Zootaxa 1939: 1–9 (2008)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Studying species definitions for mutual nonexclusiveness

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Abstract

In the absence of a single universally accepted species concept, taxonomists rely on working conventions when defining species. One such convention is based on the intuition that no specimen is in more than one existing species: species are disjoint and their definitions should be mutually exclusive. When two species definitions both describe one and the same specimen, the two definitions are not mutually exclusive and do not conform to this assumption. Uncorrected, such nonexclusive species definitions make taxonomic indistinctness.

Here the author, after exploring the notion of mutual nonexclusiveness, presents simple ways to revise or replace a pair of currently accepted species definitions if they are found to be mutually nonexclusive. The author shows some possible consequences of not doing so in two important areas of biologic research—species diversity studies, and heterospecific hybridization experiments. There is a semiformal discussion of nonexclusiveness in an appendix.

Key words: biological taxonomy, conspecific, heterospecific, hybrid, mutual exclusiveness, mutual nonexclusiveness, species circumscription, species diversity, xenotaxy

Introduction

In the absence of a single universally accepted species concept (Agapow *et al*. 2004), taxonomists often recognize species on the basis of barriers to gene flow under natural conditions, and define each species with a unique combination of characters that signify properties observed in individuals thought to be in that species. Taxonomists rely on working conventions when defining species. One such convention is based on the intuition that no organism is in more than one existing species: species are *disjoint* (Kornet 1993; but see Michener 1963, Jardine & Sibson 1968) and *xenotaxic*, that is, species are

> completely distinct, without any overlapping ... the taxonomic system should be univocal, i.e. any given living being should *unambiguously* be ascribed a single place in the system (Dubois 2005: 406, 372) [author's italics].

The disjoint species conjecture is hardly a species concept and does not touch on the origin of existing species; it merely gives some guidance for the practical work of species definition and specimen identification. It means currently accepted species definitions should be *mutually exclusive*—no two of them should describe one and the same specimen.

Two species definitions do not conform to the disjoint species conjecture when they are mutually *nonexclusive*—when there is at least one specimen they both describe. Without correction, this would make the specimen assignable to both currently recognized species. If there is nonexclusiveness among our currently accepted species definitions, the result is taxonomic indistinctness.

Accepted by A. Dubois: 30 Sept. 2008; published: 21 Nov. 2008