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Letter

Cryptic Species –
Conceptual or
Terminological Chaos?
A Response to Struck
*et al.*Michael Heethoff^{1,*}

In a recent article, Struck *et al.* [1] aimed at finding evolutionary processes hidden in cryptic species. They provided a broad overview on the different usage of the term ‘cryptic species’ and called for a more rigorous definition by comparing phenotypic (morphological) disparity with the degree of genetic differentiation. They conclude ‘if biologists cannot even agree on what to consider different species, then how can we reach consensus on what represents cryptic species?’ I argue that there is only one solution to both of these issues and that cryptic species represent nothing more than an incompatibility of species ‘concepts’ in applied taxonomy. Hence, ‘cryptic species’ can neither be defined nor are they outcomes of an evolutionary process like ‘cryptic speciation’.

Species delimitation has been confused with species conceptualization, leading to

a controversy on what the species category is and how species can be delineated [2]. The evolutionary species concept [3] represents a general primary concept, however, without much value for applied taxonomy. Applied taxonomy mostly refers to the morphological species concept, although there is no clearly defined workflow for species delineation [4]. In this context, Struck *et al.* suggest that ‘morphological variation needs to be explicitly quantified’, and I could not agree more. The biological species concept [5] is often used to confirm or reject morpho-species hypotheses, but is only applicable to sexually reproducing organisms. Using genetic differences for species delineation has also been proposed (e.g., [6]), and has recently been applied to split giraffes into four distinct species despite them interbreeding in captivity [7]. Hence, whether a species is cryptic or not depends on nothing else than the underlying species concept. Struck *et al.* implicitly used the morphological species concept and ‘tested’ it against genetic divergence. Hence, they compared two classes of species concepts (morphological vs. genetical) regarding their compatibility (i.e., supporting the same boundaries of species), and ‘define’ species to be cryptic when they are morphologically similar but genetically distinct (which is here taken as a proxy for ‘reduced gene flow’ and ‘reproductive isolation’ and would thus confirm the biological species hypothesis). This approach prioritizes the ‘evolutionary truth’ of genetic over morphological species concepts – probably a valid approach in many if not most cases. Ten years ago, Bickford and colleagues defined cryptic species as ‘two or more distinct species classified as a single species’ [8], rendering ‘cryptic’ species as nothing more than grouping artifacts. I agree and conclude that cryptic species do not exist as a concept, but that the term ‘cryptic’ is only used to prioritize one species concept over others. Eventually,

it may turn out that cryptic species are not so cryptic at all [9].

Hence, we should not aim at defining what ‘cryptic species’ are, but what species concept we believe to represent evolutionary entities that we can use as fundamental units in biology – even if such a concept may lack clear instructions for applied taxonomy.

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Letter

Cryptic Species –
More Than
Terminological Chaos:
A Reply to Heethoff

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