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Letter to the editor regarding "Commercially driven taxonomy: The necessity of knowing species; by Stephen J. Maxwell and Tasmin L. Rymer"

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I read the Maxwell and Rymer article (2016, Festivus 48(1):52-53) with interest and agree with many of the conclusions. However, some important points are omitted. I have been accused of 'taxonomic inflation' myself. When Manuel Tenorio and I wrote our book *Systematic Classification of Recent and Fossil Conoidean Gastropods* (2009, ConchBooks, 269 pp., 11 pls.) we recognized 5 families with 4 subfamilies containing 89 genera of which 27 were newly described from what had widely been considered to be a single genus and family. We used cladistic methods to attempt to clarify clades among these taxa in an as objective way as possible to differentiate and define these genera. Our analysis departed from all other supraspecific classifications in that we did not exclude fossil taxa and that we relied heavily on the morphology of the conoidean radula. The radula among cone shells had been widely ignored or dismissed as taxonomically useless with no attempt to determine homologies among the radular traits. This problem is still common and one only has to examine Kohn's new Western Atlantic book (A. J. Kohn, 2014, *Conus of the Southeastern United States and the Caribbean*, Princeton University Press, 457 pp), which continued using imprecise definitions of radular morphological traits. Our radular traits along with shell traits produced phylogenetic trees similar in many respects to those produced from molecular studies. Some of our critics have accused us of taxonomic inflation. We consider this spurious considering that cone shells had essentially been included in a single family with a single genus. Such a system was and still is widely put forward as a *good enough* explanation for 80 million years of worldwide evolution. It might have been easier to use a single family single genus classification. Unfortunately, such an approach is not scientifically useful. Moreover, the single genus placed into a single family classification contains almost no information, which is the only reason to have a supraspecific classification to begin with. For instance, the old taxonomy of Conidae/*Conus* information content is all concentrated in the family name. A Conidae will have the conical coiling of the shell; the resorption of the inner shell walls; they will be predators that use a specialized radular tooth as a venom delivery apparatus, etc. However, the generic name is meaningless. It can carry only the information already transmitted by the family name. In contrast, the Tucker & Tenorio classification, has a family name (*e.g.*, Conilithidae), a subfamily name (*e.g.*, Conilithinae), and a genus name (*e.g., Jaspidiconus*). In this instance, the family and subfamily names carry the same sort of information that the name Conidae carries. However, these suprageneric names also carry specific information on the radular tooth. Conilthidae and Conilithinae have radular teeth that do not have serrations but their teeth do all have a shaft fold. The genus name, *Jaspidiconus* transmits certain shell and radular morphological traits. All of the *Jaspidiconus* have whorl tops that do not have cords; all have paucispiral protoconchs; none have an anterior

notch; the radular teeth have posterior and anterior folds, all have a basal spur, *etc.* In this classification, the generic names are not meaningless because they transmit systematic information unique to *Jaspidiconus*. We thus did not think that use of all the generic names was a simple example of inflation. We also tried to define each taxon in an objective way; one of Maxwell & Rymer's goals.

Regardless, Maxwell and Rymer (2016) suggested four reasons for what they identified as taxonomic inflation. Assuming that they define taxonomic inflation as an increasing number of taxa at various levels, they miss the most obvious reason for increasing numbers of taxa. That reason is scientific progress often due to new discoveries in new places not just the tendency for commercial interests to play the *name game*. A good example would be the species swarm found in the Cape Verde Islands. When Jerry Walls (1979: *Cone Shells*, TFH Publications, 1011 pp.) wrote his book on cone shells, there were only about eight species of cone shells described between 1843 and 1975 listed by Walls as endemic to the Cape Verde Islands. Since 1975, a further 83 species group taxa (all *Africonus* species) have been described as endemic to the Cape Verde Islands. In part, this number may reflect some inflation but mostly it does not. It is instead due to the exploration of the diverse habitats in the Cape Verde Islands by European collectors. These *Africonus* species do not have long larval dispersive phases, which apparently results in the geographically isolated cone shell species (*see* Monteiro *et al*., 2004, *A Conchological Iconography. The family Conidae. The West African and Mediterranean species of Conus*, ConchBooks, 102 pp., 164 pls.). Another example, no doubt, will be the deep water species just now being pulled from the vicinity of New Caledonia by deep dredging operations. These species largely escape commercial effects because almost all are being collected by museum expeditions and being described by museum professionals.

I do agree that descriptions of new species by shell dealers are likely to prove to be bad ideas. Here there is a strong likelihood of conflict of interest. Not a certainty, but certainly a likelihood. When I complain about these possible conflicts to other collectors, the ghosts of the Sowerbys are often raised as good justification for continuing a bad practice. Be that as it may, the ICZN has nothing to say about the practice and the names are usually technically valid anyway. In fact, the various suggestions about judging the quality of descriptions by the professional level of the describers or having a group of defined journal or defined academics that are allowed to describe new species is foolishness and would not reduce the number of new species being described. Our system of ICZN rules now in use is good and does not get in the way of scientific inquiry.

Finally, I doubt that taxonomic inflation, at least among cone shells, is that bad of a problem. Moreover, can it be objectively defined well enough to show that it is an actual problem? For example Dr. Edward Petuch and his coauthors have described about 175 Holocene species or subspecies of cone shells. Many of the West Atlantic species belong to the genera *Purpuriconus* or *Jaspidiconus*, both of which do not have strong dispersive abilities. Of the *Purpuriconus,* Alan Kohn (2014) considered 12 of Petuch's species to be synonyms of *P. cardinalis*. So on one hand, one author may have inflated the number of *Purpuriconus* whereas another deflated them, *i.e.*, the old lumper versus splitter conundrum. Similar to *Jaspidiconus* (*see* Tucker, 2015, Festivus 47(4):250-254) there is no way to independently decide just how many species of *Purpuriconus*

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or *Jaspidiconus* are valid. We just do not yet know how to distinguish the little red cones (*Purpuriconus*) from each other. We know nothing about how reproductive isolation works in cone shells. It is possible that molecular methods may help but that remains to be seen. However, before molecular methods can be used on a large scale it is necessary to provide names to the samples that are going to be compared. I think my advice to collectors of cone shells is: "Don't worry, be happy" (from the 1988 song by Bobby McFerrin; and that olive shells are even worse).

Figure 1 consists of various specimens from the Purpuriconus cardinalis complex. They are listed as forms but many likely represent full species and Tucker & Tenorio (2013) should be consulted for details. Many other morphs were not included among these but they are in Tucker & Tenorio (2013).

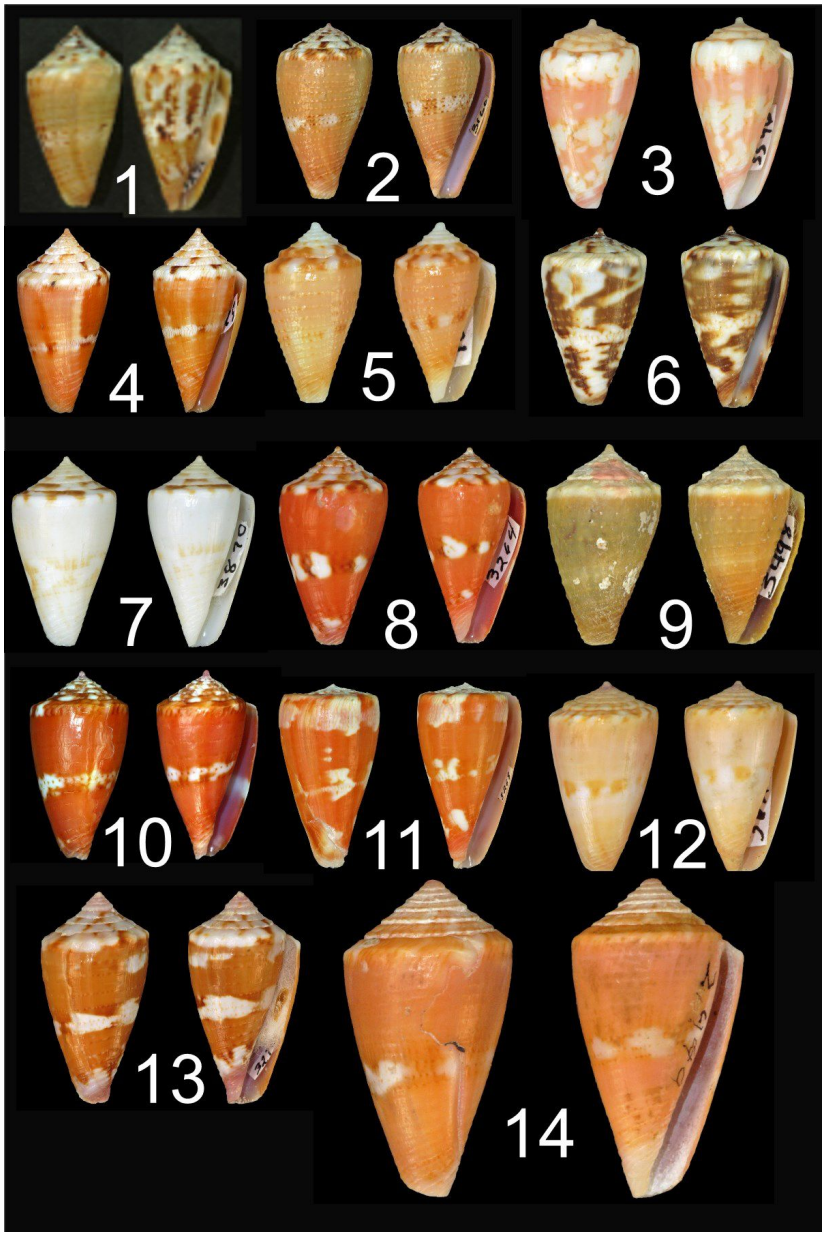

Figure 1.
1. INHS 80076, form *abbotti*, 28.3 mm long, in 2 to 3 m under coral rocks, Winding Bay, Eleuthera, Bahamas. 2. INHS 44792 form *belizeanus*, 24.6 mm long, 3 to 5 m, under rocks, off Southeast Cay, Belize. 3. INHS 44905 form *bessei*, 16.5 mm long, Catasarca Key, Honduras. 4. INHS 79996 *cardinalis* (form *rosalindensis*), 20.2 mm long, in 30 m, Isla de San Andreas, Colombia. 5. INHS 44968 form *donnae*, 13.9 mm long, in 3 to 6 m, Andros Island, Bahamas. 6. INHS 44940 form *explorator*, 17 mm long, in 24 m, north coast of Jamaica. 7. INHS 44939 form *hennequini*, 18.5 mm long, in 2 m, La Vauclin, Martinique. 8. INHS 80074 form *lucaya*, 31.7 mm long, in 1 to 3 m, Abaco Cays, Bahamas. 9. INHS 44883 form *magellanicus*, 16.1 mm long, in 18 m, northwest point, Providenciales, Turks and Caicos Islands. 10. INHS 45017 form *pseudocardinalis*, 21.2 mm long, in 50 to 65 m off Guarapari, Espirito Santo, Brazil. 11. INHS 44817 form *richardbinghami*, 36.1 mm long, in 20 m, off Victory Cays, SW Bahama Bank, Bahamas. 12. INHS 44911 form *sahlbergi*, 17.3 mm long, in 10.7 m, south Cat Cay, Bahamas. 13. INHS 44818 form *sphacelatus*, 31.7 mm long, in 1.5 to 3 m, Abaco Cays, Bahamas. 14. INHS 44755 form *stanfieldi*, 18.9 mm long, off Fort Myers, Florida (from an old collection). Specimen is shown at a greater magnification because it is the only *Purpuriconus* in INHS collections with a Florida locality data. There are sufficient carbonaceous habitats off shore along the Gulf of Mexico that a species of *Purpuriconus* could occur there.