

# Making sense of the mess ... A new and workable sea-snake taxonomy with nomenclature to match!

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## ABSTRACT

The taxonomy of the sea snakes (Hydrophiinae) has been unstable since the Linnaean system of classification started.

Notwithstanding the advent of new molecular methods of analysis and many of the relationships between species being accurately resolved, the taxonomy and nomenclature of the group has remained in heated dispute. In the wake of this, at one extreme has been the erection of new genera and even families to accommodate morphologically divergent forms (Wells 2007).

At the other end of the spectrum has been a mass merging of genera as a result of recently published phylogenies that consistently show a very recent radiation of often morphologically distinct species (e.g. Sanders *et al.* 2008, Ukuwela *et al.* 2012).

Seeking consistency of taxonomy and nomenclature, the majority of herpetologists have in most recent years reclassified the sea snakes along phylogenetic lines. The result is the merging of the majority of genera, most notably a broad group consisting most species into the single genus *Hydrophis* Latreille, 1801.

While agreeing that the taxonomy should reflect the phylogeny, morphological affinities can in the majority of cases still be reflected by the use of subgroups within the newly enlarged genera and employing suitable nomenclature.

I hereby offer a sensible solution for dealing with the problem and in compliance with the Zoological Code (Ride *et al.* 1999).

To that end I propose the recognition of these morphologically divergent groups at subgenus level when the phylogenies allow this.

As a result, I also formally name a new subgenus for a highly divergent lineage within the major sea-snake genus *Hydrophis* Latreille, 1801.

**Keywords:** Taxonomy; nomenclature; sea snakes; *Hydrophis*; new; subgenus; *Crottyhydrophis*; species; *donaldi*.

## INTRODUCTION

The taxonomy of the sea snakes (Hydrophiinae) has been unstable since the Linnaean system of classification started.

Notwithstanding the advent of new molecular methods of analysis and many of the relationships between species being accurately resolved, the taxonomy and nomenclature of the group has remained in heated dispute.

In the wake of this, at one extreme has been the erection of new genera and even families to accommodate morphologically divergent forms (Wells 2007).

At the other end of the spectrum has been a mass merging of genera as a result of recently published phylogenies that consistently show a very recent radiation of often morphologically distinct species (e.g. Sanders *et al.* 2008, Ukuwela *et al.* 2012).

As of 2013, the backlash against division of larger genera has at times become irrational, even when the molecular evidence supports such splits. One small group of so-called herpetologists have even seen fit to step outside the zoological code (Ride *et al.* 1999) and demand a mass-boycott of valid names (Kaiser 2012a, 2012b, Kaiser *et al.* 2013), their claims and ideas being totally discredited by Hoser (2012a).

Seeking consistency of taxonomy and nomenclature, the majority of herpetologists have reclassified the sea snakes in the past decade along phylogenetic lines. The result is the merging the majority of genera, most notably a broad group consisting most species into the single genus *Hydrophis* Latreille, 1801.

Notable exceptions to this trend have been Kharin (2004) and Wells (2007).

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morphological affinities can in the majority of cases still be reflected by the use of subgroups within the newly enlarged genera and employing suitable nomenclature.

I hereby offer a sensible solution for dealing with the problem and in compliance with the Zoological Code (Ride *et al.* 1999). To that end I propose the recognition of these morphologically divergent groups at subgenus level when the phylogenies allow this.

Kharin (2004) and in other papers has actually taken steps in this regard, but his taxonomic actions have been largely ignored by others.

Wells (2007) has published a reclassification based effectively entirely on morphological differences between the living sea snakes and with no apparent regard for the known phylogenies between the given species as confirmed by molecular means.

As a result, I don't agree with the taxonomic and nomenclatural proposals of Wells (2007), a point I stress herein. This is done noting the repeated allegations by a pseudo-taxonomist Mr Wolfgang Wüster, that I have an "uncritical acceptance of the arrangements of Wells" (Wüster 2001, Wüster *et al.* 2001a).

Another problem facing taxonomists dealing with Sea Snakes in particular has been the massive number of generic names proposed for the various species and species groups.

As a result, and when allowing for known phylogeny, there are clearly many groups for which numerous subgeneric names are available.

Cogger *et al.* (1983) list most of the Australian synonyms available for these various groups, while most of the rest are detailed by Uetz (2013).

In terms of the most speciose genus *Hydrophis*, a number of authors have described it as 'a taxonomic parking place for species whose relationships are not yet understood' (Greer, 1997, Lukoschek and Scott Keogh 2006).

However in light of the more recent evidence of Sanders *et al.* (2008), that shows that the entirety of *Hydrophis sensu lato* diverged from the land-dwelling elapid genera of Australia less than 10 million years before present, the case for retaining *Hydrophis* as a single genus is strong.

To do so would maintain taxonomic and nomenclatural consistency across snake groups, noting a general reluctance to create new genera for species groups with less than a 10 million year divergence.

I do note however that there is no "official" time frame given for diagnosing of genera, with more primitive snakes (e.g. Typhlopids) generally having genera defined at considerably older divergence dates (Hoser 2012b).

However there seems to be no well-established criteria for establishing and using subgenera in terms of divergence dates. The only criteria it seems for separating subgenera is that of splitting apart separate but like species and groups from one another, as in species-groups not sufficiently divergent to warrant being placed in separate genera.

On this basis, it makes eminent sense to continue to recognize *Hydrophis sensu lato* as a single genus, while at the same time dividing *Hydrophis* into subgenera when there are obvious species groups (of which there are many).

Within the known *Hydrophis* subgroups, is one recently described and highly divergent lineage that does not have any genus or subgenus name available. This is the species *Hydrophis donaldi* Ukuwela, Sanders and Fry, 2012, shown by their published phylogeny, to be the most divergent species within the expanded genus *Hydrophis sensu lato* (see their fig 3).

This molecular divergence is also corroborated by morphological divergence making it a highly derived taxon and a candidate for placement into a new subgenus.

As a result, I also formally name a new subgenus for this highly divergent lineage in compliance with the Zoological Code (Ride

*et al.* 1999).

There are many important taxonomic papers of note on sea snakes, including the extensive list published by Wells (2007), not republished here.

However some key publications include the following: Boulenger (1996), Burger and Natsuno (1974), Cadle and Gorman (1981), Cadle and Gorman (1981), Cogger (1975, 2000), Cogger *et al.* (1983), Golay (1985), Gopalakrishnakone and Kochva (1990), Greer (1997), Heatwole (1999), Heatwole and Cogger (1994), Hutchinson (1990), Mao *et al.* (1983), McCarthy (1985, 1986), McCosker (1975), McDowell (1969, 1970, 1972, 1974), Minton (1975), Minton and da Costa (1975), Nock (2001), Rasmussen (1994-1997, 2002), Sanders and Lee (2008), Sanders *et al.* (2008), Schwaner *et al.* (1985), Scott Keogh (1998), Scott Keogh *et al.* (1998, 2000, 2005), Shine (1991), Slowinski and Scott Keogh (2000), Slowinski *et al.* (1997), Smith (1926), Smith *et al.* (1977), Ukuwela *et al.* (2012), Voris (1966, 1972, 1977) Voris and Voris (1983) and Wells (2007).

#### **CROTTYHYDROPHIS SUBGEN. NOV.**

**Type species:** *Hydrophis donaldi* Ukuwela, Sanders and Fry, 2012.

**Diagnosis:** The diagnosis for the monotypic subgenus is as for the species.

*Hydrophis donaldi* Ukuwela, Sanders and Fry, 2012 is distinguished from all other *Hydrophis* species except *H. coggeri*, *H. sibauensis* and *H. torquatus diadema* by the following combination of characters: ventrals not divided by a longitudinal furrow, 29-30 costal scale rows around neck, 33-35 costal scales around body, 6-7 maxillary teeth behind fang on each side, 246-288 ventrals (Rasmussen *et al.* 2001, Smith 1926). The new species differs from *H. coggeri* by having 47-56 (versus 30-42) bands on the body and tail, strongly spinous (versus feebly carinate) body scales, 246-288 (versus 280-360) ventrals, relatively larger and rounded (versus smaller, elongate) head, and anterior part of the maxilla not arched upwards and the tip of the fang projecting below the level of the maxillary teeth (see also Fig 1D Ukuwela *et al.* 2012) (versus anterior part of the maxilla arched upwards and tip of fang not projecting below the level of the maxillary teeth) (Cogger 2000). *Hydrophis donaldi* Ukuwela, Sanders and Fry, 2012 differs from *H. sibauensis* by a higher number of scale rows around the neck 29-30 (versus 25-26 in *H. sibauensis*) and strongly spinous (versus feebly carinate) body scales (Rasmussen *et al.* 2001). *Hydrophis donaldi* Ukuwela, Sanders and Fry, 2012 differs from *H. torquatus diadema* by a lower midbody scale count (33-35 versus 35-42 in *H. torquatus diadema*) and strongly spinous (versus feebly carinate) body scales (Smith 1926) (Ukuwela *et al.* 2012).

*Hydrophis donaldi* can be assigned to the genus *Hydrophis* (Smith 1926; McDowell 1972; Cogger 2000) based on the following characters: fewer than 73 scale rows around body, single rostral shield, nasals not separated from internasals, more than four supralabials, ventrals small and not broader anteriorly than posteriorly, mental shield broader than long, shorter head without a bill like snout, shorter gape, ventrals entire, no spines on head shields, preocular scales present, maxillary bone not extending forward beyond the palatine, fang followed by a diastema (see also Fig 1D Ukuwela *et al.* 2012), ventrals distinct throughout the body and not enlarged compared to the dorsal scale rows, ventral scales not broader than twice the adjacent body scales and more than 24 scales around the thickest part of the body (Ukuwela *et al.* 2012).

**Distribution:** Currently only known from the Weipa area, on the Gulf of Carpentaria, Queensland, Australia. The only specimens known, consisting of the type series were collected from shallow (less than 10 m deep) estuarine habitats (with shale, mud and sea-grass on the bottom) at the mouths of the Mission River and Hey Creek where they connect to Albatross Bay in Weipa, Queensland (Ukuwela *et al.* 2012).

**Etymology:** Named in honour of a former pet dog of myself, named Crotty as an abbreviation of the full name "Crotalus" being named after a well-known Pitviper genus from North America. The loyal dog successfully guarded the facility of the author for nearly 13 years allowing myself to continue to undertake taxonomic research and publications.

**Content:** Monotypic for the species, *Hydrophis (Crottyhydrophis) donaldi* Ukuwela, Sanders and Fry, 2012.

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#### CONFLICT OF INTEREST

The author has no conflicts of interest in terms of this paper or conclusions within.

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