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## The potential of type species to destabilise the taxonomy of zooxanthellate Scleractinia

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The ongoing demise of zooxanthellate Scleractinia from world-wide environmental deterioration has prompted a very large number of people including aquarists, managers, students, conservationists and scientists to work on reef corals. These people have a right to expect their various endeavors to be based on a nomenclature derived from taxonomic studies rather than human-created rules. Clearly there must be an amalgamation of the two; however a decade-long construction of a website on zooxanthellate Scleractinia has revealed that 15% of all genera, most with a history extending back to the 18<sup>th</sup> century and involving over 100 species, are vulnerable to name changes that are readily avoidable.

Clearly this matter is one for the International Commission on Zoological Nomenclature (ICZN) to consider. Relevant documentation will take time to assemble and be reviewed especially as the central issue, subsequent designation of type species, is not likely to be confined to Scleractinia. This matter was initially raised by Veron (2013) and has since attracted considerable interest. The genus *Favia* is taken as an example; however the issue is not about a particular genus, it is about the potential for widespread name-changes being made based on nothing more than historical error. Such changes do nothing for taxonomy and less for users of taxonomy. Of the many opinions expressed on this matter there is a divide between those who believe that taxonomy and the nomenclature it creates is a self-contained discipline governed by rules absolved from downstream consequences and those who believe taxonomy is a servant of other disciplines and that nomenclatorial changes should reflect that responsibility. Either way it is clearly better to address this matter before adverse changes are made than try to repair outcomes after they have been.

### Destabilising use of type species

Throughout the twentieth century, a central axiom of coral taxonomy was that nomenclatorial changes should only be made if they provide increased certainty. However, of recent years this notion has fallen by the wayside. Some cases are minor, others less so. The value of type species, the species on which genera are based, seems obvious. However in practice, making nomenclatorial changes on issues created by type species are not helpful because these are usually among the earliest described species of a genus and therefore represent a distillation of the sorts of historical artefacts that the ICZN spends so much time and effort rectifying.

A recent case in point is Budd *et al.*'s (2012) replacement of the genus *Favia* Oken, 1815 by the previously unused genus *Dipsastraea* de Blainville, 1830 because the type species, *Madrepora fragum* Esper, 1793 (in Esper, 1797 dated in accordance with Ott, 1975) by the subsequent designation of Verrill (1901), is clearly not a *Favia* as that name is otherwise used. Budd *et al.* were in their rights to make such a change, however there is some history behind this issue. In 1975 the present author raised it with John Wells who kept track of such matters (Wells, 1956). Wells agreed that '*Favia*' *fragum*, which has no surviving holotype and no meaningful description, was more akin to *Dichocoenia* than *Favia* and was not an appropriate selection for the type species of *Favia*. He further commented that TW Vaughan (of Vaughan and Wells 1943) also thought Verrill had made a mistake. Well's advice was to "let sleeping dogs lie" because such problems were widespread in coral taxonomy. In this particular case, all Oken's (1815) genera (including *Favia*, but also *Acropora*, *Galaxea*, *Mussa*, *Mycedium*, *Pectinia* and *Turbinaria*) were initially unavailable (ICZN, 1956) because Oken did not adhere to binomial nomenclature. Even *Acropora*, the best known of all coral genera, was only validated by the ICZN in 1963 and the other genera, except *Turbinaria*, not until 2004. *Turbinaria* still appears to be an unavailable name. The question one may therefore ask is: should an obscure 200-year-old publication, supposedly corrected by a

100-year-old mistake, be of compelling importance when the name *Favia* has now been used unambiguously in thousands of publications? It may further be noted that all designations subsequent to the original description are matters of opinion which may not accord with the views of other taxonomists, or with those of the original author of the genus. Thus, Wells, Vaughan and now Veron (2013) have all expressed opinion counter to Verrill's (1901) selection of *Madrepora fragum* Esper, 1793 for the type species of *Favia*. An alternative would be *Astrea pallida* Dana, 1846, this being one of the oldest and least taxonomically convoluted *Favia*.

Such issues are far more widespread than generally supposed. In total, and irrespective of rules, nineteen genera of extant zooxanthellate Scleractinia (*Astrangia*, *Colpophyllia*, *Coscinaraea*, *Diploria*, *Goniopora*, *Leptoria*, *Leptoseris*, *Meandrina*, *Montastraea*, *Oculina*, *Pavona*, *Podabacia*, *Polyphyllia*, *Porites*, *Seriatopora*, *Solenastrea*, *Stephanocoenia*, *Trachyphyllia* and *Turbinaria*) have uncertain or unrecognisable type species and as it currently stands, the validity of all these names lack certainty for one historical reason or another. For example, the type species of genus *Leptoseris* is *Leptoseris fragilis* Milne Edwards & Haime, 1849 is so little known that it was not re-described in Dinesen's (1980) revision of that genus nor included in Veron (2000). At least *L. fragilis* is almost certainly a *Leptoseris*, but the identity of the type species of other genera is less certain. For example, the type species of *Montastraea* is *Astrea guettardi* de Blainville, 1830 a long-lost Miocene fossil, debatably from France or Italy, that is unidentifiable. In neither of these examples, nor for any of the genera listed above, do issues with type species diminish the usefulness of their respective generic names.

It may be argued that cases for validating type species should be debated individually. However, for most there is little or nothing to debate as the names are clear whilst their type species, subsequently designated or not, are anything but clear. The present author knows of no instance where the identity of a type species has played a clarifying role in the taxonomy of extant zooxanthellate Scleractinia although this may not be so for other corals. Either way, it is suggested that the onus of argument for changing widely used generic names on the basis of regulations should be reversed. Either the change should be of compelling biological importance or else the matter be noted, perhaps a neotype nominated, then by-passed.

### The broader context

There can be no procedural impediment to any taxonomist assigning a species to a genus of choice. However, the basic premise of taxonomy is that it should reflect phylogeny as determined by relevant science. Nomenclature, on the other hand, should remain theory neutral. Beyond that and irrespective of the opinion divide noted above, names are what link taxonomic, phylogenetic, biogeographic, physiological, ecological, palaeontological, environmental and bibliographic data to specified taxonomic units. Should a name be changed, the information that becomes linked to the new name will over time become different from that linked to the old. If there is a biological basis for the name change, so be it. However, names being changed because of nomenclatorial priority, which are found throughout coral taxonomy as in most taxa, seldom if ever add value to our knowledge of the species.

Changes to generic names fall into two categories. The most common category, and one to which there could be no rational objection, is where new or different information creates a need for change. The second, of which Budd et al.'s (2012) treatment of *Favia* is an example, is not based on new information. These authors simply took all currently used species of this genus *en masse* and changed their names. The present writer objects to such changes being made without wide consultation and compelling reason and notes that if such actions were taken with all the nineteen genera noted above, coral taxonomy would be plunged into a state of chaos. There are adequate ICZN provisions to allow past mistakes to be corrected, but none to prevent controversial changes being made without peer consultation.

A policy embraced by the website [www.coralsoftheworld.com](http://www.coralsoftheworld.com) is to maximise taxonomic certainty whilst allowing for changes that stem from new studies and further information. The use of ICZN regulations that are in need of revision, artefacts of nomenclatorial history including spelling, and change resulting from perceptions of Latin grammar as a reason for changing established species or generic names are not supported. We are now in an age of electronic searches that makes taxonomy readily accessible to all users, a goal which should not be needlessly compromised. Results from new studies are certainly supported where molecular, field and morphological information are in accord or where there are other persuasive reasons for doing so. Where there are conflicts, the authors take a conservative approach, maintaining the *status quo* until further studies provide clarification. The authors of this website welcome debate that will inevitably result from these points of view and will change any policy should there be a good reason for doing so.

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