(2) a *synonymy and aponymy*, or, more shortly, a *paronymy* (from *paronym* as defined above), i.e. a list of nomina and references including protonyms with their authors and dates and their aponyms (and sometimes their anoplonyms) with their first-users and dates;

(3) a *synonymy, aponymy and chresonymy*, or, more concisely, a *holonymy* (from the Greek *olos*, "complete"), i.e. a list of nomina and references including protonyms, aponyms and chresonyms (and sometimes anoplonyms).

In all these three categories, the lists can be either *complete* or *partial*, according to whether all synonyms, aponyms, chresonyms and/or anoplonyms are listed, or not.

A further clarification may be useful, concerning the term chresonym. Recognition of the new categories of anoplonym (for a published but nomenclaturally unavailable nomen) and of aponym (for the first-use of any new morphonym of an already available nomen) restricts the category chresonym to all subsequent uses of a given morphonym. Still then, however, this category remains heterogeneous. As already mentioned above, nomina of chresonyms that appear in a holonymy may either be nomina that stand also in this list under their protonyms, or not. In other words, the chresonymy of a taxon's nomen may include, beside citations of the valid nomen of the taxon and of its synonyms, citations of nomina that have been used in the past by mistake by some authors to designate this taxon, but which are now considered to apply to another taxon. In such holonymies, these improper uses of the nomen are often pointed out by use, just after the cited nomen and before the reference, of the Latin words *nec* or *non*, followed by the author and date of the protonym of this cited nomen, in order to make clear why this latter protonym does not appear in this holonymy. These two kinds of chresonymies should be distinguished. For the first kind of chresonymy, justified or correct chresonymy (the nomen used for the taxon being either its valid one or that of one of its current synonyms), I propose the term *orthochresonymy* (from the Greek *orthos*, "right, correct"). For the second kind of chresonymy, that of unjustified

or incorrect chresonymy (the nomen used for the taxon referring in fact to another taxon), I propose the term *heterochresonymy* (from the Greek *eteros*, “other, different”).

Finally, in order to be able to designate all kinds of nomina and nomen-use lists (synonymies, paronymies, chresonymies and holonymies) under a single term (whose use is exemplified in the appendices of this paper), I propose the term *logonymy* (from the Greek *logos*, “speech”).

The usefulness of these terms and categories, for a precise designation of the different kinds of lists usually known as “synonymies” and of nomina and nomen uses that appear in such lists under the general term of “synonyms”, will be made clearer by the study of some examples and by precise proposals for the typographical presentation of such lists in order to make them “self-evident” regarding the information they provide: this is given below in app. 1-3.

CONCLUSION

Standardization of the presentation of logonymies, through adoption of the suggestions above, or of other similar but better standards, by all zoologists, zoological publications and data-bases, would be a good way to increase the efficiency of these lists for information storage and retrieval in taxonomy and to improve communication of animal taxonomists between themselves and with other members of the scientific community. Ultimately, it might be useful to incorporate some at least of these suggestions as “recommendations” both in the *Code*, in the *Instructions for Authors* of zoological journals, and in the definition of fields and attributes in zoological data-bases.

APPENDIX 1 SOME EXAMPLES OF LOGONYMIES

A list of examples of different kinds of logonymies (all taken from publications dealing with Amphibia) will make clearer the distinction made above between different categories of nomina and nomen uses. In the examples below, a logonymy is recorded as “complete” if it was intended to be so by the author of the publication, although often, despite this intention of completeness, it proved later to be incomplete; in other cases however, the author clearly stated that he/she only planned to provide a partial (e.g., selected on the basis of a geographical, or other, criterion) list. The examples below are not meant at giving a complete survey of all important revision works on the taxonomy of amphibians, but rather at illustrating the various situations that can be encountered in works of widely different periods. Particularly interesting is the fact that several of the authors cited more than twice below changed their way of working during time, and published different kinds of logonymies in their different works. A careful examination is therefore necessary to know what kinds of logonymies actually appear in a given publication.

(1) *Complete synonymies* (but no apo-chresonymies):

(a) for nomina of family-series and genus-series taxa alone: DUBOIS (1992);

(b) for nomina of family-series taxa alone: DUBOIS (1983);

(c) for nomina of genus-series and species-series taxa alone: LOVERIDGE (1957); GORHAM (1974); DUBOIS & ÖHLER (1995a);

(d) for nomina of species-series taxa alone: BARBOUR & LOVERIDGE (1928); PERRET (1966); HEYER (1973, 1978, 1979); LYNCH (1980, 1981); LYNCH & MYERS (1983); ZHAO & ADLER (1993); GLAW & VENCES (1994: 411-424).

(2) *Complete paronymies* (but no chresonymies):

(a) for nomina of family-series and genus-series taxa alone: LYNCH (1971); DUBOIS (1981);

(b) for nomina of family-series taxa alone: DUBOIS (1984a);

(c) for nomina of genus-series and species-series taxa alone: SCHMIDT (1953);

(d) for nomina of species-series taxa alone: FATIO (1872); DUELLMAN (1961), LYNCH & DUELLMAN (1973); LYNCH (1975); HARDING (1983); HEYER (1983, 1994); DUBOIS (1984b); HEYER et al. (1990); DUELLMAN & CAMPBELL (1992).

(3) *Complete holonymies*:

(a) for nomina of taxa of all 4 nominal-series: BOULENGER (1882); COPE (1889); NIEDEN (1923); AHL (1931); PARKER (1934);

(b) for nomina of class-series, genus-series and species-series taxa (but not for taxa of the family-series): STEJNEGER (1907);

(c) for nomina of family-series and genus-series taxa alone: LIEM (1970); DREWES (1984);

(d) for nomina of genus-series and species-series taxa alone: KELLOGG (1932); SILVERSTONE (1975, 1976); BLOMMERS-SCHLÖSSER & BLANC (1991);

(e) for nomina of species-series taxa alone: GÜNTHER (1864); CAMERANO (1884); BOULENGER (1890, 1897, 1898, 1912, 1920*a-b*); SCHMIDT (1919, 1923, 1924); COCHRAN (1941, 1955); BOURRET (1942); INGER (1954); KIRTISINGHE (1957); CEI (1962, 1980); COCHRAN & GOIN (1970); LAURENT (1972, 1976, 1982, 1983); BERRY (1975); SCHIOTZ (1975); LESCURE (1976); LANZA (1981); DUELLMAN & HOOGMOED (1984);

(f) for nomina of species-series taxa alone, with partial holonymies for nomina of genus-series taxa: VAN KAMPEN (1923); POYNTON (1964); SCHIOTZ (1967);

(g) for nomina of species-series taxa alone, with complete paronymies for nomina of genus-series taxa: OKADA (1966).

(4) *Partial holonymies* (complete paronymies with partial chresonymies):

(a) for nomina of genus-series and species-series taxa alone: DUELLMAN (1970, 1977); POYNTON & BROADLEY (1985*a-b*, 1987, 1988);

(b) for nomina of species-series taxa alone: STEJNEGER & BARBOUR (1923); LIU (1950); SCHMIDT & INGER (1959); MERTENS & WERMUTH (1960); LIU & HU (1961); GORHAM (1966); INGER (1966); THORN (1969); HEYER (1970); DUBOIS (1974); LYNCH & DUELLMAN (1980); LYNCH & RUIZ-CARRANZA (1985).

All the works just mentioned were chosen because they demonstrate a consistent choice of the information to be included in "synonymies", even if in some cases the latter are not strict synonymies in the sense of the *Code*. Unfortunately however, still nowadays, some authors use the term "synonymy" in a completely loose sense, i.e. as a partial list of nomina of references for the choice of which no clear rationale can be found: a recent striking example is GASC et al.'s (1997) volume, where most lists of so-called "main synonyms" (provided for each species) include an unpredictable mixture of partial synonymy, partial aponymy and sometimes partial chresonymy, and are therefore unsatisfying both for nomenclatural and bibliographic purposes (see DUBOIS, 1998*a*).

APPENDIX 2

SUGGESTIONS FOR THE PRESENTATION OF LOGONYMIES

GENERAL SUGGESTIONS

A slight improvement of the traditional presentation of logonymies at the head of taxonomic accounts could allow to make such lists more useful to the community of zoologists. The presentation should allow, by simple inspection of these lists, knowledge of the status of nomina, authors' names and dates. Some unformulated rules are often used "spontaneously" by various authors and editors for this purpose, and I am just proposing below to formalize them more strictly and precisely.

Information on the status of nomina and references can be provided, in the heading of the logonymy, by the use of brackets enclosing the nomenclatural author's and some first-users' names, with the dates of the publications concerned, and, in the list itself: (1) by the order of presentation of nomina and references in the list; (2) by the indentation of lines; (3) by the use of quotation marks enclosing the nomen; (4) by the use of standard signs between the nomen and the name of the author of the reference; and (5) by typographical conventions in the printing of the latter name. More details are given on all these matters below.

A general suggestion regarding the format of such publications is that they should preferably use full-page width, rather than the two-column format. The latter tends to be more and more used in zoological journals, presumably both to save costs and to facilitate reading over long lines, but it is particularly ill-adapted for the presentation of logonymies, especially if different kinds of indentation of lines are used, as suggested here. To reduce problems in the reading of long lines, the size of the page should not be too large: printed lines from 12 to 14 cm wide would appear to be a good format for taxonomic publications.

Publications using the two-column format and/or printing all authors' names with the same characters (see below) could also follow the present suggestions. Their publishers would just have to decide to apply a particular format to logonymies, centering the heading of the taxonomic account in the middle of the page (as is often done for chapter or subchapter headings in such publications), then presenting the logonymy over the whole width of the page, then reverting to the two-column format for the rest of the taxonomic account. Furthermore, *within logonymies*, they could decide to modify their usual typographical presentation of authors' names, in order to be able to use the conventions presented below to distinguish nomenclatural authors of nomina from subsequent users of these nomina.

AUTHORS' NAMES

As a matter of fact, a puzzling problem for all editors of zoological journals is to show, by the way they are printed, the difference between *the name of the author of a nomen* (followed by the date of the latter), and *the name of the author of a quoted reference* (followed by the date of the latter). This problem is solved in a peculiar way in publications that do not quote the names of authors of references in the text, but only refer to these references by numbers, usually printed in parentheses or between square brackets: in such cases, the only authors' names that appear in the text are those of nomenclatural authors of nomina. But the problem is a real one for all other publications.

Some books or periodicals use printing conventions to make a distinction between both kinds of names by printing names of nomenclatural authors of nomina in *lower-case letters* and names of authors of references cited in the text in *small capitals*. However, no such conventions can be used in publications where both kinds of names are printed with the same characters (either lower-case letters or small capitals). For this reason, it may be useful to suggest that publications which tend to often publish

taxonomic works, revisions, checklists and catalogues (such as many museum publications) should adopt a printing format with different letters for the two kinds of names.

An alternative suggestion would be more drastic but perhaps much clearer, in the long run, for all zoologists: it would be to explore the possibility to quote the names of authors of nomina in a particular way, that could be recognized immediately in all publications, whatever their printing conventions. In this respect, the *Code* does not give very precise recommendations. It only states (Article 51.2) that "the name of an author follows the name of the taxon without any intervening mark of punctuation, except in changed combinations". This leaves ground for a number of possibilities. Furthermore, a clear weakness of the *Code*'s recommendation is that it recognizes the practice of citing the taxon's author's name without the date, which, as reminded in the text above, is a practice that should be discouraged, the major purpose of citing this name being to facilitate bibliographic research of the original description (see NG, 1994).

The use of a particular typography for nomina of the species-series and of the genus-series is already a quite universal practice in zoological nomenclature: in almost all publications (except a few amateur or divulgation books), these nomina are written *in italics*. Why not consider also a universal convention for printing the author's names and the dates of nomina, and allow to distinguish them from normal bibliographic references? If such a convention was adopted by all zoologists, then the *nominal-complex*, defined in the text above as the indissociable complex [*nomen* + *author* + *date*], would appear more clearly than it does now as a single set of information, not liable to be confused with a reference's citation.

Several alternative suggestions can be made in this respect. I am providing below a non-restrictive list of such suggestions. Each of them will be illustrated showing the resulting way of writing two early frog nominal-complexes, chosen in order to well point to the problems posed by such situations as multiple authorship or change of generic allocation of a species: a simple case is the nomen *Rana temporaria*, proposed by LINNAEUS (1758) and maintained in the genus *Rana* Linnaeus, 1758; a more complex case is the nomen first proposed by LICHTENSTEIN et al. (1856) as *Ixalus leucorhinus* for a species then allocated to the genus *Ixalus* Duméril & Bibron, 1841, but currently placed in the genus *Philautus* Gistel, 1848 (e.g., DUTTA, 1997: 82).

(1) The most common way of writing these two nominal-complexes is: *Rana temporaria* Linnaeus, 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens, 1856). This use has at least two drawbacks. (a) As mentioned above, this mode of writing, especially in the second example, is clearly different from a normal quotation of a reference only in the case of journals that use different characters for nomina's authors and dates and for references' authors and dates. (b) Two interpretations can be given of the role and meaning of the comma that appears just before the date in this writing: either it is understood as equivalent to "opening a parenthesis" to include the date, or just as a separation between the author's name and the date, but remaining internal to the nominal-complex. There is no difference between both interpretations when the nominal-complex occurs alone (e.g., in a title) or at the end of a sentence. But when it appears at the beginning or middle of a sentence, under the first interpretation it will always have to be followed by a comma (to "close the parenthesis"), while under the second interpretation it will have to be followed by a comma only in certain cases, but not in others, according to the meaning and grammar of the sentence (see e.g. DUBOIS, 1997a). This difference of interpretation is sometimes a matter of disagreement, if not dispute, between the author of a paper and the editor of a journal where this paper is being published.

(2) Some publications already use another convention, suppressing the comma after the author's name: *Rana temporaria* Linnaeus 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens 1856). This writing is acceptable under the current *Code*. It allows to suppress the second problem mentioned in (1), namely the differences of interpretation of the meaning of the comma, but usually not the first one, because often the same publications also do not include a comma after the

author's name when citing a reference. However, using a comma in the latter case but not in nominal-complexes might be a way to point out the difference between the two situations by simple editorial conventions.

(3) Another suggestion (Philippe BOUCHET, personal communication) would be to use a different character set to print the names of authors of nomina, e.g., in a text in Times, to use Courier for authors' names and publication dates: *Rana temporaria* Linnaeus, 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens, 1856); or *Rana temporaria* Linnaeus 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens 1856). However, such a suggestion cannot claim universality, as different publications use widely different character sets.

(4) Beside italics and small capitals, the only other character set that has almost general universality in all publications is that of bold characters, whose use could also be considered in this context: *Rana temporaria* Linnaeus, 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens, 1856); or *Rana temporaria* Linnaeus 1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens 1856). This suggestion could claim universality, but it has a drawback: as the bold characters are often used to highlight a portion of a text, this might give an excessive weight or importance to the name of the author of the nomen, to the detriment of the latter. As underlined by NG (1994), what is important in quoting the author's name is not a celebration of this person, but an aid for bibliographic research. A reverse use, with bold characters for the nomen and italics for the author's name and date, might be much better, but for this the universal use of italics for nomina would have to be changed, which seems neither feasible nor desirable.

(5) Another way of finding a universal representation of nominal-complexes would be to use a sign other than the comma between the author's name and the date. Several widely used signs, used by all printers and publishers, could be considered in this respect, including the hyphen, the colon, the dash, the star or the arobas. The results would be as follows: *Rana temporaria* Linnaeus-1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens-1856); *Rana temporaria* Linnaeus:1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens:1856); *Rana temporaria* Linnaeus/1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens/1856); *Rana temporaria* Linnaeus*1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens*1856); *Rana temporaria* Linnaeus@1758 and *Philautus leucorhinus* (Lichtenstein, Weinland & Von Martens@1856). Other signs could also be considered for the same purpose. No confusion with normal references would remain possible, and such a system, once agreed upon by zoologists, could rather quickly gain universality in zoological publications.

(6) NG's (1994) comments can also be the basis for more drastic suggestions. As well argued by this author, the function of citing the author and date of a nomen is to help for a quick finding of the original description. Usually the easiest way to achieve this is to survey the *Zoological Record* or some other comprehensive bibliographic data-base. Such a research is hierarchised, i.e. it starts with the year and then goes to the author's name or to the nomen. Thus, the year somehow appears a more important information than the author's name. One could consider inverting the order of these two pieces of information, as follows: *Rana temporaria* 1758, Linnaeus and *Philautus leucorhinus* (1856, Lichtenstein, Weinland & Von Martens). This could also be combined with some of the other suggestions above, e.g.: *Rana temporaria* 1758 Linnaeus and *Philautus leucorhinus* (1856 Lichtenstein, Weinland & Von Martens); *Rana temporaria* 1758-Linnaeus and *Philautus leucorhinus* (1856-Lichtenstein, Weinland & Von Martens); *Rana temporaria* 1758@Linnaeus and *Philautus leucorhinus* (1856@Lichtenstein, Weinland & Von Martens). At first, such modes of notation would no doubt seem strange to all zoologists, but in the long run they might lead to a much clearer and non-ambiguous communication in allowing immediate recognition of nominal-complexes and their distinction from the rather common situation where a nomen alone (without its author and date) is cited, and immediately followed by a reference to a publication.

(7) Finally, an even more radical suggestion (Annemarie OHLER, personal communication) goes even further in the same line of thought, in suggesting to simply withdraw the author's name from the nominal-complex: *Rana temporaria* 1758 and *Philautus leucorhinus* (1856). This would be greatly justified, because once one knows the date of a nomen it is usually only a question of minutes to find it in an appropriate source, such as the *Zoological Record*. Acceptance of this change would really mean that taxonomists have become aware that easy tracing of a bibliographic reference is much more important than knowing who is the author of a nomen. However, beside the fact that the minds are probably not ready for such a revolutionary change, it would have some drawbacks, in particular of making the bibliographic research slightly longer and probably more hazardous, especially in the (admittedly quite rare) situation of two homonyms being published in the same year by two different authors (or the same author). A way to prepare the minds to this suggestion would be to adopt solution (6), where the change of order between author's name and date would already be an important progress towards the "desanctification" of authors in zoological taxonomy, a process that would do a great service to this discipline.

I provided all these new suggestions in order to elicit some thoughts and comments from colleagues, but for the time-being I am not supporting adoption of any of them (although some have my preference). In this paper, I will keep using the usual way described in (1) above, which in the present case is fully non-ambiguous as the journal where this paper is published uses lower-case letters for nomenclatural author's names and small capitals for authors of references cited in text. Regarding the two possible interpretations of the role and meaning of the comma in this writing, in this paper like in my other works I consider this just as an internal separation between the author's name and the date, remaining internal to the nominal-complex, which therefore does not have to be automatically "closed" by another comma whenever the sentence continues after the nominal-complex.

HEADING OF LOGONOMY

On the occasion of its first publication, any species-series epithet is usually associated with a given generic substantive. DUBOIS (1995: 64) proposed to call this the *primary generic-combination*; it points to the association between a genus substantive and an epithet, irrespective of the latter being of specific or of subspecific rank, and of a subgeneric substantive being or not interpolated between the generic and specific nomina. If subsequently this epithet is transferred to another genus, this provides a *secondary generic-combination*. Article 51.3 of the *Code* states that, in such a case, the name of the original author of the epithet is to be enclosed in parentheses. Recommendation 51.G of the *Code* allows the citation of the first-user's name and date of the new combination, by adding them after the parentheses enclosing the name of the author of the original epithet. Although such a use is rare in zoology (except in some parasitological publications), it is a rule in botany (see GREUTER et al., 1994), and it might become more common in zoology. Some authors (SMITH & SMITH, 1980: 9-10; DUBOIS, 1987a: 9-10) also made suggestions for facultative acknowledgement of the first-user of a new spelling and/or rank in family-series nomina. SMITH & SMITH's (1980) proposal extended to family-series nomina recommendations parallel to those of Recommendation 51.G for species-series nomina: in case a family-series nomen is now used with a spelling different from the original one (change of suffix), the name of its original author (and the date) should be enclosed in parentheses, followed, off the parentheses, by the name of the first-user of the current spelling (and the date of this first use); additional names and dates can even be added in parentheses in case of change of rank or of family-series nomina based on unjustified emendations of generic nomina (for more details, see: SMITH & SMITH, 1980; DUBOIS, 1987a). A similar recommendation may be proposed in the species-series for new onymorphs other than new combination (subspecies upgrading or species downgrading, taxonomic recognition of aggregates of species or subspecies, etc.), or in the genus-series for new rank for subgenus (upgrading) or genus (downgrading). However, Article 51.2 of the *Code* expressly states that the only case in which the author's name and date of a nomen should be enclosed in parentheses is the case of a change of combination for a species-series nomen. For this reason, in all other cases it would seem better to follow

DUBOIS's (1987a) suggestion, according to which the only author's name and date off the parentheses should be those of the original nomen (author in the technical nomenclatural sense of the term), whereas all other names and dates should be placed in parentheses. An additional distinction might be introduced in using *parentheses* only to enclose the names of authors in cases of changed combinations (following Article 51.3 of the *Code*), and in using *square brackets* in all other cases just described. This distinction is followed below in the examples of app. 3. Adoption by zoologists of such proposals would simply be a logical extension and generalization of the current Recommendation 51.G of the *Code*, and might be quite useful for information retrieval.

In case of adoption of these suggestions, in the heading of the logonymy, the same typographical conventions should be applied to the names of first-users mentioned after the nomen as to those of nomenclatural authors (see above).

ORDER OF NOMINA

The first distinction between protonyms, aponyms, chresonyms and anoplonyms should be given by the order of presentation of these nomina in the logonymy. Rather than listing all these nomina together, simply presented chronologically, a hierarchical presentation should be used. Except when preceded by anoplonyms, protonyms should be presented first, in chronological order of their publication. Each protonym should be followed, if relevant, first by its chresonyms in chronological order, then by its aponyms in chronological order of their first use, each aponym being in its turn followed by its chresonyms in chronological order. Anoplonyms, when they exist, should be intercalated between protonyms in the chronological order of their publication.

PROTONYMS

In order to further sort them without difficulty from all other kinds of nomina and nomen uses, protonyms, i.e. the only genuine synonyms in the *Code*'s sense, should always be printed without indentation, and immediately followed, without intercalation of any punctuation mark or other sign, by the name, printed in lower-case letters, of their nomenclatural author and their publication date, then possibly followed by other information (such as publication's page, collection number of onomatophore, geographical information on type-locality, collector, etc.).

Neonyms, which are but particular cases of protonyms, should also appear in a logonymy under the same presentation. However, in order to point to their particular situation, I suggest to add, after the author's name and date, and between brackets, a descriptive mention such as "nomen substitutum for...", "unjustified emendation of...", etc., or, more shortly and precisely, "alloneonym for...", "autoneonym for...", etc.

Any logonymy contains only a single kyronym, but may contain several akryonyms. The latter are also only special protonyms, that were invalidated subsequently to their original publication by use of normal or exceptional rules of the *Code* or by a specific action of ICZN. In a logonymy, an akronym should also be presented as a protonym. In cases of invalidation of a nomen due to normal rules of the *Code* (junior synonyms or homonyms), this should be sufficiently clear from the presentation of the logonymy by chronological order of nomina, but in other, unusual, cases, that involve invalidation of a senior nomen, the latter should be followed by a mention, between brackets, stating at least that it is an akronym, possibly followed by more detailed information, such as: "nomen partially invalidated by ICZN for the purposes of priority but not for those of homonymy or typification".

The suggestion to add some information between brackets after some nomina (neonyms and akryonyms) is merely an extension to new situations of the current Recommendation 51.F of the *Code* (see below).

APONYMS

Each aponym should be presented with a simple indentation from the margin, and identified by the use of a colon between the nomen and the name of the publication's author; furthermore, in the case of publications that allow this distinction, whereas the name of the author of the protonym is to be printed in lower-case letters, the name of the first-user of an aponym should be printed in small capitals, being just the author of a publication, not the nomenclatural author of a nomen.

A special recommendation may be in order here. As defined above, aponyms may differ from their protonym in three respects (or a combination of them): change of spelling, of onymorph or of rank. Whereas the first two cases are self-evident (the change can be seen in the nomen itself), it may not be the case in the third one, at least in the genus-series and in the family-series. In such cases, the reason for considering the new use as a new aponym should be indicated in clear, in full words, between brackets, after the nomen. This suggestion is also an extension to new situations of Recommendation 51.F of the *Code* (see below).

Let us take two examples of this rather rare situation. The first example concerns genus-series nomina. FITZINGER (1843: 31) erected a subgenus *Limnionectes* of the frog genus *Rana* Linnaeus, 1758; DUBOIS (1987a: 57, 60) raised *Limnionectes* to the rank of genus, with five subgenera, including of course a nominotypical one. In a logonymy, these three different paronyms of this nomen should be written as follows:

Limnionectes Fitzinger, 1843: 31 [subgenus of *Rana* Linnaeus, 1758].

Limnionectes [genus]: DUBOIS, 1987a: 57.

Limnionectes [subgenus of *Limnionectes* Fitzinger, 1843]: DUBOIS, 1987a: 60.

Four other similar cases are presented in app. 3 below under examples [7] to [10].

The second example deals with family-series nomina. GOLDFUSS (1820: xi) erected a family *Ranae*. This nomen received a number of different spellings and ranks in the works of subsequent authors (see DUBOIS, 1984a: 41, 1987c: 53). Among them, two spellings were given by different authors for several different ranks each: the spelling *Ranoidea* was used by FITZINGER (1826: 37) for a taxon of family rank and by BOLKAY (1919: 348) for a taxon probably of superfamily rank; the spelling *Ranini* was used by BONAPARTE (1839: [225]) for a taxon of subfamily rank, by BRONN (1849: 684) for a taxon probably of family rank and by DUBOIS (1981: 231) for a taxon of tribe rank. In both these cases, the different ranks given to the same spelling are different aponyms, with different first-users. This information should appear in a paronymy by writing each of these aponyms under a form such as:

Ranoidea [family]: FITZINGER, 1826.

More details are given in app. 3 below under example [5], which gives the complete paronymy where these nomina appear.

CHRESONYMS

Each chresonym (either of a protonym or of an aponym) should be presented with a double indentation from the margin, a hyphen being used instead of a colon before the name of the first publication's author; here also, in the case of publications that allow this distinction, the name of author of the cited publications should be printed in small capitals. Whereas protonyms and aponyms refer to a single bibliographic reference (as there is only one nomenclatural authorship and one first-usership for each nomen), each chresonym may be followed by numerous bibliographic references.

The presentation of orthochresonyms and heterochresonyms should also allow to distinguish them. Orthochresonyms just follow the protonym or aponym which appears in the same holonymy, and therefore need no further identification. On the other hand, any heterochresonym, when appearing in a holonymy, is like a "stranger", as its protonym, and usually also its aponym (but here there are some exceptions) do not occur in this list. It is therefore justified to add between parentheses, after the nomen of the heterochresonym, the term *non*, followed by the protonym from which it was derived (with its nomenclatural author and date). This clearly indicates that the presence of this nomen in the holonymy is due to a misidentification, but that the correct nomenclatural status of this nomen is different. This may be further underlined by grouping all heterochresonyms at the end of the holonymy, and by preceding them by the mention "Other chresonyms" without indentation, as was done by DAVID & VOGEL (1996) or VENCES et al. (1999), or better by the mention "Heterochresonymy".

ANOPLONYMS

An anoplonym may appear in a logonymy, and may even be the nomen starting the list, if it was the first nomen ever given to the taxon. It is important to distinguish such nomina from true protonyms having a status in nomenclature. Recommendation 51.F of the *Code* suggests the addition, after a gymnymon and its "author" (actually its first-user) and date, of the mention *nomen nudum* in parentheses. This suggestion could be expanded to other kinds of anoplonyms. Furthermore, for more clarity, I propose to print such nomina between quotation marks, as I have done in previous works (e.g., DUBOIS, 1981; DUBOIS & OHLER, 1995a-b, 1997b, 1998). Since an anoplonym does not have an author in the sense of the *Code*, its nomen should be separated by a colon from the name of its first-user, which should be printed in small capitals in journals that allow this distinction. On the other hand, as such nomina do not derive from protonyms, they have their own independent status and they should not be indented from the margin.

THE USE OF *NEC* AND *NON*

To continue clarification, I suggest to standardize the use of the terms *nec* (Latin for "and not") and *non* (Latin for "not") in logonymies. These two terms are often used interchangeably in logonymies to indicate that a nomen was used in a sense different from that it had in a previous publication. But this use confounds two different situations. The first one is that of the *creation* of a new homonymous nomen, with its own status in nomenclature, its author and date, and its onomatophoré. The second one is that of the simple *use* of an already existing nomen, but in an improper sense. In this second case, no new nomen is created and the improper nomen has no independent nomenclatural existence. This latter fact has been quite often misunderstood in the past by some taxonomists, who considered the user of such a misidentification as the nomenclatural author of both a "new junior (primary) homonym" of one nomen and a "new junior synonym" of another nomen: if they were true, i.e. if heterochresonyms had a status in nomenclature, we would have to recognize the nomenclatural existence of "hundreds, thousands or even millions" of such nomina (see DUBOIS & OHLER, 1997a: 306-307). In order to stress this difference in logonymies, I suggest to use the term *nec* in the first case and the term *non* in the second case. An example, chosen in the group of Amphibia (YE et al., 1993: 218-220; DUBOIS & OHLER, 1995a: 162-163, 167), will make this point clearer.

BOULENGER (1879) described a brown frog species under the nomen *Rana japonica*, and, three years later (1882), a green frog subspecies under the nomen *Rana esculenta* var. *japonica*. According to the *Code* (Article 57), the latter nomen has an independent status in nomenclature and is a junior hadronym of the former. Application of the proposals made above implies that, in a logonymy, these nomina be written respectively *Rana japonica* Boulenger, 1879 [nec *Rana esculenta* var. *japonica* Boulenger, 1882] and *Rana esculenta* var. *japonica* Boulenger, 1882 [nec *Rana japonica* Boulenger, 1879], as shown in examples [14-20] in app. 3 below.

Several subsequent authors applied the nomen *Rana japonica* Boulenger, 1879 (VOGT, 1924: 339; CHANG & HSÜ, 1932: 151-153), or its derived onymorph *Rana japonica japonica* (LIU & HU, 1961: 177-181), to specimens from Sichuan (China), which were recently stated to represent a distinct species *Rana omeimontis* Ye & Fei in YE et al. (1993: 218-220). Of course, none of the authors who reported *Rana japonica* from Sichuan created a new speciesomen. Mentions of this nomen by these authors should therefore be cited in a logonymy of *Rana omeimontis* as a heterochresonym of the latter, as follows:

Rana omeimontis Ye & Fei in YE et al., 1993: 218-220.

Rana japonica [non *Rana japonica* Boulenger, 1879]: VOGT, 1924: 339; CHANG & HSÜ, 1932: 151-153.

Rana japonica japonica [non *Rana japonica* Boulenger, 1879]: LIU & HU, 1961: 177-181.

This example shows clearly how the two kinds of nomina can be distinguished: in the first case the protonym considered is followed by its author and date, then, in parentheses or between square brackets, by the term *nec* followed by the homonymous nomen with its author and date; in the second case the heterochresonym considered is not followed by any author's name (as it does not have an author in the sense of the *Code*), but is immediately followed, in parentheses or between square brackets, by the term *non* followed by the nomen incorrectly used for the taxon, with its author and date.

THE USE OF PARTIM

The term *partim* (Latin for "in part") is another common term in logonymies. Use of this term may be fully justified in chresonymies, as the sense given to an already existing nomen in a given publication may be heterogeneous, this nomen referring in part to the taxon validly denoted by the nomen, and in part to another taxon or several other taxa. But this use is not justified in genuine synonymies, as, through its onomatophore, a given nomen refers to a single taxomen, even when it was not clearly understood as such by its original author, and irrespective of possible "mistakes" in this respect in the original description. This is clear in the cases of taxomina created with a single onomatophore, such as speciesomina created with a holotype (either by monotypy or by original designation) or genus-series generomina created with a type-species (either by monotypy or by original designation): even if other specimens or taxomina were referred by mistake to the taxon in the original description, the taxomen should only be referred to the synonymy where its onomatophore belongs. The situation may appear more ambiguous in the case of taxomina created with several onomatophores, such as a speciesomen described on the basis of several syntypes belonging in fact to different biological species, or a generomen created with several originally included speciesomen, none of which was designated as type, and considered later to belong in different genus-series taxa. However, in all such cases, clarification of the nomenclatural status of the nomen requires action of taxonomists, through subsequent designation of a lectotype among the syntypes or of a type-species among the syntype-species (see DUBOIS & OHLER, 1997a). As long as this clarification has not been made, the status of the nomen remains unsettled and the nomen cannot properly be referred to a synonymy; but once it has been made the nomen properly belongs to a single synonymy and should not appear in other synonymies *sensu stricto* (although it may appear in other chresonymies). Misunderstanding of this situation is not uncommon even in recent works, as will be shown by an example (DUBOIS, 1987b: 141).

AHL (1925) erected the frog genus *Pararthroleptis* for four speciesomina (including two new ones), none of which was designated as type. These four speciesomina are currently placed in three distinct genera (FROST, 1985; DUELLMAN, 1993): the speciesomina *Pararthroleptis nanus* Ahl, 1925 and *Arthroleptis schoutedeni* de Witte, 1921 (a subjective synonym of *Phrynobatrachus parvulus* Boulenger, 1905 according to SCHMIDT & INGER, 1959: 160-161) are currently placed in the genus *Phrynobatrachus* Günther, 1862; the speciesomen *Pararthroleptis zimmeri* Ahl, 1925 is currently placed in the genus *Arthroleptis* Smith, 1849; and the speciesomen *Arthroleptis lightfooti* Boulenger, 1910 is currently placed

in the genus *Arthroleptella* Hewitt, 1926. Therefore, as understood by its original author, the genus *Pararthroleptis* was clearly heterogeneous, a quite common situation in zoology indeed. Presumably for this reason, GRANDISON (in FROST, 1985: 443) wrote that the genus *Pararthroleptis* Ahl, 1925 was only *in part* to be considered a synonym of *Phrynobatrachus* Günther, 1862. However, as was pointed out by DUBOIS (1981: 253), DECKERT (1938: 166) had designated the speciesomen *Pararthroleptis nanus* as type-species of *Pararthroleptis*, so that this latter generomen is simply a junior subjective synonym of *Phrynobatrachus*, without any restriction carried out by terms like "part", "in part", "pro parte", "ex parte" or "partim".

THE USE OF QUERY

Whenever publishing a logonymy, a taxonomist should make every possible efforts to present complete, unambiguous information about all nomina and nomen uses cited therein. Usually, the person who prepared a logonymy did so after a careful and complete study of the case, and is the best informed about the latter: the problems that he/she will leave unsolved are likely to remain so afterwards. Therefore, preparation of a logonymy should be the occasion of a thorough inquiry about the status of all nomina at stake, including examination of type-specimens and/or designation of lectotypes, description of neotypes, designation of type-species, etc. Despite these efforts, in some cases the status of a nomen may remain unclear, e.g. in the case of type-specimens that are known to be still in existence but are (temporarily) unavailable for study. In such cases, a doubt may remain about the nomenclatural status of some nomina. This doubt should be mentioned in the logonymy. As is done by a number of taxonomists already, the simplest way appears to indicate that the presence of a nomen in a logonymy is doubtful by use of a query, and to add some explanation about the case in full words after the nomen. In order to distinguish it from a query that may have been written within or after a new nomen by its original author (e.g., when describing a new species, to indicate a doubtful generic allocation of the latter), the query pointing to a doubt in the mind of the taxonomist who wrote the logonymy should be placed *before* the cited nomen and *enclosed* between square brackets. The distinction between the two kinds of queries is made clearer below in examples [11] and [16] of app. 3 below.

THE USE OF "EQUALS"

In the botanical code (GREUTER et al., 1994), the symbol "=" ("equals") is used to designate taxonomic synonyms, here called isonyms, but I do not recommend it. As I have pointed elsewhere (DUBOIS, 1997a: 185), this symbol has a precise meaning in mathematics and is not appropriate in biological nomenclature to designate synonymies. It should not be used in this context. Instead, phrases like "*Hyla viridis* Laurenti, 1768 (junior doxonym of *Rana arborea* Linnaeus, 1758)" should be used. Several cases where this is useful are provided in examples [2] and [10] of app. 3 below.

APPENDIX 3

EXAMPLES OF PRESENTATION OF LOGONYMIES

The following examples are meant at illustrating the suggestions for presentation made above, including those concerning unusual situations: use of *nec. non. partim* and queries, nomina of particular categories (anoplonyms, neonyms, akronyms), relative priority of two nomina fixed by first-reviser action, consequences of Articles 11.6, 32.5, 35.4 and 40.2 of the current *Code*, etc. They also provide opportunities for showing, in the heading of each taxonomic account, the use of complete citations of authorship following Recommendation 51.G of the *Code* for species-series nomina or the proposals of DUBOIS (1987a: 9-10) for family-series nomina, completed above for species-series and genus-series nomina. References cited in the examples of logonymies below are not given in the *Literature Cited* section of the present paper (except if they are cited elsewhere in this paper), but should be consulted in the works from where these logonymies were drawn (see below). To shorten these lists, I limited to 3 the number of references given for each chresonym; when more references appeared in the original logonymy, this is indicated by "etc.". The mention "hyponym" or "exoplonym" after a nomen is given only in cases of rejection of the latter through a specific decision of ICZN or through use of some special articles of the *Code*, but not in cases of junior synonyms or homonyms, for which the status of akronym is immediately evident by direct examination of the logonymy. Mention of some other facultative information (such as type-genus or type-species) is made only in a few logonymies below, by way of illustration.

Among recent works in herpetology, the checklists of BAUER (1994) and of DAVID & VOGEL (1996) provide very carefully prepared partial holonymies (complete paronymies with partial chresonymies) for species-series nomina, although only partial paronymies (BAUER, 1994) or no logonymies at all (DAVID & VOGEL, 1996) for taxa above the species-series. These two books can be taken as models to prepare logonymies, except that the presentation should be slightly modified to follow the suggestions above. Examples given below that were drawn from these two books will allow to make clear how these changes in presentation should be made.

Examples of logonymies, presented according to the suggested standards, are given below in the family-series (examples 1-5), the genus-series (example 6-10) and the species-series (examples 11-20) of nomina. In each nominal-series, cases are presented by alphabetical order of kyronyms. All these examples illustrate cases of complete synonymy without apo-chresonymy (examples 11, 14, 16, 20), complete paronymy without chresonymy (examples 1-10, 17-18) and partial holonymy (complete paronymy with partial chresonymy) (examples 12-13, 15, 19). These 20 examples were drawn from the following publications: [1] DUBOIS (1985, unpublished), LESCURE et al. (1986), ANONYMOUS (1987, 1996), NUSSBAUM & WILKINSON (1989); [2] DUBOIS (1982*b*, 1984*a*); [3] DUBOIS (1984*a*, 1987*a*, 1987*d*); [4] DUBOIS (1984*a*); [5] DUBOIS (1984*a*, 1985, 1987*c*, 1992); [6] PARKER (1934), DUBOIS (1987*f*); [7] MELVILLE & CHINA (1968), DUBOIS (1981, 1987*a*), MELVILLE (1985); [8] SAVAGE (1973), DUBOIS & OHLER (1998); [9] DUBOIS (1982*a*, 1987*c*), DUBOIS & OHLER (1998); [10] DUBOIS (1981, 1982*a*, 1987*a*, 1992), EMERSON & BERRIGAN (1993); [11] BOURRET (1942), DUBOIS (1992, 2000*e*), [12] DAVID & VOGEL (1996); [13] DAVID & VOGEL (1996); [14] HEYER (1983); [15] BAUER (1994); [16] BOULENGER (1920*a*), BOURRET (1942), DUBOIS (1992), ZHAO & ADLER (1993); [17] DUBOIS (1995, 1998*b*); [18] AHL (1931), BOURRET (1942), ANONYMOUS (1985, 1999), FROST (1985); [19] POYNTON (1964), POYNTON & BROADLEY (1985*b*); [20] DUBOIS (1992), DUBOIS & OHLER (1995*a*). In all this part, "the *Code*" means the fourth edition of the *Code* (ANONYMOUS, 1999), whose rules have force of law since 1st January 2000.

EXAMPLES IN THE FAMILY-SERIES

1. Family **Caeciliidae** Rafinesque-Schmaltz, 1814 [Gray, 1825] [Bonaparte, 1850]
Caecilia Rafinesque-Schmaltz, 1814: 104 [exoplonym]. – Original amelotonym for *Cecilia* (see DUBOIS, 1985: 70); authorship (but not nomen or spelling) to be conserved following ICZN's Opinion 1830 (ANONYMOUS, 1996).
Ceciliidae: BONAPARTE, 1839: 272.
Cecilia: BONAPARTE, 1852: 480.
Cecilia: DUBOIS, 1984: 114.
Ceciliidae: DUBOIS, 1985: 71.
Caeciliidae Gray, 1825: 217 [nec *Caeciliini* Kolbe, 1880]. – (1) Hadronym of *Cecilia* Rafinesque-Schmaltz, 1814, according to Article 58.1 of the *Code*. (2) Nomen (but not authorship or spelling) to be conserved following ICZN's Opinion 1830 (ANONYMOUS, 1996).
Caecilioides: EICHWALD, 1831: 177.
Caeciliidae: BONAPARTE, 1831: 66.
Cecilia: BONAPARTE, 1839: 124.
Caecilioides [family]: GISTEL, 1848: 102.
Caeciliidae BONAPARTE, 1850. – Spelling to be conserved following ICZN's Opinion 1830 (ANONYMOUS, 1996).
Cecilia: BONAPARTE, 1850.
Ceciliinae: TAYLOR, 1969: 303.
Caeciliidae: SMITH & POLHEMUS, 1984: 108. – Spelling once to be conserved following ICZN's Opinion 1462 (ANONYMOUS, 1987), but later rejected following ICZN's Opinion 1830 (ANONYMOUS, 1996).
Caecilioides: LESCURE et al., 1986: 167.
Caecilioides [superfamily]: LESCURE et al., 1986: 167.
Caecilioides: LESCURE et al., 1986: 168.
Caeciliidae: LESCURE et al., 1986: 168.
Caecilioides: LESCURE & RENOUS, 1988: 20.
Caeciliidae: NUSSBAUM & WILKINSON, 1989: 41.
Caeciliidae: NUSSBAUM & WILKINSON, 1989: 41.
Coecilioides Fitzinger, 1826: 35. – Hadronym of *Cecilia* Rafinesque-Schmaltz, 1814, according to Article 58.1 of the *Code*.
Coecilia: WAGLER, 1828: 736.
Coecilia: BONAPARTE, 1838: 392.
Coeciliidae: HOGG, 1840: 265.
Coeciliidae: GRAY, 1850: 6.
Coecilioides: BRUCH, 1862: 221.
Siphonopina Bonaparte, 1850.
Siphonopidae: DUBOIS, 1984: 113.
Siphonopinae: DUBOIS, 1984: 113.
Siphonopoides: LESCURE et al., 1986: 162.
Siphonopoides: LESCURE et al., 1986: 162.
Siphonopoides: LESCURE et al., 1986: 163.
Siphonopidae: LESCURE et al., 1986: 163.
Siphonopoides: LESCURE et al., 1986: 166.
Siphonopini: LESCURE et al., 1986: 166.
Siphonopiti: LESCURE et al., 1986: 167.
Dermophinae Taylor, 1969: 303.
Dermophiidae: LAURENT, 1984: 199.
Dermophiinae: LAURENT, 1984: 199.
Dermophiini: LESCURE et al., 1986: 166.
Herpelineae Laurent, 1984: 199.
Herpeloides: LESCURE et al., 1986: 163.
Herpeliini: LESCURE et al., 1986: 163.
Herpeli: LESCURE et al., 1986: 164.
Geotrypetidae Lescure, Renous & Gasc, 1986: 145.
Geotrypetoides: LESCURE et al., 1986: 162.
Oscaciliidae Lescure, Renous & Gasc, 1986: 145.
Oscacilioides: LESCURE et al., 1986: 167.
Grandisoniidae Lescure, Renous & Gasc, 1986: 163.
Afrocaeciliini Lescure, Renous & Gasc, 1986: 164.
Indotyphlini Lescure, Renous & Gasc, 1986: 164.
Pseudosiphonopiti Lescure, Renous & Gasc, 1986: 166.
Pseudosiphonopiti: LESCURE et al., 1986: 166.
Brasilotyphlini Lescure, Renous & Gasc, 1986: 166.
Gymnophiliidae Lescure, Renous & Gasc, 1986: 168.

2. Family **Dendrobatidae** [Bonaparte, 1850] Cope, 1865

Phyllobatae Fitzinger, 1843 [hyponym]. – (1) Type-genus: *Phyllobates* Duméril & Bibron, 1841. (2) Juniorization relative to Dendrobatidae Cope, 1865 (1850) requested to ICZN by DUBOIS (1982b); this case having not yet been voted upon (see e.g. DUBOIS, 1987c: 40-43), by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and the nomen Dendrobatidae used for this taxon; however, should ICZN persist in ignoring this case, the nomen Phyllobatidae should be used for the family.

Phyllobatidae: PARKER, 1933.

Phyllobatinae: ARDILA-ROBAYO, 1979.

Eubaphidae Bonaparte, 1850 [exonym]. – (1) Type-genus: *Eubaphus* Bonaparte, 1831 [junior isonym of *Dendrobates* Wagler, 1830]. (2) Date (but neither nomen nor authorship) to be conserved by virtue of Article 40.2 of the *Code*, the replacement proposed by COPE (1865) of this nomen by Dendrobatidae Cope, 1865 (1850) having won general acceptance (see DUBOIS, 1982b).

Eubaphina: BONAPARTE, 1850.

Hylaplesidae Günther, 1858. – Type-genus: *Hylaplesia* Boie in SCHLEGEL, 1827 [autonym for *Hysaplesia* Boie in SCHLEGEL, 1826; senior isonym of *Dendrobates* Wagler, 1830]; DUBOIS, 1982b requested partial invalidation of both nomina *Hysaplesia* and *Hylaplesia* to ICZN; should the latter persist in ignoring this case, the nomen *Hysaplesia* should be used for this genus.

Hylaplesina: GÜNTHER, 1858.

Hylaplesiina: GÜNTHER, 1858.

Hylaplesiidae: COPE, 1875.

Dendrobatidae Cope, 1865. – (1) Type-genus: *Dendrobates* Wagler, 1830 [allonym for *Hylaplesia* Boie in SCHLEGEL, 1827]; see above under Hylaplesiidae. (2) Nomen and authorship (but not date) to be conserved by virtue of Article 40.2 of the *Code*, the replacement proposed by COPE (1865) of Eubaphidae Bonaparte, 1850 by this nomen having won general acceptance (see DUBOIS, 1982b).

Dendrobatinae: GADOW, 1901.

Colostethidae Cope, 1867. – Type-genus: *Colostethus* Cope, 1866.

Calostethina Mivart, 1869. – Type-genus: *Calostethus* Mivart, 1869 [autonym for *Colostethus* Cope, 1866].

Calostethidae: COPE, 1875.

3. Family **Discoglossidae** [Tschudi, 1845] Günther, 1858

Bombinatoria Gray, 1825 [hyponym]. – Juniorization relative to Discoglossidae Günther, 1858 requested to ICZN by DUBOIS (1987d); this case having not yet been voted upon, by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and the nomen Discoglossidae used for this taxon; however, should ICZN persist in ignoring this case, the nomen Bombinatoridae should be used for the family.

Bombinatoroidea: FITZINGER, 1826.

Bombinatoridae: GRAY, 1831.

Bombinatoros: TSCHUDI, 1838.

Bombinatoria: BAYER, 1885.

Bombinatorinae: DUBOIS, 1983.

Bombinatorini: DUBOIS, 1987.

Alytae Fitzinger, 1843 [hyponym]. – Juniorization relative to Discoglossidae Günther, 1858 requested to ICZN by DUBOIS (1987d); this case having not yet been voted upon, by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and the nomen Discoglossidae used for this taxon; however, should ICZN persist in ignoring this case, the nomen Bombinatoridae should be used for the family.

Alytina: BONAPARTE, 1850.

Alytidae: GÜNTHER, 1858.

Alytini: SANCHIZ, 1984.

Alytinae: DUBOIS, 1987.

Bombinatoros Fitzinger, 1843. – Juniorization relative to Discoglossidae Günther, 1858 requested to ICZN by DUBOIS (1987d); this case having not yet been voted upon, by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and the nomen Discoglossidae used for this taxon; however, should ICZN persist in ignoring this case, the nomen Bombinatoridae should be used for the family.

Colodactyli Tschudi, 1845. – Date (but neither nomen nor authorship) to be conserved by virtue of Article 40.2 of the *Code*, the use of the nomen Discoglossidae for this taxon being in “prevailing usage” since the works of COPE (1864, 1865) (see DUBOIS, 1987d).

Colodactylidae: DUBOIS, 1987.

Discoglossidae Günther, 1858. – (1) Nomen and authorship (but not date) to be conserved by virtue of Article 40.2 of the *Code*, the use of this nomen for this taxon being in “prevailing usage” since the works of COPE (1864, 1865) (see DUBOIS, 1987d). (2) Seniorization relative to Bombinatoria Gray, 1825 requested to ICZN by DUBOIS (1987d); this case having not yet been voted upon, by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and this nomen used for this taxon; however, should ICZN persist in ignoring this case, the nomen Bombinatoridae should be used for the family.

Discoglossina: MIVART, 1869.

Discoglossinae: FEJERVÁRY, 1921.

Discoglossoidae: [LAURENT, 1948]; LAURENT in FUHN, 1960.

Discoglossini: SANCHIZ, 1984.

Bombininae FÉJERVÁRY, 1921.

Bombinidae: TATARINOV, 1964.

4. Subfamily **Microhyliinae** [Fitzinger, 1843] Günther, 1858 [Noble, 1931]

Hylaedactyli Fitzinger, 1843 [hyponym]. – Juniorization relative to Gastrophryninae Fitzinger, 1843 fixed by the first-reviser action of PARKER (1934) (see DUBOIS, 1984a: 39).

Hylaedactylidae: BONAPARTE, 1850.

Hylaedactylina: BONAPARTE, 1850.

Gastrophryninae Fitzinger, 1843 [hyponym]. – (1) Seniorization relative to Hylaedactyli Fitzinger, 1843 fixed by the first-reviser action of PARKER (1934) (see DUBOIS, 1984a: 39). (2) Date (but neither nomen nor authorship) to be conserved by virtue of Article 40.2 of the *Code*, the replacement proposed by PARKER (1934) of Gastrophryninae Fitzinger, 1843 by Microhyliinae Noble, 1931 having won general acceptance (see DUBOIS, 1984a: 39).

Gastrophrynidae: METCALF, 1923.

Gastrophryninae: METCALF, 1923.

Microhyliina Günther, 1858 [exonym]. – Authorship (but neither nomen nor date) to be conserved by virtue of Articles 32.5.3.2 and 35.4.1 of the *Code*, the generic nomen *Microhyli* Duméril & Bibron, 1841 being an autonym for *Microhyli* Tschudi, 1838 (see DUBOIS, 1984a: 16).

Microhylidae: GÜNTHER, 1858.

Kalophrynina Mivart, 1869.

Kalophryninae: NOBLE, 1931.

Microhyliinae Noble, 1931. – Nomen (but neither authorship nor date) to be conserved by virtue of (1) of Article 40.2 of the *Code*, the replacement proposed by PARKER (1934) of Gastrophryninae Fitzinger, 1843 by Microhyliinae Noble, 1931 having won general acceptance (see DUBOIS, 1984a: 39); (2) of Articles 32.5.3.2 and 35.4.1 of the *Code*, the generic nomen *Microhyli* Duméril & Bibron, 1841 being an autonym for *Microhyli* Tschudi, 1838 (see DUBOIS, 1984a: 16).

Microhylidae: PARKER, 1934.

Microhyloidea: DUELLMAN, 1975.

Cacopinae Noble, 1931.

Kaloulinae Noble, 1931.

Kaloulidae: PARKER, 1934.

Melanobatrachinae Noble, 1931.

5. Tribe **Ranini** Rafinesque-Schmaltz, 1814 [Goldfuss, 1820] [Bonaparte, 1839] [Dubois, 1981]

Ranaridia Rafinesque-Schmaltz, 1814 [exonym]. – Authorship and date (but not nomen) to be conserved by virtue of Articles 32.5.3.2 and 35.4.1 of the *Code*, the generic nomen *Ranaria* Rafinesque-Schmaltz, 1814 being an autonym for *Rana* Linnaeus, 1758 (see DUBOIS, 1984a: 17, 1985: 65).

Ranarinia: RAFINESQUE, 1815.

Ranae Goldfuss, 1820. – Nomen (but neither authorship nor date) to be conserved by virtue of Articles 32.5.3.2 and 35.4.1 of the *Code*, the generic nomen *Ranaria* Rafinesque-Schmaltz, 1814 being an autonym for *Rana* Linnaeus, 1758 (see DUBOIS, 1984a: 17, 1985: 65).

Ranadae: GRAY, 1825.

Ranina: GRAY, 1825.

Ranoidea [family]: FITZINGER, 1826.

Ranidae: BOIE, 1828.

Ranidi: BONAPARTE, 1837.

Ranini [subfamily]: BONAPARTE, 1839.

Ranini [family]: BRONN, 1849.

Ranoides: BRUCH, 1862.

Ranida: HAECKEL, 1866.

Raninae: BOULENGER, 1888.

Ranoidea [superfamily]: BOLKAY, 1919.

Ranini [tribe]: DUBOIS, 1981.

Ranoidae: DUBOIS, 1992.

Limnodynatae Fitzinger, 1843.

Limnodynini: DUBOIS, 1981.

Amolopinae Yang, 1989.

Amolopsinae: YANG, 1991.

EXAMPLES IN THE GENUS-SERIES

6. Genus *Elachistocleis* Parker, 1927

Engystoma Fitzinger, 1826 [hyponym]. – (1) Type-species by subsequent designation of DUMÉRIL & BIBRON (1841: 740): *Rana ovalis* Schneider, 1799 (see DUBOIS, 1987f). (2) DUBOIS (1987f) requested ICZN to use its Plenary Powers to designate *Rana gibbosa* Linnaeus, 1758 as type-species of this nominal genus; this case having not yet been taken into account by ICZN, by virtue of Article 82.1 of the *Code* the “prevailing usage” is to be maintained and the name *Elachistocleis* used for this taxon; however, should ICZN persist in ignoring this case, the name *Engystoma* should be resurrected for this genus.

Microps Wagler, 1828 (nec Megerle, 1823). – Type-species by monotypy: *Microps unicolor* Wagler, 1828.

Systoma Wagler, 1830. – Alloneonym for *Engystoma* Fitzinger, 1830.

Stenocephalus Tschudi, 1838 [nec Latreille, 1825]. – Type-species by monotypy: *Stenocephalus microps* Tschudi, 1838.

Engistoma Peracca, 1904. – Autoneonym for *Engystoma* Fitzinger, 1830.

Elachistocleis Parker, 1927. – Type-species by original designation: *Rana ovalis* Schneider, 1799.

7. Subgenus *Kassina* Girard, 1853 [Dubois, 1981]

Eremiophilus Fitzinger, 1843 [exonym]. – Nomen partially invalidated by ICZN for the purposes of priority but not for those of homonymy or typification (MELVILLE, 1985).

Hylanibates Duméril, 1853 [genus] [exonym]. – Nomen partially invalidated by ICZN for the purposes of priority but not for those of homonymy or typification (MELVILLE & CHINA, 1968).

Hylanibates [subgenus of *Kassina* Girard, 1853]: DUBOIS, 1981.

Kassina Girard, 1853 [genus].

Kassina [subgenus of *Kassina* Girard, 1853]: DUBOIS, 1981.

Cassina Cope, 1864. – Autoneonym for *Kassina* Girard, 1853.

Cassiniopsis Monard, 1937.

Sennodactylus Hoffman, 1939.

Kassinula Laurent, 1940.

Notokassina Drewes, 1985.

8. Subgenus *Leptobrachium* Tschudi, 1838 [Dubois, 1980]

Leptobrachium Tschudi, 1838: 81 [genus]. – Original meletonym, under Article 32.5.1 of the *Code* (see DUBOIS & ÖHLER, 1998: 21–22).

Septobrachium: TSCHUDI, 1838: 43. – Original ameletonym, under Article 32.5.1 of the *Code*, of *Leptobrachium* Tschudi, 1838 (see DUBOIS & ÖHLER, 1998: 21–22).

Leptobrachium [subgenus of *Leptobrachium* Tschudi, 1838]: DUBOIS, 1980: 475.

“*Leptobatrachium*” [anonym]: SWAN & LEVITON, 1962: 108; MARX, 1976: 57. – Subsequent ameletonym of *Leptobrachium* Tschudi, 1838, therefore nomenclaturally unavailable.

“*Lepidobatrachium*” [anonym]: SAVAGE, 1973: 441. – Subsequent ameletonym of *Leptobrachium* Tschudi, 1838, therefore nomenclaturally unavailable.

9. Genus *Megophrys* Kuhl & Van Hasselt, 1822

Megophrys Kuhl & Van Hasselt, 1822a: 104 [genus]. – Original meletonym, under Article 24.2.4 of the *Code*, being the only of both original spellings used in KÜHL & VAN HASSELT (1822b).

Mogophrys: KÜHL & VAN HASSELT, 1822a: 102. – Original ameletonym, under Article 24.2.4 of the *Code*, of *Megophrys* Kuhl & Van Hasselt, 1822a, the latter being the only of both original spellings used in KÜHL & VAN HASSELT (1822b).

Megophrys [subgenus of *Megophrys* Kuhl & Van Hasselt, 1822a]: DUBOIS, 1980: 471.

Megalophrys Wagler, 1830. – Autoneonym for *Megophrys* Kuhl & Van Hasselt, 1822a.

Ceratophryne Schlegel, 1858.

Megalophrys Palacký, 1898. – Autoneonym for *Megalophrys* Wagler, 1830.

Pelobatrachus Beddard, 1908.

“*Megalophrys*” [anonym]: SHERBORN, 1928. – Subsequent ameletonym of *Megalophrys* Wagler, 1830, therefore nomenclaturally unavailable (see DUBOIS, 1982a: 267).

“*Megaphrys*” [anonym]: SHERBORN, 1928. – Subsequent ameletonym of *Megophrys* Kuhl & Van Hasselt, 1822a, therefore nomenclaturally unavailable (see DUBOIS, 1982a: 267).

10. Genus *Ocoidozyga* Kuhl & Van Hasselt, 1822

Ocoidozyga Kuhl & Van Hasselt, 1822a [genus]. – Type-species by subsequent designation (through *Oxydozyga* Tschudi, 1838) of STEINEGER (1925: 33): *Rana lima* Gravenhorst, 1829.

Ocoidozyga [subgenus of *Ocoidozyga* Kuhl & Van Hasselt, 1822a]: DUBOIS, 1987a.

Ocoidozyga [subgenus of *Rana* Linnaeus, 1758]: EMERSON & BERRIGAN, 1993.

Ooeidozyga Kuhl & Van Hasselt, 1822b. – Autoneonym for *Ocoidozyga* Kuhl & Van Hasselt, 1822a.

Ocoidozyga Gray, 1825. – Autoneonym for *Ocoidozyga* Kuhl & Van Hasselt, 1822a.

Houlema Gray, 1831. – Type-species by monotypy: *Houlema obscura* Gray, 1831 [junior doxisonym of *Rana lima* Gravenhorst, 1829, according to DUBOIS, 1981: 245].

Oxyglossus Tschudi, 1838 [nec *Oxyglossus* Swainson, 1827; nec *Oxyglossus* De Chaudoir, 1843]. – Type-species by monotypy: *Rana lima* Gravenhorst, 1829.

Oxydozyga Tschudi, 1838. – (1) Autoneonym for *Ocoidozyga* Kuhl & Van Hasselt, 1822a. (2) Nomen published as a junior doxisonym but made nomenclaturally available before 1961 (Article 11.6.1 of the *Code*) through its adoption as a kyronym by STEINEGER (1925: 33).

“*Rhomboglossus*” [anonym]: DUMÉRIL & BIBRON, 1841. – Nomen published as a junior doxisonym and never treated as a kyronym before 1961 (Article 11.6 of the *Code*).

Osteosternum Wu, 1929. – Type-species by original designation: *Omeosternum amoyense* Wu, 1929 [junior doxisonym of *Rana lima* Gravenhorst, 1829, according to POPE, 1931: 482].

EXAMPLES IN THE SPECIES-SERIES

11. *Amolops (Amolops) marmoratus* (Blyth, 1855) Dubois, 1992

Polypedates (?) *marmoratus* Blyth, 1855.

Polypedates afghana Günther, 1859.

Ixalus kakhienensis Anderson, 1879.

Rana latopalnata Boulenger, 1882.

Ixalus argus Annandale, 1912.

Rana senchalensis Chanda, 1990.

Amolops nepalicus Yang, 1991.

12. *Cerberus rynchops rynchops* (Schneider, 1799) [Günther, 1864] Smith, 1930 [Loveridge, 1948]

Hydus rynchops Schneider, 1799.

Python rynchops: MERREM, 1820.

Homalopsis rynchops: BOIE, 1827.

Cerberus rynchops: GÜNTHER, 1864.

Cerberus rynchops – BOULENGER, 1890a–b, 1896; etc.

Hurria rynchops: STEINEGER, 1907.

Hurria rynchops – BARBOUR, 1912; SWORDER, 1922.

Cerberus rynchops: SMITH, 1930.

Cerberus rynchops – TWEEDIE, 1983.

Cerberus rynchops rynchops: LOVERIDGE, 1948.

Cerberus rynchops rynchops – HAAS, 1950; GYL, 1970; WELCH, 1988.

Elaps boaeformis Schneider, 1801.

Cerberus boaeformis: DUMÉRIL et al., 1854.

Cerberus boaeformis – BLEEKER, 1857, 1858, 1860.

Homalopsis boaeformis: JAN, 1863.

Homalopsis boaeformis – HAGEN, 1890; LIDTH DE JEUDE, 1890.

Hydus cinereus Shaw, 1802.

Cerberus cinereus: CANTOR, 1839.

Cerberus cinereus – GRAY, 1849.

Hurria schneideriana Daudin, 1803a. – Alloneonym for *Elaps boaeformis* Schneider, 1801.

Coluber schneiderianus: DAUDIN, 1803b.

Coluber cerberus Daudin, 1803b.

Homalopsis cerberus: FITZINGER, 1826.

Cerberus cerberus: CUVIER, 1829.

Homalopsis molorus Boie, 1826.

“*Coluber obtusatus*” [gymnonym]: SCHLEGEL, 1837.

Homalopsis schneiderii Schlegel, 1837. – Alloneonym for *Elaps boaeformis* Schneider, 1801.

Homalopsis schneideri: SCHLEGEL & MÜLLER, 1845.

13. *Chrysopelea pelias* (Linnaeus, 1758) Smith, 1930

Coluber pelias Linnaeus, 1758.

Chrysochlora pelias: ANDERSSON, 1899.

Chrysopelea pelias: SMITH, 1930.

Chrysopelea pelias – BRONGERSMA & WEHLBURG, 1933; HAAS, 1950; MERTENS, 1968; etc.

“*Chrysopelea erythrochloris*” [gymnonym]: BOIE in SCHLEGEL, 1826; BLEEKER, 1860.

"*Chrysopelea erythromelas*" [gymnonym]: REINWARDT in BOIE, 1827.

Dendrophis chrysochlorus Schlegel, 1837.

Chrysopelea chrysichlora: BOULENGER, 1896, 1912; FLOWER, 1896; etc.

Chrysopelea hasseltii Bleeker, 1860.

Chrysopelea ornata var. *hasseltii*: BOETTGER, 1887.

Chrysopelea hasseltii: HAGEN, 1890.

Heterochresonymy:

Leptophis ornatus [non *Coluber ornatus* Shaw, 1802] – CANTOR, 1847.

Chrysopelea ornata [non *Coluber ornatus* Shaw, 1802] – GÜNTHER, 1864; LIDTH DE JEUDÉ, 1890a, 1890b [partim].

14. *Cycloramphus asper* Werner, 1899

Cycloramphus asper Werner, 1899 [nec *Telmatobius asper* Boulenger, 1907].

Telmatobius asper Boulenger, 1907 [nec *Cycloramphus asper* Werner, 1899].

Niedenis spinulifer Ahl, 1924.

Cycloramphus neglectus Lutz, 1928. – Alloneonym for *Telmatobius asper* Boulenger, 1907.

Cycloramphus boulengeri Lutz, 1929. – Alloneonym for *Telmatobius asper* Boulenger, 1907.

15. *Cyrtodactylus marmoratus* Gray, 1831

"*Goniodactylus marmoratus*" [gymnonym]: KUHL in SCHLEGEL, 1826; SCHLEGEL, 1827.

"*Phyllurus marmoratus*" [gymnonym]: BOIE in FITZINGER, 1826.

Cyrtodactylus marmoratus Gray, 1831 [nec *Gymnodactylus marmoratus* Beddome, 1870].

Cyrtodactylus marmoratus – GRAY, 1845; DORIA, 1874; MEYER, 1874; etc.

Gymnodactylus marmoratus: DUMÉNIL & BIBRON, 1836.

Gymnodactylus marmoratus – SCHLEGEL, 1844; RÜPPELL, 1845; DUMÉNIL, 1851; etc.

Gonyodactylus (Gonyodactylus) marmoratus: FITZINGER, 1843.

Gonyodactylus (Cyrtodactylus) marmoratus: WERMUTH, 1965.

Gonyodactylus (Cyrtodactylus) marmoratus – BRYGOO, 1991.

Gonyodactylus marmoratus: KLUGE, 1991.

Gymnodactylus agamensis Bleeker, 1860a.

Gymnodactylus agamensis – BLEEKER, 1860b-d.

Gymnodactylus marmoratus var. *quadrilineatus* Werner, 1896.

Heterochresonymy:

Gymnodactylus fumosus [non *Gymnodactylus fumosus* Müller, 1895] – DE ROOIJ, 1915 [partim];

DAMMERMAN, 1929 [partim]; BRONGERSMA, 1929 [partim]; etc.

16. *Hoplobatrachus rugulosus* (Wiegmann, 1834) Dubois, 1992

[?] *Rana chinensis* Osbeck, 1765.

[?] *Rana picta* Gravenhorst, 1829 [nec *Rana picta* Pallas, 1814].

Rana rugulosa Wiegmann, 1834.

"*Hydrostenior pantherinus*" [gymnonym]: FITZINGER, 1861.

Rana tigrina var. *pantherina* Steindachner, 1867.

Rana burkilli Annandale, 1910.

17. *Hyla intermedia* Boulenger, 1882 [Héron-Royer, 1890]

Hylaria variegata Rafinesque-Schmaltz, 1814 [nec *Rana variegata* Bonnatere, 1789; nec *Hyla variegata* Daudin, 1802].

Hyla variegata: NOLLERT & NOLLERT, 1992.

Hyla arborea var. *intermedia* Boulenger, 1882.

Hyla intermedia: HERON-ROYER, 1890.

"*Hyla maculata*" [gymnonym] [nec *Hyla maculata* Gray, 1830; nec *Hyla maculata* Spencer, 1901]: ASTUDILLO & ARANO, 1995.

"*Hyla italica*" [gymnonym]: BRESSI, 1995.

Hyla italica Nascetti, Lanza, & Bullini, 1995. – Alloneonym for *Hylaria variegata* Rafinesque-Schmaltz, 1814.

18. *Philautus tuberculatus* (Anderson, 1879) Bourret, 1942

Ixalus tuberculatus Anderson, 1879.

Philautus tuberculatus: BOURRET, 1942.

Rhacophorus andersoni Ahl, 1927. – Alloneonym for *Ixalus tuberculatus* Anderson, 1879 [nec *Rhacophorus tuberculatus*

Anderson, 1871]; nomen formerly to be conserved by virtue of Article 59.b of the third edition of the *Code* (ANONYMOUS,

1985), the nomen *Ixalus tuberculatus* Anderson, 1879 having been rejected (by AHL, 1927) before 1961 for being considered

as a junior asthenonym (see INGER in FROST, 1985: 526), but now to be rejected according to Article 59.3 of the current *Code* (ANONYMOUS, 1999), the relevant taxa being no longer considered congeneric and AHL's nomen not having been widely used.

R[hacophorus] (P[hilautus]) andersoni: AHL, 1931.

Philautus andersonii: BOURRET, 1942.

Rhacophorus andersonii: BOURRET, 1942.

Rhacophorus (Philautus) andersoni: BOURRET, 1942.

Philautus andersoni: INGER in FROST, 1985.

19. *Phrynobatrachus natalensis* (Smith, 1849) Günther, 1864

Stenorhynchus natalensis Smith, 1849 [nec *Phrynobatrachus natalensis* Günther, 1862].

Phrynobatrachus natalensis: GÜNTHER, 1864.

Phrynobatrachus natalensis – BOULENGER, 1882, 1902; PETERS, 1882; etc.

Phrynobatrachus natalensis Günther, 1862 [nec *Stenorhynchus natalensis* Smith, 1849].

Phrynobatrachus ranoides Boulenger, 1894.

Arthroleptis moorii Boulenger, 1898.

Phrynobatrachus maculatus FitzSimons, 1932.

Phrynobatrachus duckeri Loveridge, 1953.

20. *Rana (Pelophylax) nigromaculata* Hallowell, 1861 [Dubois, 1992]

"*Rana esculenta* var. *japonica*" [gymnonym]: GÜNTHER, 1859.

"*Rana esculenta* var. *japonica*" [gymnonym]: MAACK, 1859.

Rana marmorata Hallowell, 1861 [nec *Rana esculenta* var. *marmorata* Massalonge, 1854; nec *Rana temporaria* var. *marmorata* Werner, 1897].

Rana nigromaculata Hallowell, 1861 [nec *Rana muta* var. *nigro-maculata* Camerano, 1884; nec *Rana temporaria* var. *nigromaculata* Werner, 1897; nec *Rana arvalis* var. *nigromaculata* Wolterstorff, 1904].

Hoplobatrachus reinhardtii Peters, 1867.

"*Hoplobatrachus davidi*" [gymnonym]: DAVID, 1873.

Rana esculenta var. *japonica* Boulenger, 1882 [nec *Rana japonica* Boulenger, 1879].

"*Rana nigromaculata schybanovi*" [gymnonym]: TERENTJEV, 1923.

Rana nigromaculata mongolia Schmidt, 1925.

Rana nigromaculata schybanovi Terentjev, 1927.

Rana tenggerensis Zhao, Macey & Papenfuss, 1988.

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EDITORIAL COMMITTEE

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ADDITIONAL COMMENTS OF THE EDITORIAL COMMITTEE

[a] Why to cite the *Code* under ANONYMOUS? On page iv of the 1999 edition it is stated that "The author of this *Code* is the International Commission on Zoological Nomenclature" as, indeed, it appears on the title page. [A. M.]

Author's reply. – There are two reasons for not following this suggestion: (1) it is simply a matter of meaning of the term "anonymous"; (2) the *Code* cannot interfere with the editorial rules of journals.

(1) The term "anonymous" is defined by all major dictionaries as "made by a *person* whose name is unknown". Thus for example, in the *Cambridge international dictionary of English* (PROCTER, 1995: 47):

"a-non (...) *n* (...) *abbreviation* for ANONYMOUS (= a writer whose name is not known) (...)

a-non-y-mous (...) *adj* (made or done by someone) with a name which is not known or made public"

Interestingly, the *Code* itself acknowledges this meaning when it defines the terms "anonymous" and "author" in its *Glossary* (p. 100):

"**anonymous**, *a*. (1) Of a work: one that does not state the name(s) of the author(s). (2) Of a name or nomenclatural act: one of which the authorship cannot be determined from the work itself (...). (3) Of an author: one whose identity cannot be determined from the work itself.

(...)

author (*pl. authors*), *n*. The person(s) to whom a work, a scientific name, or a nomenclatural act is attributed (...). For the purposes of the *Code*, if a work is attributed to an editor, or an official (e.g. Secretary), or a body (e.g. a committee or a commission), only that person(s) actually responsible for the work, name, or act, is deemed to be the author (...)."

In order not to consider the *Code* as anonymous, it should not be "attributed to a body" (the Commission), but to the list of persons who composed this body. However, the zoological *Code* does not provide this list, unlike the situation for the codes of botanical nomenclature (GREUTER et al., 1994) or of nomenclature for cultivated plants (TREHANE et al., 1995), which both are attributed to a list of *persons* that can be considered authors.

(2) Each scientific journal has its own editorial rules. Some journals accept to consider committees, commissions, institutes, associations, commercial firms, or various other kinds of organizations, as "authors", and will accept e.g. to include the abbreviations designating these bodies (e.g., ICZN, NATO or WWF) as "authors" in their lists of references at the end of papers. Others refuse this, and will quote all such works as "anonymous", unlike works whose authorship is composed of identified *persons* (see e.g. DUBOIS, 1997). This is the case of *Dumerilia*. The *Code* has no power to oblige any publication to abandon its own editorial rules for quoting this work, all the more that, as shown above, this would be contradictory with the definition of "author" given in the *Code* itself.

[b] "Onymology" and related terms could be formed in a much better way from Greek stems. Their prototype seems to be SMITH & PEREZ-HIGAREDA's (1986) "onymorph" (also used in this paper) proposed as derived from the Greek *onyma*, name (and *morphe*, form), but (1) ονομα is simply a secondary (dialectal) variant form of the much more used (and much preferred) ονομα; (2) compound terms with a derivative of ονομα as first component take the stem ονοματ-, according to the genitive ονοματός, as, by the way, in *onomatophore* (SIMPSON's 1940 term used in this paper). Therefore these terms should be *onomatology* and the like. [A. M.]

Author's reply. – DUBOIS (2000) explained the reasons for his choice of the root *onymos* for this and derived terms: (1) names based on the root *onomatos* would be too long and quite unpalatable, especially for longer terms designating subfields such as *zoonymology*, *botanonymology* or *bacterionymology* (see DUBOIS, 2000); (2) names based on the Latin root *nomen* would be hybrid Latin-Greek terms, which is not desirable (although sometimes unavoidable); (3) the root *onymos* is clearly identifiable by anyone, as it is present in common language terms such as *synonym*, *homonym* or *pseudonym*.

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Table 1. – Suggested terms for the designation of logonymies and of related concepts. Ref.: reference to use of this term: [1] Term recognized in the *Code* (ANONYMOUS, 1999). [2] New term. [3] Term used in the botanical code (GREUTER et al., 1994). [4] Term apparently first used by DUBOIS (1982a). [5] Term proposed by SMITH & SMITH (1973). [6] Term proposed by DUBOIS (1984a). [7] Term proposed by DUBOIS (2000b). [8] Term recognized in the *Code*, but used here in another, precise and technical meaning. [9] Term of traditional use in zoological nomenclature, but not recognized in the current edition of the *Code*. [10] Term proposed by DUBOIS (1995). [11] Term coined by SMITH & SMITH (1993), but used here in another, wider sense. [12] Term not recognized in the current *Code*, but used in some zoological or paleontological works (see e.g. KAESLER, 1997). [13] Term coined by SIMPSON (1940). [14] Term proposed by DUBOIS (2000a). [15] Term proposed by SMITH & PÉREZ-HIGAREDA (1986).

Term	Ref.	Definition
Act	1	<i>Nomenclatural</i> act: any published action instoring a new taxomen or modifying the status of a taxomen (e.g., a subsequent onomatophore designation for a taxomen, or a first-reviser action)
Akronym	2	Invalid hoplonym of a taxon; the invalidation may be <i>permanent</i> (exoplonym) or <i>conditional</i> (hypnonym), <i>total</i> or <i>partial</i>
Alloneonym	2	Neonym not directly derived from a hoplonym through unjustified emendation
Ameletonym	2	Spelling of a nomen used <i>inadvertently</i> by an author, editor or publisher: either <i>original</i> (including any spelling rejected by the first-reviser in case of multiple original spellings) or <i>subsequent</i> incorrect spelling of a nomen (see Articles 32-33 of the <i>Code</i>)
Anoplonym	2	Published but nomenclaturally unavailable nomen according to the <i>Code</i> , being either (1) excluded under Article 1.3, or (2) not conform to the provisions of Articles 10 to 20
Aponym	2	Modified morphonym of a protonym
Aponymy	2	List of aponyms of a protonym
Argionym	2	Eunym currently <i>unused</i> in zoological taxonomy

Term	Ref.	Definition
Asthenonym	2	<i>Secondary homonym</i> in the <i>Code</i> : any of two or more identical (or “deemed to be identical” under Article 58 of the <i>Code</i>) species-series epithets established for different speciesomina and originally combined with different generic substantives but currently combined with the same generic substantive
Author (or nomenclatural author)	1	Person(s) to whom a published work, protonym or nomenclatural act is attributed
Autoneonym	2	Neonym directly derived from a hoplonym through unjustified emendation
Available	1	Available <i>nomen</i> : hoplonym
Basionym	3	Correct spelling of a protonym (term used in botanical nomenclature)
Binomen (pl. binomina)	1	Nomen of a specific taxomen of the species-series
Chresonym	4	Subsequent use of a paronym
Chresonymy	5	List of chresonyms of a nomen
Class-group	6	Denomination given by DUBOIS (1984a) to <i>class-series</i> as used in this paper
Class-series	7	<i>Class-group</i> in DUBOIS (1984a): in the hierarchy of classification, the set of taxa ranked above the family-series, whose names are not fully regulated by the <i>Code</i> ; it includes higher taxa at the ranks of class, order, kingdom, and any additional ranks that may be required
Classification	1	<i>Biological</i> classification: the arrangement of living beings in taxonomic classes (the taxa)
Classomen (pl. classomina)	7	Any taxomen of the class-series (nominal-class, nominal-order, etc.)
Combination	1	Any onymorph implying association between a generic substantive and either a specific (in case of species) or a subspecific (in case of subspecies) epithet, irrespective of the other words in the binomen or trinomen
Conditional	8	Conditional <i>synonymy</i> , <i>homonymy</i> , <i>seniorization</i> or <i>invalidation</i> of a hoplonym, etc.: liable to change as taxonomy changes
Doxisonym	2	<i>Subjective synonym</i> in the zoological <i>Code</i> (<i>taxonomic synonym</i> in the botanical code): any of two or more nomina based on different onomatophores but considered, for subjective (taxonomic) reasons, to denote the same taxon
Epithet	9	Specific or subspecific name being part of a binomen or trinomen
Ergonym	2	Eunym <i>in current use</i> in zoological taxonomy
Eunym	2	Correct spelling, onymorph and rank of a nomen
Exoplonym	2	Permanent akronym

Term	Ref.	Definition
Familiomen (pl. familiomina)	7	Any taxomen of the family-series (nominal-family, nominal-tribe, etc.)
Family-group	1	Denomination given in the <i>Code</i> to family-series as used in this paper
Family-series	7	<i>Family-group</i> in the <i>Code</i> : in the hierarchy of classification, the highest-ranking set of taxa whose names are fully regulated by the <i>Code</i> ; it includes taxa at the ranks of family, subfamily, tribe, superfamily, and any additional ranks that may be required
First-user	2	Person(s) to whom the first publication of an aponym is attributed
Generic-combination	10	Any combination between a generic substantive and an epithet, irrespective of the rank of the latter: it may be either <i>primary</i> (i.e., occurring in the original publication of the epithet) or <i>secondary</i> (i.e., established in a subsequent publication), <i>actual</i> or <i>virtual</i> (see DUBOIS, 1995)
Generomen (pl. generomina)	7	Any taxomen of the genus-series (nominal-genus, nominal-subgenus)
Genus-group	1	Denomination given in the <i>Code</i> to genus-series as used in this paper
Genus-series	7	<i>Genus-group</i> in the <i>Code</i> : in the hierarchy of classification, the set of taxa ranked between the species-series and the family-series; it includes taxa at the ranks of genus and subgenus
Gymnonym	2	<i>Nomen nudum</i> in the <i>Code</i> : a particular case of anoplonym; published but nomenclaturally unavailable nomen according to the <i>Code</i> , for not being conform to the provisions of Articles 12 or 13
Hadromonym	2	Any of two or more nomina established for different taxomina and having either (1) in the family-series, exactly the same stem ("simple homonyms" in the <i>Code</i>), or (2) in the genus-series, exactly the same spelling ("simple homonyms" in the <i>Code</i>), or (3) in the species-series, spellings and onymorphs exactly identical or "deemed to be identical" under Article 58 of the <i>Code</i> , and originally combined with the same generic substantive (<i>primary homonyms</i> in the <i>Code</i>)
Heterochresonym	2	Chresonym incorrectly used to designate a taxon (misidentification)
Heterochresonymy	2	List of heterochresonyms of a nomen
Holonymy	2	List of synonyms of a nomen (protonyms) with their aponyms, chresonyms and, if relevant, anoplonyms
Homonym	1	Any of two or more nomina established for different taxomina and having the same spelling or spellings "deemed to be identical", either permanently (<i>hadromonyms</i>) or conditionally (<i>asthenonyms</i>)
Homonymy	1	The relationship between homonyms
Hoplonym	2	Nomenclaturally available nomen according to the <i>Code</i> , as (1) not being excluded under Article 1.3, and (2) conform to the provisions of Articles 10 to 20
Hypnonym	2	Conditional akronym

Term	Ref.	Definition
Invalid	1	Invalid <i>hoplonym</i> (akronym): hoplonym not to be used to denote a taxon, as (1) being a junior synonym or homonym, or (2) having been invalidated as a result of automatic application of some special rules of the <i>Code</i> (e.g., Articles 40.2 or 59.3), or (3) having been invalidated by ICZN using its Plenary Powers
Isonym	2	<i>Objective synonym</i> in the zoological <i>Code</i> (<i>nomenclatural synonym</i> in the botanical code): any of two or more nomina based on the same onomatophore
Invalidation	2	Process by which a hoplonym is rendered invalid; this invalidation may be <i>permanent</i> or <i>conditional</i> , <i>total</i> or <i>partial</i>
Junior	1	Junior <i>nomen</i> (synonym or homonym); published after the senior one
Juniorization	2	A particular case of <i>invalidation</i> : process by which a senior nomen is withdrawn priority over a junior nomen as a result of either (1) automatic application of some special rules of the <i>Code</i> (e.g., Articles 40.2 or 59.3), or (2) a special action of ICZN using its Plenary Powers; the juniorization may be <i>permanent</i> or <i>conditional</i> , <i>total</i> or <i>partial</i>
Kronym	2	Valid hoplonym of a taxon
Logonymy	2	Any list of nomina and/or nomen uses
Meletonym	2	Spelling of a nomen used <i>intentionally</i> by an author: either correct original spelling (including the spelling adopted by the first-reviser in case of multiple original spellings), or emendation, or mandatory change (see Articles 32-34 of the <i>Code</i>)
Morphonym	11	Any particular spelling, onymorph or rank of a given nomen
Name	1	Non-technical term used in common language with various meanings, including several ones liable to apply in zoological nomenclature: (1) nomen; (2) one of the words of a binomen or of a trinomen; (3) chresonym; (4) name of author or of first-user of a nomen
Name-bearing	1	Name-bearing <i>type</i> : denomination given in the <i>Code</i> to onomatophore as used in this paper
Neonym	2	<i>Nomen novum</i> in the <i>Code</i> , or <i>new replacement nomen</i> , or <i>nomen substitutum</i> : nomen established expressly to replace an already established nomen
Nomen (pl. nomina)	7	Scientific name of a taxomen as defined by the <i>Code</i> (uninomen, binomen or trinomen)
Nomen correctum (pl. nomina correcta)	12	Aponym, whose spelling was modified in order to comply with the regulations of the <i>Code</i> , but not following a change in rank of the taxon denoted by the nomen
Nomen novum (pl. nomina nova)	1	Denomination given in the <i>Code</i> to <i>neonym</i> as used in this paper
Nomen nudum (pl. nomina nuda)	1	Denomination given in the <i>Code</i> to <i>gymnonym</i> as used in this paper

Term	Ref.	Definition
Nomen substitutum (pl. nomina substituta)	9	Neonym
Nomen translatum (pl. nomina translata)	12	Aponym, whose spelling was modified in order to comply with the regulations of the <i>Code</i> , following a change in rank of the taxon denoted by the nomen
Nomen-bearing	2	<i>Nomen-bearing-type</i> : onomatophore
Nomenclatural	1	(1) Of or relating to nomenclature. (2) Nomenclatural <i>act</i> : any published action instoring a new taxomen or modifying the status of a taxomen (e.g., a subsequent onomatophore designation for a taxomen, or a first-reviser action). (3) Nomenclatural <i>author</i> : person(s) to whom a published work, protonym or nomenclatural act is attributed. (4) Nomenclatural <i>synonyms</i> (in botany) (see GREUTER et al., 1994): objective synonyms (in zoology) or isonyms
Nomenclature	8	Biological nomenclature: system of scientific names (nomina) for taxomina and taxa, including information attached to these nomina
Nominal	1	(1) <i>Nominal taxon</i> in the <i>Code</i> : "a concept of a taxon which is denoted by an available name"; onymological tool denominated taxomen in the present paper. (2) <i>Nominal-species</i> , <i>nominal-genus</i> , <i>nominal-family</i> , etc.: taxomen of rank species, genus, family, etc.
Nominal-complex	2	Complex [<i>nomen</i> + <i>author</i> + <i>date</i>], as an indissociable unit providing the major information on the nomen, authorship and date of a taxomen
Nominal-series	7	Set of nomina applying to any of the following sets of taxa: the <i>species-series</i> , the <i>genus-series</i> , the <i>family-series</i> or the <i>class-series</i> as defined in this paper (i.e., the <i>species-group</i> , the <i>genus-group</i> or the <i>family-group</i> as defined in the <i>Code</i> , or the <i>class-group</i> as defined by DUBOIS, 1984a)
Nothonym	2	Incorrect spelling, onymorph or rank of a nomen
Objective	1	Objective <i>synonym</i> in the zoological <i>Code</i> (<i>nomenclatural synonym</i> in the botanical code) or isonym: any of two or more nomina based on the same onomatophore
Onomatophore	13	Objective standard of reference whereby the application of a nomen to a taxon can be determined
Onymological	14	Of or relating to onymology
Onymology	14	The study of concepts and theory of biological nomenclature
Onymorph	15	Any particular association between genus-series substantive(s) and species-series epithet(s)
Original	1	(1) Original <i>publication</i> : work where a protonym or a nomenclatural act was first published. (2) Original <i>spelling</i> , <i>onymorph</i> or <i>rank</i> of a nomen, <i>type-species designation</i> , <i>description</i> , etc.: appearing in the original publication
Orthochresonym	2	Chresonym correctly used to designate a taxon
Orthochresonymy	2	List of orthochresonyms of a nomen

Term	Ref.	Definition
Paronym	2	Protonym or one of its aponyms (or anoplonyms if relevant)
Paronymy	2	List of synonyms of a nomen (protonyms) with their aponyms and, if relevant, anoplonyms
Partial	2	Partial <i>invalidation</i> of a hoplonym: for one or two nomenclatural purposes (among priority, homonymy and typification) only
Permanent	2	Permanent <i>synonymy</i> , <i>homonymy</i> , <i>seniorization</i> or <i>invalidation</i> of a hoplonym, etc.: definitive, not liable to change as taxonomy changes
Priority	1	Precedence of a nomen over another, fixed either by their respective dates of publication or by seniorization of the junior one
Protonym	2	Original morphonym of a hoplonym
Publication	1	(1) Any published work. (2) Issuing of a work conforming to the provisions of Articles 8 and 9 of the <i>Code</i> (technical onymological meaning)
Published	1	(1) Issued for public distribution. (2) Issued conforming to the provisions of Articles 8 and 9 of the <i>Code</i> (technical onymological meaning)
Rank	1	Any particular hierarchical rank either within a nominal-series (e.g., superfamily, family, subfamily, tribe) or in different nominal-series (e.g., class, order, superfamily)
Senior	1	Senior <i>nomen</i> (synonym or homonym): published before the junior one
Seniorization	2	Process by which a junior nomen is afforded priority over a senior nomen, as a result of either (1) automatic application of some special rules of the <i>Code</i> (e.g., Articles 40.2 or 59.3), or (2) a special action of ICZN using its Plenary Powers; the seniorization may be <i>permanent</i> or <i>conditional</i>
Species-group	1	Denomination given in the <i>Code</i> to <i>species-series</i> as used in this paper
Species-series	7	<i>Species-group</i> in the <i>Code</i> : in the hierarchy of classification, the lowest-ranking set of taxa the names of which regulated by the <i>Code</i> ; it includes taxa at the ranks of species and subspecies, as well as aggregates of species or of subspecies
Speciesomen (pl. speciesomina)	7	Any taxomen of the species-series (nominal-species, nominal-subspecies, etc.)
Spelling	1	Any particular association and arrangement of letters that form a nomen
Subjective	1	Subjective <i>synonym</i> in the zoological <i>Code</i> (<i>taxonomic synonym</i> in the botanical code) or doxonym: any of two or more nomina based on different onomatophores but considered, for subjective (taxonomic) reasons, to denote the same taxon
Subsequent	1	(1) Subsequent <i>publication</i> : any publication mentioning a nomen published after the original publication. (2) Subsequent <i>spelling</i> , <i>onymorph</i> or <i>rank</i> of a nomen, <i>type-species designation</i> , <i>description</i> , etc.: appearing in a subsequent publication

Term	Ref.	Definition
Substantive	2	Generic or subgeneric name being part of a binomen or trinomen
Synonym	1	Any of two or more nomina considered, either for <i>objective</i> (isonym) or for <i>subjective</i> (doxisonym) reasons, to denote the same taxon
Synonymization	2	Statement that two or more nomina are synonyms and of the valid one (kyronym) for the taxon they denote
Synonymy	1	(1) List of synonyms of a nomen (protonyms and anoplonyms only). (2) The relationship between synonyms
Taxomen (pl. taxomina)	7	Onymological tool, designated as <i>nominal taxon</i> in the <i>Code</i> ; the permanent association between a nomen (hoplonym) and an onomatophore, allowing objective, non-ambiguous and stable allocation of nomina to taxa; the onomatophore may be actual or potential (e.g., specimens lost or destroyed, but known from their description or illustration); unlike a taxon, a taxomen has no diagnosis, content or taxonomic boundaries
Taxon (pl. taxa)	1	Any taxonomic unit recognized by a zoologist, whether named or not; a taxon is a class having a diagnosis, a content and boundaries; when validly named according to the <i>Code</i> , it is denoted by its kyronym
Taxonomic	1	(1) Of or relating to taxonomy. (2) Taxonomic <i>synonyms</i> (in botany) (see GREUTER et al., 1994); subjective synonyms (in zoology) or doxisonyms
Taxonomy	1	The theory and practice of biological classification
Total	2	Total <i>invalidation</i> of a hoplonym: for all nomenclatural purposes, i.e. for priority, homonymy and typification
Trinomen (pl. trinomina)	1	Nomen of a subspecific taxomen of the species-series
Type-genus	1	Generomen designated as onomatophore of a familiomen or of a classomen
Type-species	1	Speciesomen designated as onomatophore of a generomen
Type-specimen(s)	1	Specimen(s) designated as onomatophore of a speciesomen: holotype, syntypes, lectotype or neotype
Typification	1	Process by which a specimen (or a series of specimens) is fixed as the onomatophore of a speciesomen, or by which a taxomen is fixed as the onomatophore of a taxomen of a higher nominal-series (e.g., a speciesomen as onomatophore of a generomen, or a generomen as onomatophore of a familiomen or of a classomen)
Unavailable	1	Unavailable <i>nomen</i> : anoplonym
Uninomen	2	Nomen of a generomen, of a familiomen or of a classomen
Valid	1	Valid <i>hoplonym</i> (kyronym): hoplonym to be used to denote a taxon, as (1) not being a junior synonym or homonym, (2) not having being invalidated as a result of automatic application of some special rules of the <i>Code</i> (e.g., Articles 40.2 or 59.3), and (3) not having been invalidated by ICZN using its Plenary Powers
Zoonymology	7	The study and theory of zoological nomenclature

Fig. 1. – Categories of nomina regarding availability and validity.

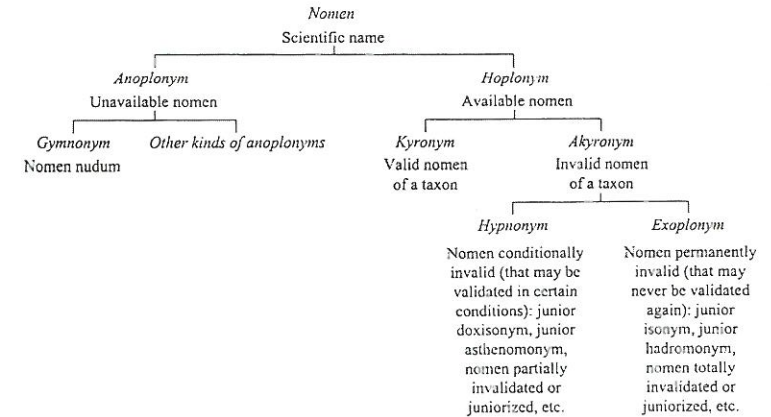


Fig. 2. – Categories of nomina regarding spelling, onymorph and rank.

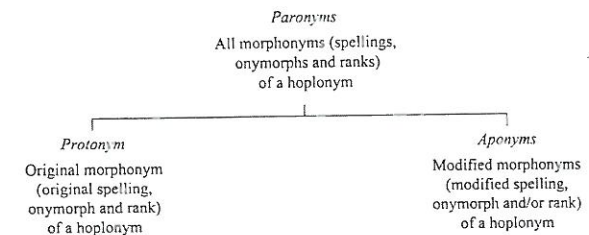


Fig. 3. – Categories of morphonyms regarding intentionality of spelling.

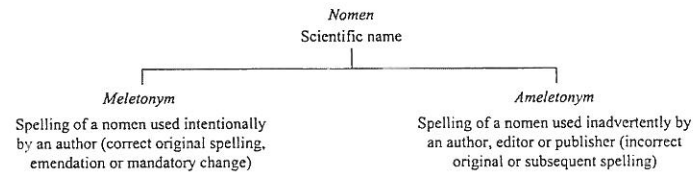


Fig. 4. – Categories of nomina substituta (new replacement nomina).

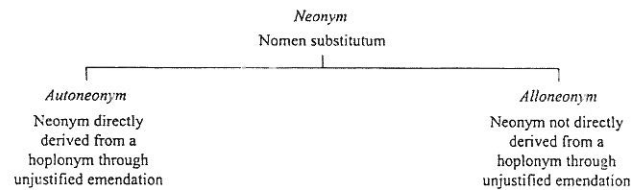


Fig. 5. – Categories of morphonyms regarding correctness and current use.

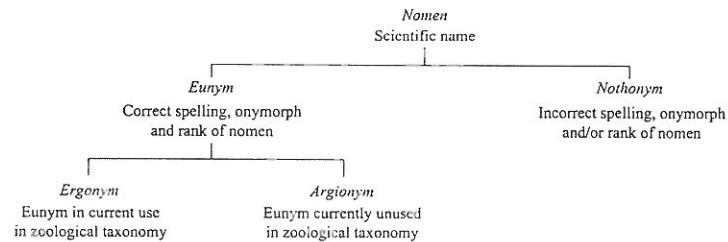


Fig. 6. – Categories of subsequent uses of nomina in chresonymies.

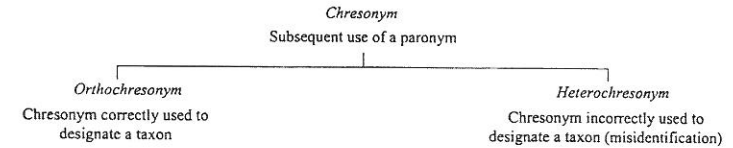


Fig. 7. – Categories of nomina regarding synonymy.

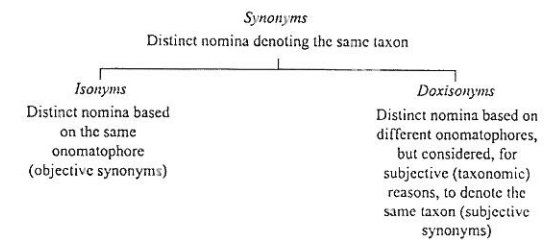


Fig. 8. – Categories of nomina regarding homonymy.

