

On Supraspecific Categories

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Abstract It is briefly discussed here the problem of supraspecific categories. The Author thinks that they are not “products of our mind”, as it is commonly repeated, but that they rather reflect something happened in natural history, which designs, as far as we can presently understand, natural groups, something that unifies relationships or similarities among, say, fishes or among birds, that already exists in nature and that we need only to recognize.

Keywords Supraspecific Categories, Natural Groups, Commonalities or Similarities of Species Belonging to

1. A dogma in Systematic Biology

A dogma among many systematic biologists is that only species exist in nature, and higher *taxa* or supraspecific categories (genera, families, orders, etc.) are artificial superstructures of convenience[1, 2, 3]. On the occasion of a seminar organized by the Roman Association for Entomology (ARDE) in June 2006, for instance, a general assertion was made, with no objections, that while species reflect (at least in the majority of cases) something really existing in nature, all supraspecific categories are little more than “our mind’s products”. Because I question this dogma, I circulated an informal draft of my objections among a few interlocutors, and it raised a stimulating debate. The counterarguments to my proposal largely dismissed my points as terminological questions: while I intended to refer to “contents” (the various orders or families of Insects, Mammals, etc.) those who stated their conventionality and subjectivity rather referred to the “containers” (the *taxa* as they are: genus, family, order, etc.).

It seems now to be clear and self-evident that for instance Butterflies are a natural group (and not a “convention” or “human mind’s product”), while supraspecific categories (i.e. the ‘containers’ and the “ranks” that we recognize to them) are instead conventional. I would nevertheless like to eventually extend this small “provocation” to all students of zoology and entomology. Not for adding something to what famous thinkers and authoritative biologists have already written on this topic, but in order to test my own way of thinking, what, I hope, will happen to be perhaps useful to somebody else. Therefore to explore this complex subject I present here some personal reflections on the topic.

2. What is a Species?

That the species is something really existing and not human mind’s product is a concept which is widely accepted, apparently without any opposition, also because biological species[4] (also in its evolutionary meaning, apart from, of course, all organisms having uniparental reproduction) is normally defined as the whole of those populations which altogether can mix with each other while being, in contrast, reproductively isolated from all others. To be precise, there are even those who make a distinction between real objects (individuals) and conceptual objects (classes) and think that even species would not be real but only conceptual objects; and those[5, 6] who think that species should not be regarded as classes but as individuals. There are also those[7] who consider the genera to be real evolutionary units, to be identified on the basis of the hybridisation criterion. Nevertheless, as it was said before, there exists a general agreement in looking at the species as something really existing in nature. The species is in fact a good compromise between systemization needs and the biological discontinuities which can be found at a microevolutionary level[8]. Not casually, the individuation of species, at least in most recognizable groups, long preceded the beginnings of modern systematics (a recent careful review of the different meanings of the word “species” has been provided by Bernardi & Minelli[9]). Undoubtedly, the great naturalists of the past - Ippocrates or Aristotle, as well as Lucretius or Plinius - were perfectly able to recognize a great number of animals and plants - at least those more showy or the domestic ones or those which had, to humans as well, a certain practical importance - for all of them their own language (Greek or Latin) knew and proposed different names.

The same can be said for every other human culture or community. An example that impressed me was given by Ernst MAYR[10], who began his extraordinary career as biologist and thinker by working as a naturalist on New Guinea birds. As he personally tested, of more than a hundred bird species which occurred in a forest area of this huge island, the natives were able to recognize the most part

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(by confusing only a few between them), and named them with common names that corresponded, with particular and surprising exactness, to the species recognized by modern ornithologists.

3. What are Higher Taxa?

One can thus ask if the same can be said of higher taxa. As a matter of fact both the ancient and the present native populations, devoid in both cases of deep and sophisticated naturalistic knowledge[11], were and are perfectly able to distinguish a fish from a bird, a frog from an insect, a conifer from a broadleaf plant. In other words: of individuating and recognizing those characteristics which, taken together, distinguish a fish from a bird, and so on. To distinguish a fish (even if fishes are probably a polyphyletic group) from a bird does not seem to be an expression of “our mind’s product”, but it seems more to reflect something that unifies relationship or similarity among fishes and among birds and that already exists in nature, that we need only to recognize and that the various species within the fishes or within the birds share a commonality with each other.

With special reference to modern taxonomical systems, which more than previously aim to reflect phylogeny, we all agree that modern systematics must have a phylogenetic basis to reconstruct effective relationships rather than mere similarities (which may well be due to convergence, parallelism, or other reasons); and it seems to me that every time the systematist recognizes or demonstrates evolutionary relationships, he does nothing else than to recognize and name something already and really existing in nature and that historically occurred along the history of life. In other words, he just recognizes, and he pays attention to it in his classifications, an evolutionary history which made a fish to be more similar to another fish than to a bird.

As an example from a group of beetles that I have studied for many years (Coleoptera Cicindelidae), there is not yet a general consensus about what constitutes the genus *Cicindela* Linnaeus, 1758. Most contemporary students (especially all Europeans), following the taxonomy proposed, in the Fifties and Sixties of 20th Century, by the French specialist Emile RIVALIER think it to be obviously divided in over fifty different genera[12, 13, 14, 15, 16, 17], which are more or less species-rich and more or less distinct by morphological, anatomical and ecological characters, and by their geographical ranges. In contrast other specialists[particularly many Americans: 18, 19, 20] prefer to treat some of RIVALIER’s genera merely as subgenera of *Cicindela* (the genus level name they consider to be still valid for almost all world’s Tiger Beetles, even if, rather curiously, it would be almost cosmopolitan in distribution and biogeographically meaningless). Biogeography has its own importance, and I would think that, as a general rule, that a species’ distribution should always have its own clear, and phylogenetically interpretative, homogeneity.

Similar examples can be instanced for every other

systematic group. In entomology many large genera *sensu auctorum* are known, that more recent (and most probably better founded) taxonomical proposals have split into different genera: *Feronia*, *Carabus*, *Pterostichus* and *Bembidion* among the Carabidae, *Aphodius* and *Onthophagus* among coprophagous Scarabeidae, and so on. And even at the family level traditional groups like Curculionidae and Scarabaeidae have been divided in many widely accepted families: Apionidae, Attelabidae, Brentidae and others have been split off the first ones, Geotrupidae, Cetoniidae and others for the second. However, independently from the chosen personal “zoological philosophy”, there is no beginner among the entomologists who is unable to distinguish on first sight a curculionid beetle (s.l.) from a scarab (s.l. *sensu lato*), a buprestid from a cerambycid, a carabid from a chrysomelid beetle. Or, all the more so, a beetle (Coleoptera) from a grasshopper (Orthoptera), a dragonfly (Odonata) from a butterfly or a moth (Lepidoptera), a earwig (Dermaptera) from a wasp (Hymenoptera), and so on. Do these names correspond to mere convenience typological references (“our mind’s products”), or rather do they indicate natural groups that we are able to recognize easily but, just because of that, exist irrespective of our knowledge?

4. Conclusions

Paradoxically, I would better understand those who, by considering as real objects the individuals only, also regard the species as a product of the human mind. Such a distinction (between individuals, “real objects”, and classes, “conceptual objects”), does not seem to me as being logical, and not casually it would lead to such a conclusion. At even higher levels, for instance Classes and Orders, there are even less difficulties in distinguishing a Bird from a Fish, or, among for instance the Mammals, a Cetacean from a Marsupial, an Ungulate from a Carnivore. Well before modern zoology, everybody was perfectly able to recognize, and used for them different names, such animals as the Bear, the Cat, the Wolf, the Otter, and used for them different names: all Carnivores of course, but representatives of very different families, which at a certain point of their evolutionary history have separated from each other, that the zoologist recognizes and names differently.

Since the beginnings of zoological nomenclature, biological analyses have certainly cleared up and better defined certain distinctions. Today, for instance, it is understood that Linnaeus’ “Vermes” were a collection of representatives of very different natural groups that we distinguish from each other and designate with different names. Also the traditional separation of Birds and Reptiles is far from granted. It often happens that in modern systematics organisms are linked together which resemble each other more that they have really common ancestors, and for example the monophyly of Pinnipedia (seals and sea lions) was challenged in the Eighties, most probably with

valid reasons, by somebody.

Future systematics will hopefully clear up all dubious cases, and will make the different groups to be expression of real relationships rather than mere similarities. That zoological research, based on different or even new methods than in the past, can lead to revise old statements and supposed relationships, is an absolutely normal process and does not change much. All things considered, to have a good sight, it has not even much to do with the problem we faced here. We will better understand what happened in the past in Life history on earth. But as a general rule it does not seem that many mistakes have been done in the past, and nobody has mistaken - for doing a classical example - a dolphin for a shark, or either for an ichthyosaurus.

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REFERENCES

- [1] SIMONETTA, A.M.. (1986). *Logic, Taxinomy, Taxa and Reality*. Contributi faunistici ed ecologici, Camerino, n. 2: 1-35.
- [2] AVISE J.C. & JOHNS G.C. (1999). *Proposals for a standardized temporal scheme of biological classification for extant species*. Proc. Natl. Acad. Sci. USA, 96: 7358-7363.
- [3] LAURIN M. (2010). *The subjective nature of Linnaean categories and its impact on evolutionary biology and biodiversity studies*. Contributions to Zoology, 79 (4): 131-146.
- [4] DE QUEIROZ K. (2007). *Species Concepts and Species Delimitation*". Systematic Biol., 56: 879-886.
- [5] GHISELIN M. (1974). *A radical solution to the species problem*. Systematic Zoology, 23: 536-554.
- [6] AX P. (1995). *Multicellular Animals. A new approach to the phylogenetic order in nature. volume I*. Springer-Verlag.
- [7] DUBOIS A. (1988). *Le genre en zoologie: essai de systématique théorique*. Mémoires du Muséum national d'Histoire naturelle, (A) 139: 1-130.
- [8] SBORDONI V. (1993). *Molecular systematics and the multidimensional concept of species*. Bioch. Syst. Ecol. 21 (1): 39-42.
- [9] BERNARDI M. & A. MINELLI, (2011). *Il concetto di specie e la paleontologia: una rassegna introduttiva*. Rend. Online Soc. Geol. It., 13: 2-26.
- [10] MAYR E. (1963). *Animal species and evolution*. The Belknap Press of Harvard University Press (trad. it.: *L'evoluzione delle specie animali*, Einaudi, 1970, 2 voll.).
- [11] BERLIN, B. (1992). *Ethnobiological Classifications. Principles of Categorization of Plants and Animals in Traditional Societies*. Princeton University Press.
- [12] RIVALIER E. (1950). *Démembrement du genre Cicindela Linné (Travail préliminaire limité à la faune paléarctique)*. Revue française d'Entomologie, Parigi (Francia), 17: 217-244.
- [13] RIVALIER E. (1954). *Démembrement du genre Cicindela Linné. II. Faune américaine*. Revue française d'Entomologie, Parigi (Francia), 21: 249-268.
- [14] RIVALIER E. (1957). *Démembrement du genre Cicindela Linné. III. Faune africano-malgache*. Revue française d'Entomologie, Parigi (Francia), 24: 312-342.
- [15] RIVALIER E. (1961). *Démembrement du genre Cicindela L. (suite). IV. Faune indomalaise*. Revue française d'Entomologie, Parigi (Francia), 28: 121-149.
- [16] RIVALIER E. (1963). *Démembrement du genre Cicindela L. (fin). V. Faune australienne (Et liste recapitulative des genres et sous-genres proposés pour la faune mondiale)*. Revue française d'Entomologie, Parigi (Francia), 30: 30-48.
- [17] RIVALIER E. (1971). *Remarques sur la tribu des Cicindelini (Col. Cicindelidae) et sa subdivision en sous-tribus*. Nouvelle revue d'Entomologie, Parigi (Francia), 1: 135-143.
- [18] ERWIN T. (2007). *A Treatise of the Western Hemisphere Caraboidea (Coleoptera). Their classification, distributions, and ways of life. Volume I. Trachypachidae, Carabidae – Nebriiformes 1*. Pensoft, Sofia-Moscow, pp.1-323, plates 1-22.
- [19] ERWIN, T. & PEARSON D.L. (2008). *A Treatise of the Western Hemisphere Caraboidea (Coleoptera). Their classification, distributions, and ways of life. Volume II. Carabidae - Nebriiformes 2, Cicindelitae*. Pensoft, Sofia-Moscow, pp.1-323, plates 1-33.
- [20] Mayr & Bock, 2002 Mayr & Bock, 2002 Pearson D.L., Knisley C. B. & Ch.J. Kozilak (2006). *A Field Guide to the Tiger Beetles of the United States and Canada*. Oxford University Press, 1-227, plates 124.