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THE TYPE METHOD AND THE 'SPECIES'

Historical Introduction

Types are of such fundamental importance in both taxonomy and systematics that one would expect both clear expositions of type theory in the literature and a well-defined code of practice to which most, if not all, zoologists would adhere. The fact that this is not so seems to derive from the history of zoology. Most early zoologists were trained first and foremost as classical scholars, thoroughly familiar with the philosophical concepts of Aristotle and Plato enabling them to interpret the divine order of the Cosmos. The 'universals' of Greek philosophy and the metaphysical notion of a driving force were very readily applied in Zoology. The animal kingdom presents an obvious natural order and in the works of Plato, Aristotle and God's Creation a metaphysical construct of order was equally obvious. A marriage of the two was inevitable.

The type concept of the zoologists of the 18th century is termed 'typology' or 'typological thinking'. The precepts of typology follow from the intellectual background of its proponents. The natural world was clearly divisible into discrete sets of recognisably similar individuals (species - species level taxon). Each taxon in accord with philosophic concepts had a perfect form or essence. To achieve the classical ideal of an ordered world required categorisation, an essential prerequisite of which was to give species names. Not, of course a new idea but hitherto somewhat random. Carl von Linne, the tireless Swedish doctor, presented the 18th century world with just what it wanted - an ordered system of names. 'Linnaeus' and his immediate followers set about naming and ordering. Following their classical mentors they saw each taxon in terms of a perfect form. Those individuals which most closely approached this abstraction were considered typical or type and descriptions of the species were based upon them, or, alternatively an abstract ideal was based on typical forms which were the 'natural' basis of the description. Of course not all members of a taxon accorded with this ideal form, but then the purity of the Greek philosophic ideal was frequently thwarted by reality - the Scholastic "accidents". Any individuals which failed to accord with the perfect form were considered the equivalents of the Scholastic "accidents" and excluded from the description and tacitly from the ideal species.

Given these 'a priori' precepts it followed that early authors felt at liberty or even under an obligation, to replace material in their collection on which they had based descriptions. The reason for such replacements was usually that the types had been damaged in some way but sometimes because more perfect 'types' had become available. This practice was continued in some museums well into the 19th century. Another hangover of early type-concept in todays museums are collections labelled "Type-Collection of X-shire Lepidoptera or Type Collection of Ordovician Brachiopoda".

Not only did the Scholastic perfect forms and related metaphysical ideas relate to species descriptions but such pre-Darwinian theories of evolution as were proposed hinged on a pervasive striving towards perfection. The acceptance of the Darwin-Wallace model of natural selection as a convincing mechanism for evolution threw into doubt not only Biblical Truths but also provided an objectively based counter-argument to such philosphical abstractions. Not much later Karl Marx was to have exactly the same impact on the Hegelian theories of social organisation - an astonishingly similar parallel!

One of the bases for the new explanation of evolution was the demonstrable variation within species. The emphasis on variation in the new evolutionary species concept was of course the antithesis of the 'perfect form' of the classical species concept, but the full realisation of this significance was slow to emerge. Only gradually through the 19th century and early part of the present century was the deeply rooted static concept of species replaced by the modern idea of species as variable, genetically isolated, populations.

Contemporary taxonomists consider that descriptions should take account of the known variation of the species or, in some cases, be based on studies of variation (see Neville-George). This is not always possible, of course; some descriptions are based on only one specimen because only one specimen was available but even here there is tacit acceptance of the potential for variation. In this 'schema' types clearly cannot have representational function; they serve only as name-bearers.

It is essential that names should be unequivocally applied: everyone must call a cat a cat and a kettle a kettle otherwise chaos would result. Unequivocal name application is the essence of modern type-theory. Simpson (1967) has pointed out that in order to achieve this types must be unique and, in view of the confusion caused by historic usages of the term type, as well as by vernacular usages, proposes a new term 'onomatophore' (literally-name-bearer) to replace the term "type". Unfortunately this excellent suggestion has never been widely accepted and we are still left with an amalgam of old and new concepts.

Modern Type Method

Both Mayr and Simpson propose a type-doctrine in which only unique types are allowed and in which the only allowed function of the type is to bear a name. An author conceives a species as a genetically isolated variable unit which is described in terms of its variation. A single specimen from within the limits of variation of the authors species is designated type. The type does not in any way 'represent' the species, neither is it, to employ a 'common' usage 'typical' nor is it the basis of the description. To emphasise this many taxonomists now refer to the 'type of a name' and not the type of a (nominal) species.

The practice of designating a holotype or selecting a lectotype from a series of syntypes is almost universal and is in perfect accord with the 'unique type doctrine'. However many authors still base descriptions on single specimens or small groups of selected specimens when a large hypodigm is available, still use types as standards of reference or representatives, still regard types as amplifying descriptions and some even regard them as 'defining' the species. Even the most rigorous anti-typologists seem to shrink from designating 'atypical' specimens as type. Tacit witness to the lingering survival of 'typology' are the surviving subsidiary types - paratypes, paralectotypes and allotypes.

This synthesis of old and new type-concepts is not only apparent in current taxonomic practice but is, in some measure enshrined in the International Code of Zoological Nomenclature.

Categories of types - simple definitions

Most zoologists accept the definitions of types given in the International Code of Zoological Nomenclature (1961 revised 1964) and the following account is based largely on these definitions. The Code sometimes appears ambiguous or even contradictory. This unfortunate state of affairs arises from the history of type concept. Whereas the Code frequently stresses the need for unique types in accord with modern theory it also recognises the type-series. What is more typological than the phrase defining type-series "The type series of a species consists of all the specimens on which its author bases the species except any that he refers to as variant or doubtfully associates with the nominal species or expressly excludes from it". It might at first sight appear that the authors of the Code are old-fashioned or confused but this is most certainly not the case. The majority of animal species were named and described when 'typological thinking' still held sway and since we choose to use the oldest name given to a species (priority) we are forced back to old types and old type concepts.

Simple definitions of the 'true' type categories

TYPE-SERIES

At the time of writing the original description of a species an author had before him either

1. A series of specimens
2. A single specimen

on which he prepared the species description. These specimens on which the description was based are called the type-series for that species.

HOLOTYPE

If the type-series consisted of one specimen that specimen is called the holotype. If the type-series consisted of several specimens but one of these was referred to in the description as 'the type' or some expression indicates that one specimen of the series is equivalent to the type then that specimen is called holotype. Modern authors designate either the single specimen or one of a series as the holotype.

PARATYPE

After a holotype has been selected from a type-series the remainder of the specimens from the series are called paratypes.

In the Mayr-Simpson 'unique-type' doctrine paratypes are redundant. However many zoologists continue to designate them often for rather obscure reasons.

SYNTYPE

If the author has based his original description of a species on a 'type-series' of more than one specimen and has not designated or indicated a holotype then the series of equivalent specimens is referred to as syntypic and its individual components are called syntypes.

Zoologists are now disallowed from basing a species description on a series of syntypes. However this was a frequent practice of older authors - generated, at least in part by the intellectual acceptance of variation within species. Some syntypic series have, on subsequent examination turned out to be mixtures of two or even three taxa- a potent argument in favour of the unique type doctrine. In the interests of nomenclatural stability lectotypes (see below) should be designated for all species names based on such series. However lectotype designations should not be made individually but only in the course of revisionary work.

LECTOTYPE

It is usual nowadays to employ only the terms holotype and paratypes when describing a species. When a specialist studies a syntypic series for revisionary purposes it is recommended that he selects one of these to serve as the type. This specimen is called a lectotype and on its designation the remainder of the series become paralectotypes. Functionally holotypes and lectotypes are precisely equivalent, the only difference between the two being that the lectotype was chosen from the original authors type-series by a subsequent author or by the original author in a subsequent work.

PARALECTOTYPE

After a lectotype has been chosen the remaining specimens from a syntypic series are called paralectotypes. Paralectotypes are the functional equivalents of paratypes but are 'chosen' (by being remaindered) by a subsequent author from the original authors syntypic series.

NEOTYPE

When all the original type material is believed to be lost or destroyed a neotype may be designated usually from more modern material of the species taken in the type-locality. This category is used only in exceptional cases.

Pseudotypes, typoids and type terms no longer in use

The six 'true' type terms have been discussed above. This number would, however be reduced to three by some authors who would accept only the unique type, i. e. holotype, lectotype and neotype. These authors would view paratypes and paralectotypes as being redundant and would seek the replacement of the syntypic series by the single lectotype.

However the term 'type' has been prefixed in a multiplicity of other ways. Frizzel (1933) lists 233 usages, Fernald (1939) lists 108 but only includes terms applicable to single specimens, and Sadbrosky (1942) gives a further 7 (these compendia apply to botany as well as zoology). The specimens to which these additional terms refer may have special significance or attributes such as, being figured, originating from the type-locality, being of opposite sex to the holotype or whatever but none are types in the modern sense and, in this context are best wholly ignored.

Further reading and references

The present paper has been concerned with the history of type-concept and with giving some simple definitions of type terms. (one of us (R.N.) is in process of preparing a much fuller account of both type-theory and practice). The works listed below are essential reading for those wishing to follow up this short introductory paper.

Anon. 1961 (revised 1964) International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology, London, July 1958. London; International Trust for Zoological Nomenclature (the 'rule book').

Blackwelder, R. E., 1967. Taxonomy. John Wiley and Sons, New York 698pp. (A very sound and unrepentant work on the principles of neotypology).

Fernald, H. T., 1939. On type nomenclature. Ann. Ent. Soc. America 32: 689-702. (A compendium).

Frizzell, D. L., 1933. Terminology of types. American Midl. Nat. 14: 637-638. (A compendium).

Jeffrey, C., 1973. Biological Nomenclature. Systematics Association (Arnold) (An excellent short introduction for both zoologists and botanists).

Mayr, E., 1969. Principles of Systematic Zoology. McGraw Hill. New York (All zoologists should have a copy of this masterly treatise. It includes an annotated transcription of the Code).

Simpson, G. G., 1940. Types in modern taxonomy. American Journal Sci. 238: 413-431.

Simpson, G. G., 1961. Principals of animal taxonomy. Colombia University Press, New York. (A very lucid logical account of modern methodology).

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TYPE-LOCALITIES

I would like to draw attention to the following summary (in English) of a Dutch publication by Mr. L. J. M. Butot (dated 1977). The summary appeared in the duplicated newsletter of the Dutch Malacological Society (no. 181) - it runs as follows:

> 'Nature Conservation and type localities. An attentive nature conservation officer, although not a malocologist,