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On the status of *Angaria aculeata* (Reeve, 1842) (Gastropoda: Turbinidae)

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Abstract: *Angaria aculeata* (Reeve, 1842) is elaborately discussed and removed from synonymy with *Angaria delphinus* (Linnaeus, 1758), re-establishing it as a separate, valid taxon. The type material is discussed, a lectotype is designated and a comparison with its closest congeners is added.

Introduction: The placement of the genus *Angaria* Röding, 1798 (Type species: *Turbo delphinus* Linnaeus, 1758) has always been problematic, mainly hesitating between **Trochidae**, **Turbinidae** or a separate family, **Angariidae**. Bouchet & Rocroi (2005) confirmed that species belonging to *Angaria* belong to **Turbinidae** Rafinesque, 1815, based upon morphological evidence.

Angaria aculeata (Reeve, 1842) (originally described as *Delphinula aculeata*) was considered a synonym of *Angaria delphinus* (Linnaeus, 1758) by Poppe & Goto (1993), yet this proves to be incorrect and it should be considered a separate, valid species (see below). The type material, consisting of three syntypes, is stored in the Natural History Museum (NHMUK, London, United Kingdom).

Material studied: Three syntypes in the NHMUK (nrs. 1842.5.10.1633 (1 shell) and 1953.4.7.26 (2 shells)) and 39 specimens in the authors' private collections.

Discussion: The first record of *Angaria aculeata* is Reeve's (1842) 'Conchologica Systemica'. Even though this publication states it is a new taxon ("Nobis"), no description of the species is added, but only a drawing (Plate CCXII, fig. 8) and a reference "Proceedings Zool. Soc., 1842" are given. This article, which unlike Reeve's (1842) reference only appeared in January 1843 (here cited as Reeve, 1843a), contains a description of *Angaria aculeata* (as *Delphinula aculeata*), an indication of a (type) locality, a comparison with *A. formosa* (Reeve, 1842) and a reference to the 'Conchologica Systemica', mentioned above. One year later, Reeve (1843b) again mentions *A. aculeata* in his 'Monograph of the genus *Delphinula*', a part of his 'Conchologica Iconica'. This time, he refers to both references already cited (Reeve, 1842 and Reeve, 1843a), reproduces the drawing from Reeve (1842), provides a brief description of the species and adds a 'variety β' (see below), which is likewise illustrated.

Notwithstanding these clear drawings and descriptions, the presence of type material and the many specimens of *Angaria* available for study, the situation of *A. aculeata* has ever since remained very troublesome and it has most commonly been treated as a synonym of *A. delphinus* (Linnaeus, 1758), with the exception of Monsecour (2008: Plate 59, fig. 5), who does not discuss the taxon's status.

In fact, the syntypes, two of which were illustrated in Reeve, 1842: Plate CCXII, fig. 8 and Reeve, 1843b: plate I, fig. 3 and plate III, fig. 3b, represent two different species: the so-called 'variety β' (1843b: plate III, fig. 3b; NHMUK 1953.4.7.26/2) is identical to *Angaria formosa* (Reeve, 1842). For a more detailed discussion of this species, we refer to Monsecour & Monsecour (2006). The shell that was first figured (Reeve, 1842) and which obviously served as a basis for Reeve's (1843a) description (Reeve, 1843a clearly refers to Reeve, 1842) is therefore hereby indicated as the lectotype. Unfortunately, this shell (NHMUK 1953.4.7.26/1) is in a deplorable, dead-taken (?) condition and therefore live-taken, more recently collected reference material should be used to accurately identify the species. However, Reeve's type locality "Island of Ticao, Philippines" can be maintained as all recently collected material available for study indeed originates from the central Philippines, with live-taken material dived or dredged between 15 and 40 metres deep.

In order to accurately describe and identify the species, the original description is in need of some additional descriptive notes. Reeve (1843a, copied in Reeve, 1843b, but with the translation into English hereby given) describes *A. aculeata* as "Shell nearly discoid, prickly, whitish; whorls sharply angular, angle surmounted with a row of flexuous scale-

like spines, scarlet-coloured at the back; lower portion of the whorls ornamented with two rows of spines and a number of small scale-like prickles arranged in parallel rows; spire depressly flat."

We hereby present the following, more detailed diagnosis: Average size without spines 38 x 32mm, diameter/height ratio in adults about 1.3. Rather high-spired, juveniles much flatter. Protoconch consisting of 3-3 ½ whorls, flattened. Transition of protoconch to teleoconch smooth, only marked by a change in colour. First penultimate whorl developing the wavy coronation typical of many *Angaria*-species, yet flattening out towards the final whorl. Spiral sculpture of spire whorls starting on penultimate whorl and consisting of 6-8 spiral cords on the shoulder. Posterior keel with primary spine cord consisting of closed, long spines that are at straight angle with the final whorl or slightly curved upwards, especially from the 5th-6th spine onwards. Final whorl with 9-10 such spines, 6-7 on further whorls. Median keel likewise adorned with strong, long spines. Final whorl with 13-15 such spines. About 5 further spines like these can be seen before they disappear below the shoulder of the final whorl. Anterior keel sharp, bearing 10-12 short, yet sharp spines. In between the anterior and median keel, there are 5 tertiary spine cords, more consisting of scales and alternatingly stronger and weaker. Another 5-6 spine cords are present between the median and posterior keel, 4-5 consisting of minute scales and 1-2 consisting of short, sharp spines, which are hardly smaller than the ones on the anterior keel. In between the anterior keel and the wide, open umbilicus, there are 4 spiral cords, alternatingly consisting of scales and small, sharp spines. Aperture round, smooth. Peristome more or less pentagonal, flattened adapically and rather straight in between the posterior and median keel. Colour of protoconch red, changing into green or red with white dots on the first spire whorl. Colour of other whorls highly variable: purplish, red and brown or greyish with white. Umbilicus darker. Colour of spines between median keel and umbilicus dark grey to black. Operculum similar to that in all other *Angaria*: horny, multispiral and with a central nucleus.

As this species has until now often erroneously been considered a synonym of *A. delphinus*, we hereby point out the main differences: the latter lacks the wavy coronation on the shoulder, is much heavier than *A. aculeata*, has got stouter, more scale-like and heavier spines on the shoulder, which are more numerous: 11-13 on the posterior keel and 14-17 on both median and anterior keel. Moreover, there are 6-7 spiral cords between the anterior keel and the umbilicus, all of which consist of a continuous row of sharp spines. Outer lip more rounded. Colour greyish to black, sometimes with a pale pinkish glance on the body whorl. Both species live sympatrically at a depth of about 15-30 metres, even though their bathymetrical range is somewhat different (as far as confirmed to us and only taking live-taken specimens into account: 1-30 m for *A. delphinus* and 15-40 m for *A. aculeata*).

Recently, we have noticed that many collectors also identify shells of *A. aculeata* as *A. poppei* Monsecour & Monsecour, 1999. This misidentification can primarily be explained by the colour patterns of both species, but they can easily be distinguished: *A. poppei* shows a much heavier wavy coronation on the shoulder, which does not flatten out towards the final whorl, has got much more rounded whorls and a clearly rounder peristome. Moreover, there are only 3 spiral cords between the median and the posterior keel, of which the middle one is the most prominent one. The latter consists of small spines, whereas the two outer ones only comprise scales. The protoconch of *A. poppei* is embedded in the further spire whorls, rendering the effect of a downward spiral. Both species likewise live sympatrically at a depth of about 15 to 30 m deep (bathymetrical range confirmed to us is 8-30 m for *A. poppei*).

A final species that needs discussion is *A. formosa*. As stated above, Reeve's *A. aculeata* 'variety β' is in reality a representative of *A. formosa*. As we decided to select the shell pictured in Reeve (1842) as *A. aculeata* and stored in the NHMUK as the lectotype, the other two shells stored in NHMUK as former syntypes (one of which was pictured as *A. aculeata* 'variety β' (Reeve, 1843b) and is now stored in NHMUK 1953.4.7.26/2) consequently become paralectotypes. Yet, given its identity, the shell representing Reeve's 'variety β' should not be used to define *A. aculeata*. *A. formosa* was removed from synonymy with *A. delphinus* by Monsecour & Monsecour (2006), yet it is often confused with the species discussed at present. However, it can be distinguished by the depressed protoconch, the much smaller spines on all keels (with the exception of the New Caledonian population, which is only conservatively included in this taxon), which are usually only knobs or well-developed scales, the stronger spiral cords on the shoulder and the spiral cords of equal size between the posterior and median keel.

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Plate 1:

1-4: ***A. aculeata*** (Reeve, 1842)
Lectotype (present designation). NHMUK 1953.4.7.26/1, London, United Kingdom.
Figured in Reeve (1842 and 1843b).

5-8: ***A. aculeata*** (Reeve, 1842).
Philippines. Cebu. Olanga Island. Dived at 30-40m. Coll. present authors.

Plate 2:

9-12: ***A. formosa*** (Reeve, 1842).
Paralectotype of *A. aculeata*. NHMUK 1953.4.7.26/2, London, United Kingdom.
Figured in Reeve (1843b) as *A. aculeata* 'variety β'.

13-16: ***A. formosa*** (Reeve, 1842)
Syntype. NHMUK, London, United Kingdom.

Plate 3:

17-18: ***A. aculeata*** (Reeve, 1842).
Philippines. Cebu. Olanga Island. Dived at 30-40m. Coll. present authors (same shell as Figs 5-8)

19-20: ***A. formosa*** (Reeve, 1842)
Syntype. NHMUK, London, United Kingdom. (other syntype than Fig. 13-16)

21-22: ***A. delphinus*** (Linnaeus, 1758)
Syntype of *Turbo delphinus,* LSL.527, Linnean Society of London, United Kingdom.

23-24: ***A. poppei*** Monsecour & Monsecour, 1999
Paratype. Coll. present authors.

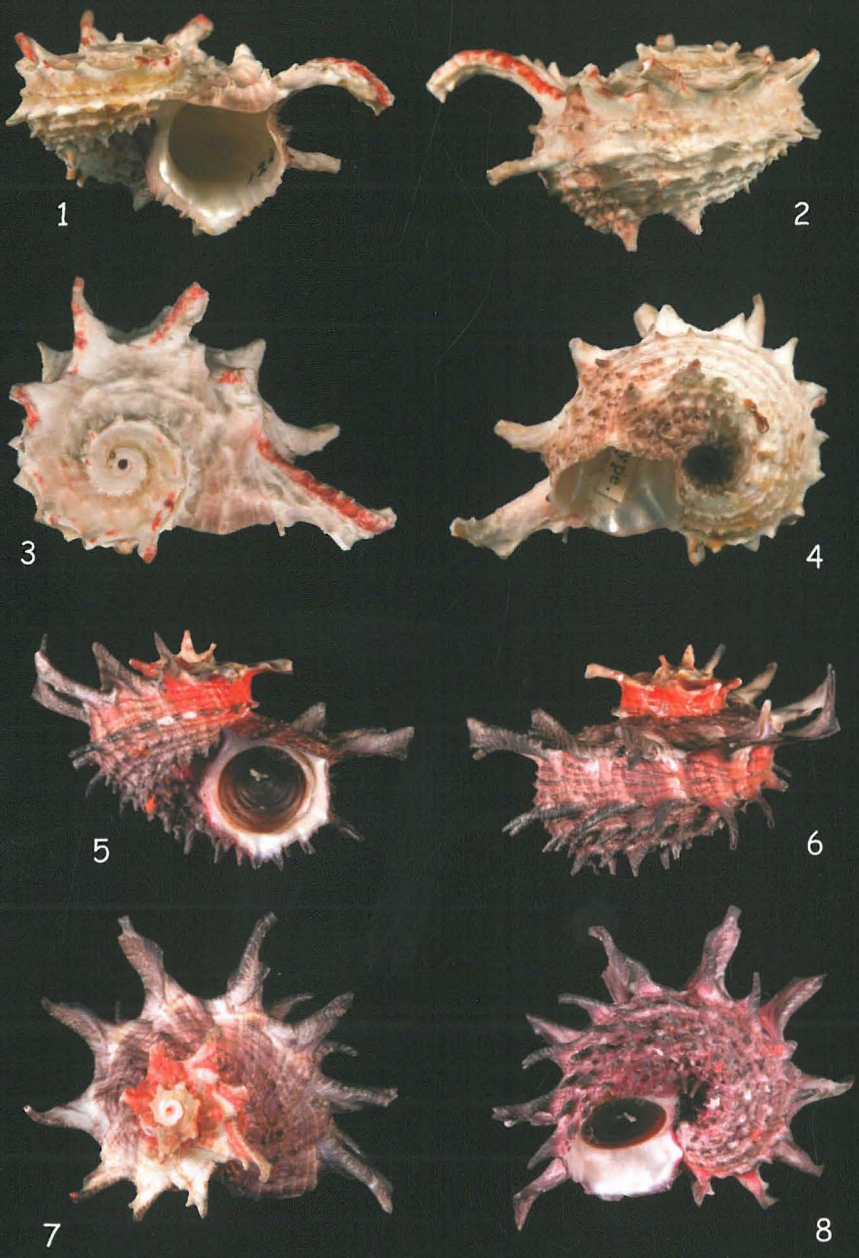

Plate 1

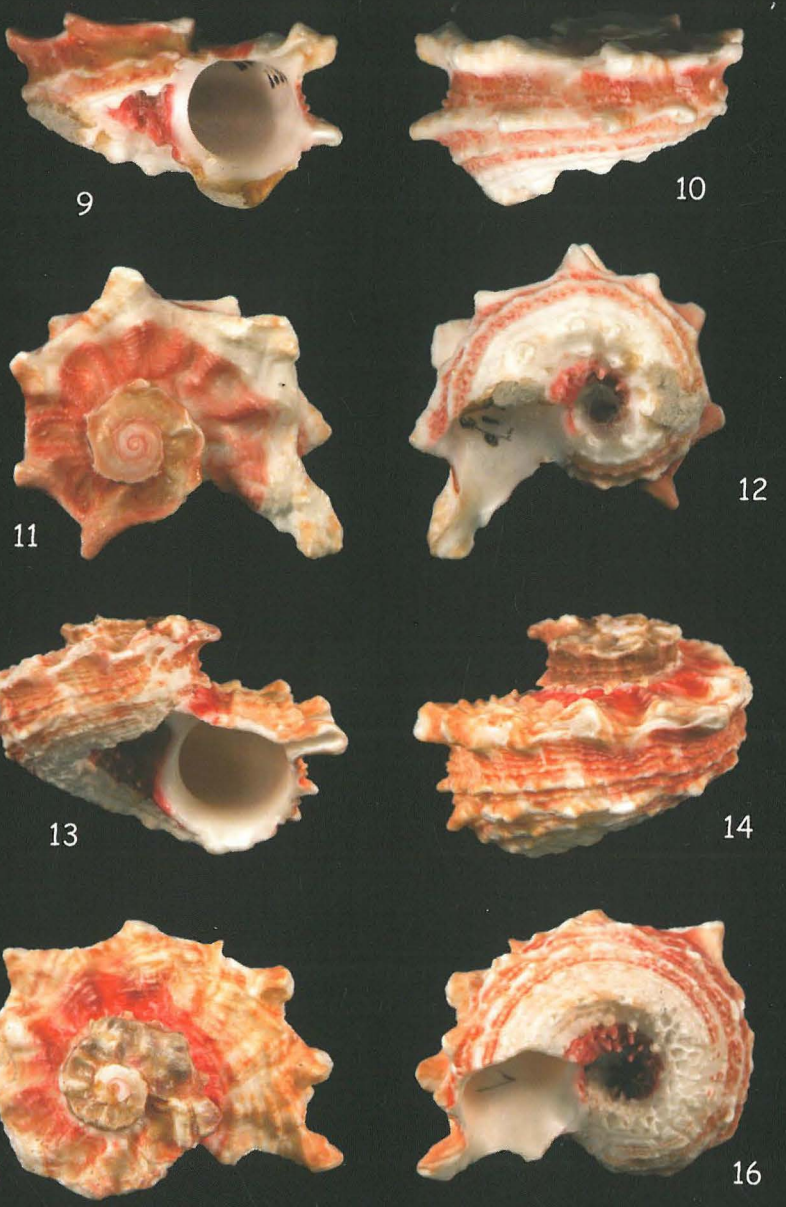

Plate 2

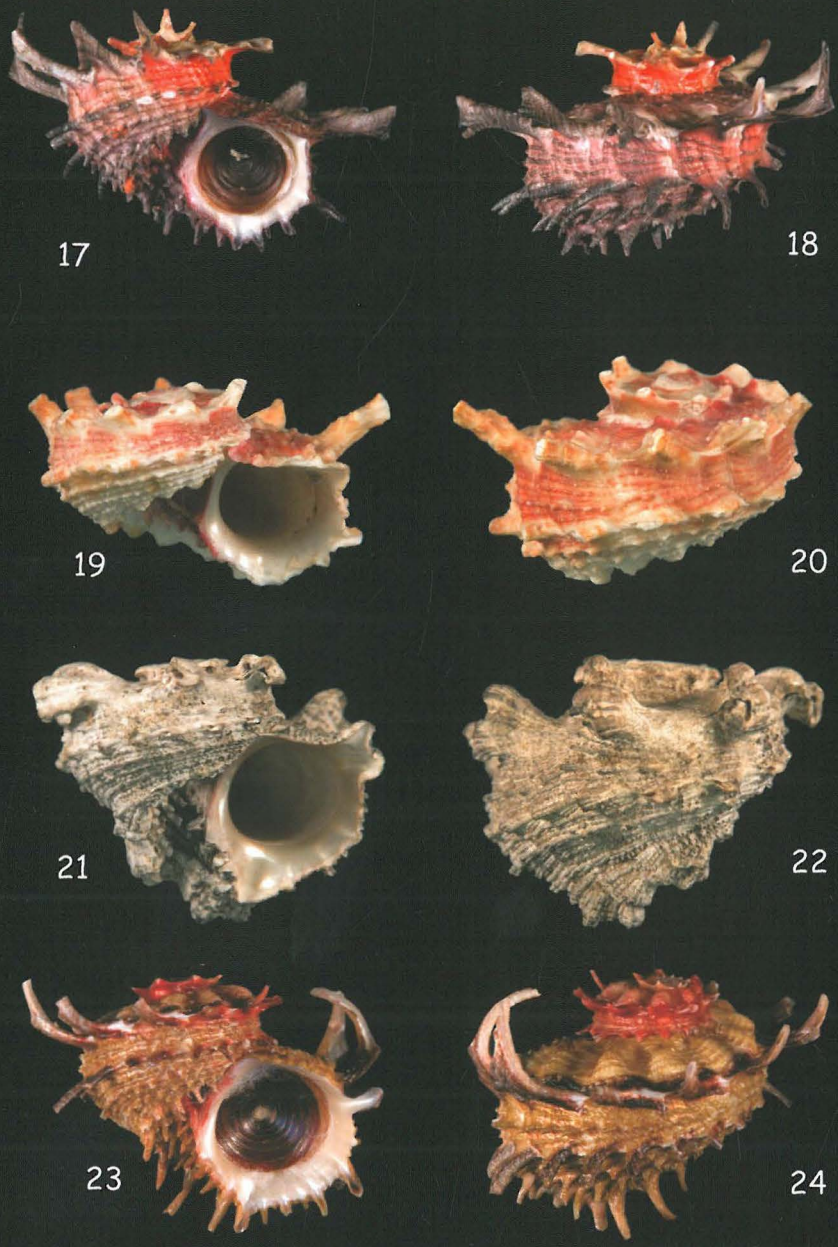

Plate 3