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GUEST EDITORIAL

International Code of Area Nomenclature

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ABSTRACT

Biogeography needs a standard, coherent nomenclature. Currently, in biogeography, the same name is used for different areas of biological endemism, and one area of endemism is known by more than one name, which leads to conflict and confusion. The name 'Mediterranean', for example, may mean different things to different people – all or part of the sea, or the land in and around it. This results in ambiguity concerning the meaning of names and, more importantly, may lead to conflicts between inferences based on different aspects of a given name. We propose the International Code of Area Nomenclature (ICAN), a naming system that can be used to classify newly coined or existing names based on a standard. When fully implemented, the ICAN will improve communication among biogeographers, systematists, ecologists and conservation biologists.

Keywords

Biogeography, Gondwana, ICAN, Linnaeus, Mediterranean, nomenclature, type-locality.

INTRODUCING A SET OF STANDARDS FOR AREA NAMES IN BIOGEOGRAPHY

One of the most powerful ways to communicate is through an established language based on a series of orthographical and grammatical rules. Taxonomy has such rules in the form of nomenclatures: naming systems that link the name of a taxon (i.e. species, genus, family, etc.) to a specimen or group of specimens, and a diagnosis. Scientists and the public alike are familiar with the scientific names *Escherichia coli* and *Tyrannosaurus rex* as the abbreviations *E. coli* and *T. rex*, respectively, even though few may realise that they are linked to detailed diagnoses, descriptions, and, for *T. rex*, a museum specimen. Taxonomists adhere strictly to a nomenclature in order to communicate or to build classifications. Without such a uniform naming system, it would be impossible to communicate precisely and effectively. *Escherichia coli* is commonly referred to as a 'stomach bug', and *T. rex* as a 'dinosaur'. Neither 'bug' nor 'dinosaur' is a valid scientific term for a discrete taxon. A bug could be an insect, a dinosaur could be a sauropod; however, neither 'insect' nor 'sauropod' refers to *E. coli* or *T. rex*. We use this simple example to introduce our premise: biogeographers should likewise adhere to an area nomenclature to build area classifications.

The first formal attempt to name and classify the biological world was by Carl Linnaeus (1707–1778), who developed a naming system for biological species using a binominal (a two-part name). Nomenclatural rules have been constantly revised during the 250 years since Linnaeus first proposed his classification system and have led to the designation of particular name-bearing type specimens. For a time during the 18th century, one particular organism could be given a series of names, each of which referred to only a certain part of its characteristics, rather than to the whole specimen. Today, the International Code of Zoological Nomenclature (ICZN), the International Code of Botanical Nomenclature, (ICBN) and the International Code of Nomenclature of Prokaryotes set out the rules for naming biological organisms.

Areas of biological endemism have been recognized as the principal units in modern biogeographical analyses (e.g. Harold & Mooi, 1994; Hausdorf, 2002). The need for a nomenclatural code for these areas of endemism has been outlined (Viloria, 2004, 2005), but there has been no previous attempt to establish a nomenclature for all recognized biotic areas that is independent of a particular classification. A group of palaeobiogeographers, the *Friends of Paleobiogeography*, developed a system of area nomenclature that agrees in many aspects with the International Code of Area Nomenclature

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(ICAN), but differs in that it was developed to support a particular classification (i.e. Westermann, 2000; Cecca & Westermann, 2003). The ICAN was drafted in early 2006 by the Systematic and Evolutionary Biogeographical Association (SEBA) to explore the needs of its potential users, namely working biogeographers. SEBA members responded to a questionnaire that addressed specific points, such as recommendations for the naming of and the ordering of ranks. The first ICAN draft was released in early 2007 and the edited draft was ratified by the SEBA Council at the First International Palaeobiogeography Symposium, held in Paris, 7-13 July 2007 (see Appendix).

WHY WE NEED AN ICAN

The first step in a biogeographical analysis is to name unequivocally the area delimited by the distribution range of a taxon. Many, when faced with the complexity of area delimitation, simply use geopolitical boundaries, equal-area grids, geographical coordinates, or the most convenient, best-fitting existing area name. In choosing one of the first three options, no biological area of endemism is defined. Choosing the last option inevitably leads to a re-description of existing area names. Regardless of how areas are chosen, each biogeographical hypothesis will need to name an area: 'Gondwana', 'Kansas' or 'Gobi Desert', for example. The problem lies not in the name of the area, but in its definition and diagnosis. Gondwana is an ancient supercontinent that existed from approximately 250–170 Ma, comprising what we now know as Australia, New Guinea, New Zealand, sub-Saharan Africa, Madagascar, India, Arabia, South America and Antarctica. The name 'Gondwana' has been used for all or just part of the once vast land-mass that began to break up in the mid-Jurassic: the 'Gondwana' of Philippe *et al.* (2003) includes India, whereas the 'Gondwana' of Barker *et al.* (2007) does not. Distribution patterns are corroborated as 'Gondwanan' if they are considered old enough (e.g. Gamble *et al.*, 2008), and rejected as 'Gondwanan' if they are not (Barker *et al.*, 2007).

Time is only one factor leading to inconsistencies of names (see also Westermann, 2000). The absence of a nomenclature presents other pitfalls. The area 'Mediterranean' may refer to 'The Mediterranean Sea (including the Black Sea and the Sea of Azov)' (Zotier *et al.*, 1999: 279); to the 'main islands of the Mediterranean Basin: Mallorca, Corsica, Sardinia, Crete and Lesvos' (Gritti *et al.*, 2006: 145), to 'The Mediterranean region, including North Africa, the western Mediterranean, Balkans–Anatolia, Middle East, Caucasus, the Iranian Plateau, and Central Asia' (Sanmartín, 2003: 1883) or to 'An area extending over 6250 km^2 in the French Mediterranean region' (Lavergne *et al.*, 2005: 799). Thus, 'Mediterranean' means different things to different people. Without a nomenclature, biogeographers are forced to re-diagnose the particular 'Mediterranean' area of each analysis. The ICAN aims to prevent this by ensuring that one name will have only one definition. This means that the Mediterranean is linked to a type-locality and diagnosis or description (see below). Unless the entire Mediterranean is being considered, biogeographers will be obliged to choose a more appropriately named area.

Once a valid name is established, it may be accompanied by the name and date of the author (ICAN *Sec. C Art. 3.1*) as in other nomenclatures. When a new name is proposed for an area, the name should be linked to a type-locality and either a diagnosis or description (ICAN *Sec. C Art. 2.1*). A type-locality consists of the geographical coordinates or geological or geographical features of the designated area. In the diagnosis of the 'Northern Adriatic Sea' (viz. Bombace, 1993), the type-locality may consist of prominent geological and geographical features such as the Foci del Po (delta of the Po River) or the Golfo di Venézia.

Most importantly, the name and type-locality must be linked to a diagnosis (ICAN *Sec.C Art. 2.3*), which may consist of a detailed description of the area including a list of endemic taxa plus climatic factors, a detailed biogeographical map (i.e. a map accompanied by a description), or a series of geographical coordinates, all to be published in a refereed journal. A list of endemic taxa for the Northern Adriatic Sea may include fishes, such as the Adriatic sturgeon, *Acipenser naccarii,* the pipefish *Syngnathus taenionotus,* the gobies *Knipowitschia panizzae* and *Pomatoschistus canestrini,* and the trochid gastropod, *Gibbula albida* (see also Bombace, 1993).

The ICAN is a system for recognizing biogeographical areas, as well as for resolving conflicting or redundant names. An area name may be synonymized with another name or rejected. The Northern Adriatic would be synonymized with the Central Adriatic, for example, if it were concluded that the presumed endemics live in both the Central and Northern Adriatic. Applying ranks to area names communicates area hierarchy. The Northern Adriatic District and Central Adriatic District may each contain their own endemic species. These areas may, in turn, be grouped in, for example, the Adriatic Province. We suggest named ranks in the ICAN; other mechanisms to indicate hierarchy are possible. In practice, ranks may be dropped when discussing unambiguous areas, such as the Pacific Plate (Springer, 1982), but not for areas that need qualification, such as the Mediterranean, as in the above example. Homonymy, the same name used at different ranks, is common in geography. What place is 'New York'? To avoid confusion, a geographical rank may be used as part of the name: New York City versus New York State, for example. The application of ranks in a biogeographical nomenclature is likely to be a focus of vibrant debate.

Revisions to the ICAN undoubtedly will be made periodically, and, accordingly, we have proposed a mechanism for review and acceptance of alterations to the code. Ideally, the ICAN will provide the biogeographer with a language that encourages effective and unambiguous communication. A common language is the key to a unified field of biogeography.

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APPENDIX. INTERNATIONAL CODE OF AREA NOMENCLATURE (PARIS CODE 2007)

Preamble

1. An area of endemism is a geographical unit inferred from the combined distributions of endemic taxa.

2. Biogeography currently has no formal naming system by which to compare areas of endemism.

3. The *International Code of Area Nomenclature* (herein ICAN) provides a universal naming system to standardize area names used in biogeography and other disciplines.

4. A naming system or nomenclature as proposed in this document requires ratification by two-thirds majority of the council members of the *Systematic and Evolutionary Biogeographical Association* (herein SEBA), voting either in-person, online, by letter or by proxy.

Section A: Objectives, intention and exceptions

Article 1: Objectives

1. The objective of ICAN is to provide a universal naming system or nomenclature for areas of endemism used in biogeography and elsewhere.

Article 2: Intention

1. ICAN is to serve as the international standard rules for proposing and using area names.

Article 3: Exceptions

1. ICAN does not govern how names are stored in repositories, whether electronically in databases or in printed publications.

2. ICAN does not endorse any particular method among those in use for validating or classifying areas.

Section B: Maintaining the code

Article 1: ICAN committee

1. The ICAN Committee is responsible for the code and acts as its legislative representative.

2. ICAN is maintained and governed by the ICAN Committee.

3. Future ICAN Committees will be nominated and elected periodically by a two-thirds majority vote of the SEBA Council.

4. 50% of ICAN Committee members will retire every 4 years.

Article 2: Amendments to the code

1. Amendments to the code are made through a two-thirds majority vote by the ICAN Committee either by electronic communication or a vote in person at a SEBA meeting.

2. All amendments of the ICAN will be published in *Biogeografía: Bulletin of the Systematic and Evolutionary Biogeographical Association* (see Article 6.3 of the *Charter of the Systematic and Evolutionary Biogeographical Association*) or another SEBA-specified publication.

3. All amendments will be adopted in the next version of the code as a new article entitled ''Amendment A'', ''Amendment B'' and so on.

Article 3: Language

1. The code will be published in English and made freely available online.

2. The English version of the code, including all amendments, is the official version.

3. All translations of the code are to be treated as interpretations of the code.

Article 4: Notation style

1. The notation style of the code is *Pre. 3* for Preamble 3, *Sec.* 3 for Section 3 and *Art. 2.1* for Article 2 paragraph 1.

Article 5: Citation

1. The online version of the ICAN is to be cited as: Ebach, M.C., J.J. Morrone, L.R. Parenti and Á.L. Viloria. 2007. *International Code of Area Nomenclature*, First Draft. Published by the Systematic and Evolutionary Biogeographical Association, http://www.sebasite.org.

Section C: Nomenclatural rules

Article 1: Areas of endemism and biogeographical ranks

1. Area names may be grouped under more inclusive area names in order to represent a biogeographical taxonomic hierarchy.

2. It is suggested that the smallest unit or rank be a district, followed by province, dominion, region, and realm. When deemed necessary, the prefix sub- may be added to increment the categories (e.g. subdistrict, subprovince, subdominion, subregion, and subrealm).

3. An area needs to have a rank to be named.

Article 2: Typification and availability of area names

1. An available area name has a type-locality and either a published diagnosis or a description in a refereed publication.

2. A type-locality, provided with appropriate geographical coordinates or being easily identifiable by a prominent geological feature, constitutes the name-bearing type to which the name of any area of endemism is permanently linked.

3. A diagnosis or description is a published written text, which may be accompanied by a series of geographical coordinates or a map.

4. A name without a diagnosis or description may not be linked to a type-locality until a diagnosis and/or description is given.

5. Names that are not published with diagnoses and/or descriptions may be linked to an existing published discussion that refers to a previous diagnosis and/or description.

6. Names that are published with a diagnosis and/or descriptions linked to a previous discussion of reference are valid and take priority.

7. A rank can only have one valid name.

8. The principles of homonymy, synonymy and priority apply to the names within any rank that have valid diagnoses, and should be applied with caution and reason. Any disputes must be submitted to the ICAN Committee for resolution.

Article 3: Validity and recommended citation

1. A valid name is accompanied by the name and date of the author (e.g. Neotropical region Sclater, 1858).

2. Where the status of a name is uncertain it is written in quotes.

3. A name that has been synonymised is bracketed.

Article 4: Rejection of names

1. A name cannot be rejected because it is vague or disagreeable.

2. A name can be rejected if it has the same diagnosis, description, geographical coordinate or distribution as an existing name, regardless if the type-locality differs.

3. Rejected names may be considered available.

4. A name proposed after 2007 can be rejected if it is not linked to a type-locality with geographical coordinates or lacks a diagnosis, description or map.

Article 5: Orthography

1. The spelling of an original name is to be retained unless it is proved that it was originally a misspelling.

2. A valid name has the first letter of the first word capitalised including all nouns and adjectives, but not articles and prepositions.

3. There are no restrictions as to the number of words a name may contain.

4. Transliterated names will not be translated into English (e.g. Huang Ho, not Yellow River).

5. The typographical correction of a name does not need to be reported to the ICAN Committee as a Nomenclatural Note.

6. Any dispute over the spelling of a name should be reported to the ICAN Committee. The Committee will vote on the spelling of names in the same manner as they would on a corrected name (Sec. C. Art. 4) and will publish their decision as a Nomenclatural Note.