

Chapter 3

Types of Types

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What is a type?

In zoological nomenclature, a type is a specimen (or a group of specimens) which serves to illustrate the defining characters of a species or genus. The purpose of designating a type is to provide an objective reference which can be used by later scholars to verify the identity of the species being described. As our understanding of the relationships between species evolves, it is not unusual for a given species to be shuffled amongst different genera. The presence of type material allows us to recognise the organism that is being referred to, even if the name is different.

In order to be valid as a type, a the specimen must meet certain guidelines set forth in the International Code for Zoological Nomenclature, a compendium of the rules of nomenclature, laid down by the International Commission for Zoological Nomenclature (ICZN). The rules for designating a type differ, depending on when the description was published. For species described after 1999, a holotype must be explicitly designated for the description to be considered valid.

Not all described species have types attached. The practice of explicitly designating types most likely began with the entomologist Pierre Andre Latreille in the early 1800's⁽¹⁾. Not all early authors designated or preserved type material, often complicating later identification of specimens. When a type was not designated in the original description, it often becomes imperative to designate a type from amongst available material in order to fix the nomenclature and clarify the identity of the species.

The primary purpose of designating a type is to enable scientists in the future to definitely identify a described species. When attempting to describe a new species, rather than depending solely on the published description, it is important to physically examine previously described species to definitively conclude that a specimen we have on hand is in fact new to science. Thus, it is critically important for type species to be placed in a well maintained, universally accessible repository.

The different types of types commonly encountered in taxonomy are briefly discussed below.

Holotype

A single specimen that has been explicitly designated in the original description as the specimen on which the description is based. If a holotype is not explicitly designated, but it is clear that only one specimen was used in describing the species, then that becomes the holotype⁽²⁾. The

holotype is, in many ways, the “gold standard” by which the species can be recognised. When describing a new species, it is important to designate as holotype a specimen that is as complete as possible and clearly illustrates diagnostic characters by which the species may be distinguished. E.g. If a species of prawn is described with features of the left cheliped being used to distinguish it from closely related species, designating a specimen missing that appendage as the holotype defeats the purpose.

A holotype is usually a preserved specimen or fossil, but in rare cases, it may consist of an illustration (like the reunion island parakeet, known only from pictures⁽⁴⁾), a live specimen⁽⁵⁾ or a tissue sample.

Allotype

A specimen of the opposite sex as the holotype, which has been used in the description. Often used to illustrate morphological characters not seen in the holotype⁽²⁾.

Paratype(s)

Specimen(s) other than the holotype on which the description is based and where these specimens have been included in the description as type material⁽²⁾.

Syntypes

When a species description is based on two or more specimens and the author failed to explicitly designate a holotype, all the specimens are considered syntypes. If the description was published prior to 1931, any specimens cited via references in the manuscript are also considered syntypes⁽³⁾. In modern times, syntypes are rarely used in new descriptions.

Lectotype

A specimen selected after the description was published, from a set of syntypes, as the type of a species⁽²⁾.

Paralectotype

When a lectotype is designated, the remaining syntypes are considered paralectotypes⁽²⁾.

Neotype

When a designated type of a species (holotype, syntypes, neotype or lectotype) has been previously designated, but is subsequently lost or damaged beyond recognition, a fresh specimen designated as the type is called a neotype. If paratypes are present, it is desirable to select the neotype from among the paratypes⁽²⁾.

Topotype

A specimen collected at a later date, and not part of the type series, from the same locality as the holotype of the species⁽²⁾. When the type series consists of a small number of specimens, data from topotypes can be used to help diagnose a new species.

Isotype

A specimen collected at the same time, but not from the same place, as the holotype, paratypes or syntypes, but not included in any of these⁽²⁾.

Morphotype

A specimen illustrating a morphological variant of a species⁽²⁾. Nowadays, it is likely a morphotype may be described as a new species. DNA sequences are useful in determining if a morphotype is distinct enough to be described as a new species.

Monotype

When the holotype of a species is the only specimen known to science, it is called a monotype⁽²⁾.

Some technical terms are often used in conjunction with type descriptions, the most common amongst those are given below.

Type locality

The location from where the holotype or lectotype of a species was collected from. Paratypes can be from a different locality to the holotype. E.g. Specimens of a new species are collected from Mumbai, Calicut and Kanyakumari. In the description, the holotype is chosen from amongst the specimens collected in Mumbai, with the rest of the specimens listed as paratypes. The type locality thus is Mumbai, where the holotype was collected.

Type localities in early descriptions were often very vague; e.g. “Madras” or “Indian Ocean”. Nowadays, with the availability of GPS, they are quite precise.

Type series

The group of specimens explicitly (or implicitly) listed as forming the type material used in the description. Additional specimens used for measurements, but not listed as type material are considered non-type or collateral types⁽²⁾.

Name bearing type

A specimen or specimens (holotype, lectotype, neotype, syntypes) which provide an objective standard by which the species can be identified.

Points to keep in mind when describing a new species

- a) A holotype must be explicitly designated, along with a precise collection locality. This specimen must clearly illustrate the key features on the basis of which the taxon is distinguished.
- b) Additional specimens used in the description must be designated as paratypes or non-type
- c) All specimens (or at least the holotype) must be deposited in a museum or recognised educational institute, where they will be properly maintained and made available to other scientists or students for study.
- d) The description must include, in addition to distinguishing characters and measurements, a diagnosis listing similarities to and differences from other closely related species. The repository where the type material is stored must also be listed.

The curious case of *Macrobrachium rosenbergii*

The giant freshwater prawn is a species of great importance to commercial aquaculture worldwide. Wowor and Ng (2007)⁽⁷⁾ caused a stir when they conclusively showed that there were, in fact, two species, not one. What was considered *M. rosenbergii* was composed of two subspecies, *Macrobrachium rosenbergii rosenbergii* described from east of Huxley's line (a biogeographical boundary that separates Asian fauna from Australian), and *M. r. dacqueti* from west of the line. Wowor and Ng proved that the two were in fact distinct, valid species.

This had the potential to cause a lot of confusion because the species that was commercially important and widely aquacultured was in fact *M. dacqueti*, with the true *M. rosenbergii* being found only in Australia, Philippines and Papua New Guinea, with no commercial importance.

In order to prevent unnecessary confusion, Wowor and Ng petitioned the ICZN to set aside the name *M. dacqueti* and retain *M. rosenbergii* for the commercially important species. In 2010, the ICZN ruled that the holotype of *M. rosenbergii* be set aside and the lectotype of *M. dacqueti* be designated a neotype⁽⁶⁾, thus retaining the name *M. rosenbergii* for the commercially important species.

While this made aquaculturists happy, it left the species from east of Huxley's line without a name. Ng and Wowor (2011)⁽⁸⁾ determined that the earliest available name, *Macrobrachium spinipes*, took precedence and assigned it to the species found in Australia, the Philippines and Papua New Guinea.

The above example shows how species can continue to be identified even in the face of changes in taxonomy thanks to the presence of type material.

References

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