BASTERIA, 59: 97-104, 1996

Philine aquila sp. nov. from the Miocene of Winterswijk (Miste) (Gastropoda, Opisthobranchia)

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Philine aquila sp. nov. is described from the Miocene (Hemmoorian, Oxlundian; Breda Formation, Aalten Member, Miste Bed) of Winterswijk (Miste), The Netherlands (Gelderland province). The shell of the new species closely resembles that of the Pliocene to Recent *P. scabra* (Müller, 1776), *P. sagra* (d'Orbigny, 1841) and *P.* sp. 1 De Jong & Coomans, 1988, but differs in details of shape and sculpture.

Key words: Gastropoda, Opisthobranchia, Philinidae, Miocene, taxonomy, new species.

In connection with a revision of the rich material of Recent Philinidae from various expeditions, present in the collections of the Nationaal Natuurhistorisch Museum (Leiden), some fossil samples from the Miocene and Pliocene of the North Sea Basin were studied for comparison. Specimens identified as *Philine (Hermania) scabra* (Müller, 1776) by Janssen (1984: 374, pl. 19 fig. 12) were found to differ considerably from the Recent species. They are here introduced as a new species.

The fossil material is housed in the Palaeontology Department (Cainozoic Mollusca) of the Nationaal Natuurhistorisch Museum at Leiden (formerly Rijksmuseum van Geologie en Mineralogie) and is here referred to with RGM registration numbers. Material from the Zoological Museum, Amsterdam is indicated with ZMA.

Philine aquila sp. nov.
(figs. 1-3)

1984 *Philine (Hermania) scabra* (Müller, 1776) — Janssen, 1984: 374, pl. 19 fig. 12 (non Müller).

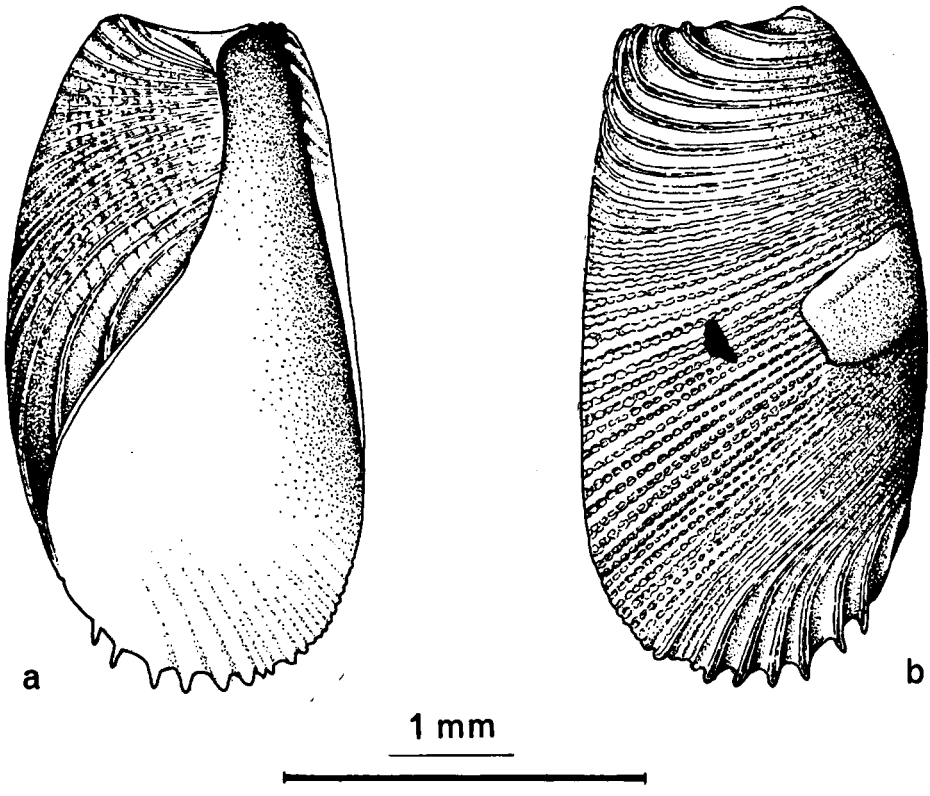
Type material. — Holotype: RGM 225 659, height 1.9 mm, fig. 1a-b. Paratypes: From the type locality there are 16 more or less defective specimens (15 specimens, RGM 393 740; 1 specimen, RGM 393 951, fig. 3a-d).

Locus typicus. — Winterswijk (Miste), The Netherlands, Gelderland province, temporary excavation, co-ordinates x = +88.200; y = -23.750, depth 2.00-3.75 m below surface.

Stratum typicum. — Breda Formation, Aalten Member, Miste Bed (Miocene, Hemmoorian, Oxlundian), *Hiatella arctica* Acme Zone, or base of *Astarte radiata* Acme Zone.

Derivatio nominis. — The finger-like fringe at the abapical apertural margin makes this part of the shell resemble the silhouette of an eagle wing: *aquila* (Latin), eagle.

Diagnosis. — *Philine* with catenoid spiral ribbons alternating with unsculptured spiral lines, widening in upper and lower shell parts. Apertural margin with 4-6 finger-like



Figs. 1a-b. *Philine aquila* sp. nov., holotype, RGM 225 659, shell height 1.9 mm; a: ventral view; b: dorsal view.

projections of the non-catenoid spiral lines at the lower apertural margin and similar, but less pronounced, projections at the upper apertural margin.

Description. — The shell is minute, almost twice as high (height 0.8-1.9 mm, width 0.5-1.0 mm) and has a slightly ovoid-cylindrical shape, barely narrowing in the apical part. The top of the shell is flattened and has a narrow suture. The sidelines of the body whorl are more or less straight, the base of the shell is gently rounded. The sinistral protoconch, comprising c. 1½ smooth whorls, is for the greater part enclosed by the subsequent whorl and therefore only visible in very juvenile specimens. The sharp boundary with the teleoconch is clearly visible, also in fully grown specimens. The teleoconch has c. three quarters of a whorl. The body whorl encloses all earlier whorls and therefore the height of the aperture equals the shell height. The posterior margin of the aperture reaches beyond the apex of the shell in fully grown specimens. In its adapical half the apertural margin is very slightly indented.

The teleoconch exterior surface has a peculiar microsculpture: on the middle of the dorsal side there are spiral rows of minute rings, often just separated, sometimes just touching each other. These catenoid spirals alternate with unsculptured spiral lines. In both ab- and adapical directions these lines become more and more raised from the surface and more and more distant from each other. At the same time the catenoid

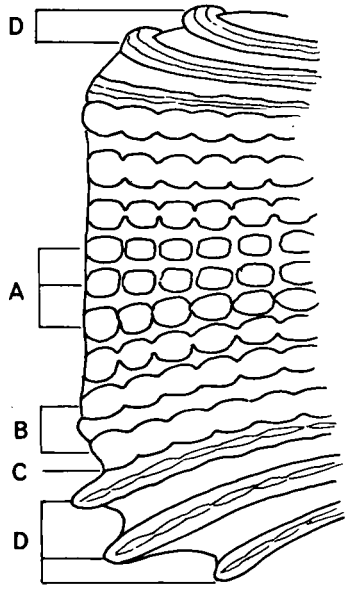
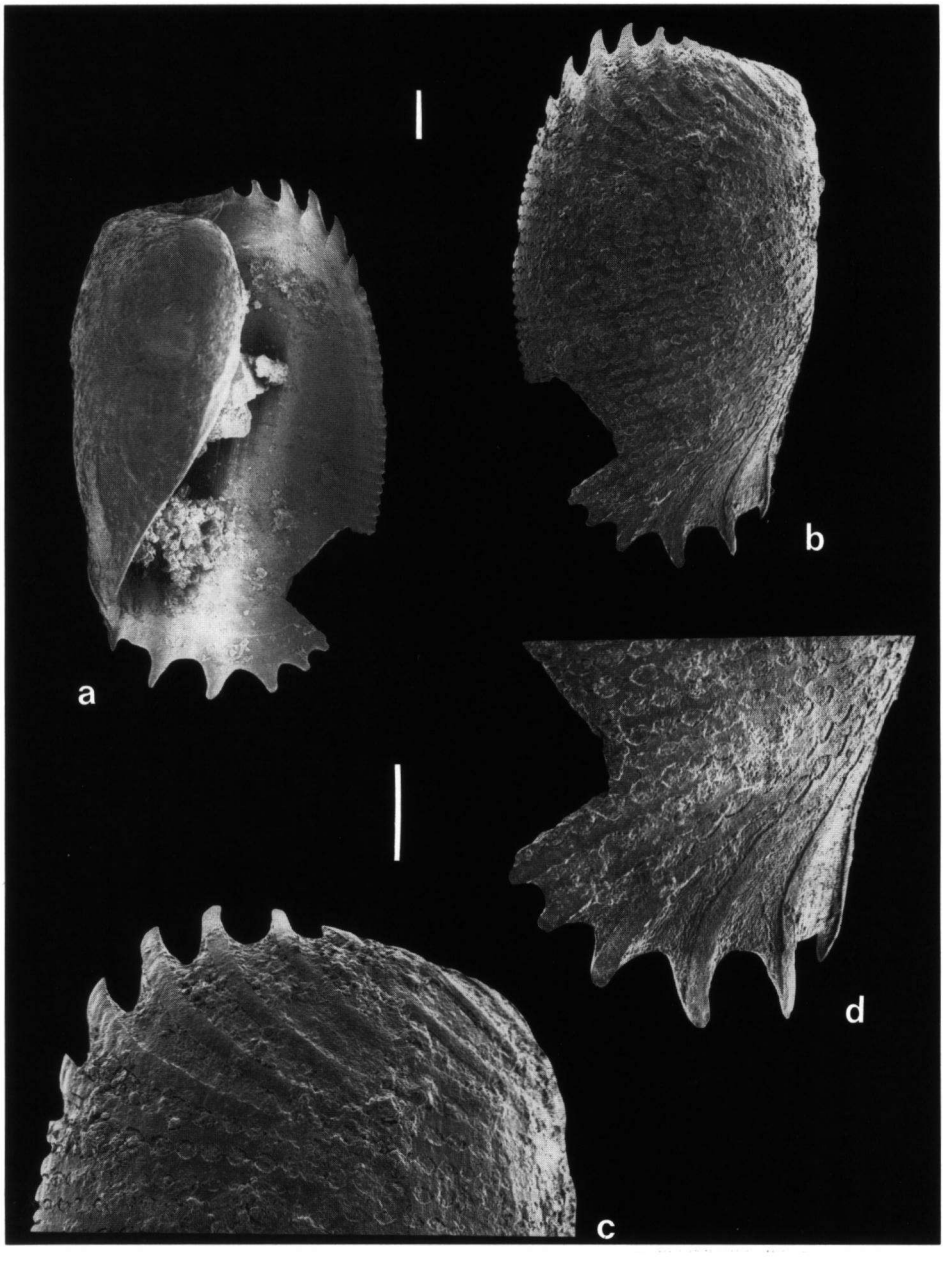


Fig. 2. Schematic representation of the microsculpture of *Philine aquila*: catenoid spiral lines are separated by smooth spirals, rings are impressed in the shell's surface, free or just touching each other (A); towards both ends of the shell the rings disperse and disintegrate (B), resulting in spiral furrows and raised spirals with a denticulate margin (C); at the extreme ends of the shell the raised spirals become accentuated and develop a longitudinal furrow (D). When these furrows are interrupted it is tempting to believe that the catenoid spiral lines of the shell's centre develop on the raised spirals. The opposite is true: they are situated in the interstices.

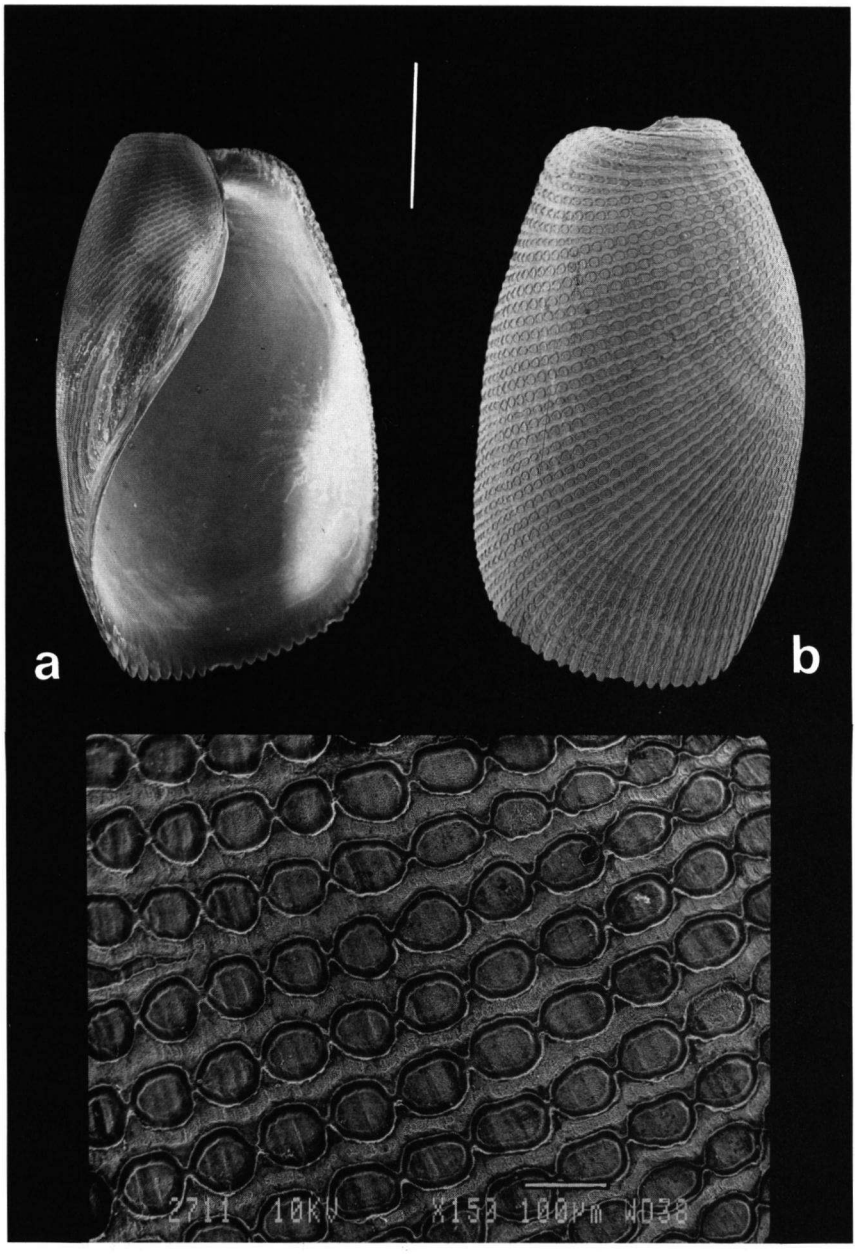
spiral ribbons become wider and wider, and the sculpture of rings fades or, more accurately, the rings disperse and disintegrate, and the embossed lines sometimes become denticulate on their margins by the remaining parts of the rings. This denticulation disappears near the extreme ends of the shell and near the edge of the aperture. Sometimes there is a minute longitudinal furrow, continuous or interrupted, in the centre of these spiral lines. In the apical shell part the raised lines do not follow the direction of growth and the curvature of the shell. From about mid-height they deviate in upward direction. The upper and lower 4-6 raised spiral chords are remarkably projected beyond the margin of the shell, like fingers.

Discussion. — The present material has been compared with several dozens of Recent *Philine scabra* samples from Norway, NW. Spain, Canary Islands, Mauritania and the Mediterranean. This material is quite homogeneous and no intermediate forms with *P. aquila* were observed. The differences can be summarised as follows.

The greater part of the *P. scabra* specimens (fig. 4) has a shell height of 3-6 mm, and according to Thompson (1988: 65) the species may reach a height of 15 mm. In *P. aquila* the largest known specimen has a height of only 1.9 mm, and there are no fragments indicating the occurrence of larger specimens. Specimens of identical size of the two species differ in shape, *P. aquila* being more cylindrical and having a less expanded aperture, especially in its anterior part. Furthermore there is a considerable difference



Figs. 3a-d. *Philine aquila* sp. nov., juvenile paratype, RGM 393 951, shell height 1.1 mm; a: ventral view; b: dorsal view; c: apical shell part; d: abapical spines (scales 0.1 mm).



Figs. 4a-c. *Philine scabra* (Müller, 1776), off Monaco, 43°40'N, 07°21'E, depth 100 m; shell height 4.1 mm (scale 1.0 mm), H.P.M.G. Menkhorst collection; a: ventral view; b: dorsal view; c (below): microsculpture (scale 0.1 mm) (copied from Van der Linden, 1994).

in ornament. *P. scabra* has a comparatively coarse catenoid sculpture, with the size of each ring at least three times that of the rings in *P. aquila*. In *P. scabra* the spiral ribbons are more or less equidistant all over the shell's surface, whereas they diverge considerably at both ends of the shell in *P. aquila*. These diverging spirals are raised, while *P. scabra* only has scarcely raised spiral ribbons in the most apical shell part, following the direction of growth and the curvature of the shell, while they deviate in upward direction in the fossil species. In the basal part of the apertural margin *P. scabra* is finely denticulate by the slightly projecting ends of the numerous fine and close-set non-catenoid spiral lines. In *P. aquila*, on the contrary, there are only 4-6 distinct, finger-like and widely spaced spines, representing the projections of the spiral chords. At the upper apertural margin of *P. aquila* similar, but less strongly accentuated, projections are present, where these are absent in *P. scabra*.

A sample of 12 *P. scabra* specimens (RGM 393 741) from the Pliocene (Scaldisian; Lillo Formation, Luchtbal Sand Member) from the construction pit B1-B2 canal at Antwerpen (Belgium) agrees completely with the Recent samples of that species.

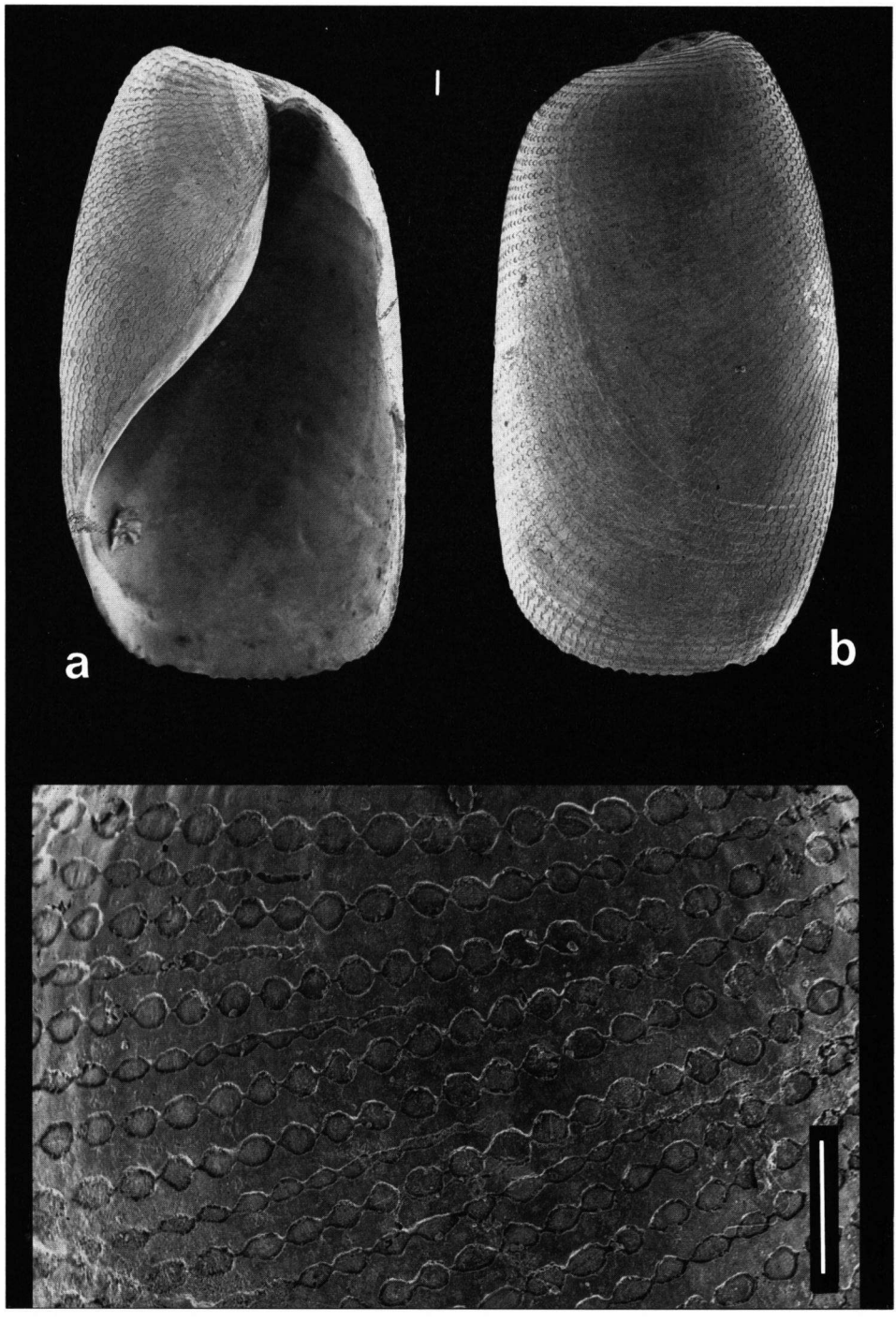
There are, as usual, various other names available for *P. scabra*. Most of these are based on the Recent form and beyond any doubt represent synonyms. Few names only were based on fossil forms. *Bulla dilatata* S.V. Wood, 1839, and *B. catenata* S.V. Wood, 1841, are based on Pliocene specimens from the Coralline Crag of Sutton, East Anglia. Wood (1848: 181), however, synonymised these names with *P. scabra*. The description and illustrations indicate clearly that indeed the Pliocene specimens agree with the Recent species.

Philine angustata 'Bivona' (Philippi, 1836: 121, pl. 7 fig. 17) refers to Recent and Quaternary specimens from Sicily, which Philippi with a query related to Wood's Pliocene *B. catenata*. The fossil specimens are only described as '*Specimen meum paullo magis angustatum quam recentia*', i.e. '... a little narrower than the recent one'. *P. aquila*, on the contrary, is more cylindrical and therefore less narrowed than *P. scabra*. The rather poor illustration of the fossil form (Philippi, 1836, pl. 7 fig. 17c) represents a specimen with a shell height of c. 6 mm, distinctly more slender than the Recent form, which Philippi illustrated in his fig. 17b. This slender form probably corresponds with the Recent *P. loveni* Malm, 1858, a taxon synonymised with *P. scabra* by Odhner (1907: 15, pl. 1 figs. 6-9) and Lemche (1948: 66). It is concluded that *P. angustata* likewise is a synonym of *P. scabra*. In the absence of Philippi's type specimens this cannot be substantiated by the designation of a lectotype.

Also *Hermania scabra* (Müller) var. *pliocenica* Sacco (1897: 54, pl. 4 fig. 42), from the North Italian Pliocene, is a slender form with a height of c. 6 mm. It was described as '*Testa crassula, cylindrico-subovulata, minus ventrosa; columella minus fortiter contorta*' (shell thickened, cylindrical-subovate, less globose, columella less strongly contorted). As already stated by Sacco this form resembles Philippi's *P. angustata*, and thus it likewise has nothing to do with *P. aquila*.

From the Miocene of the North Sea Basin various other species of Philinidae are known (e.g. Janssen, 1984), but apart from *P. aquila* none of these seems to be related to *P. scabra*. Juvenile specimens of *Scaphander grateloupi* (Michelotti, 1847), however, are easily confused with *P. scabra*-like Philinidae, but differ in details of form and sculpture and have a relatively more solid shell.

From the Recent fauna there are still two more related species, both from the west Atlantic: *Philine* sp. 1, as discussed by De Jong & Coomans (1988: 134) and *P. sagra* (d'Orbigny, 1841). The first species (fig. 5) has about the same cylindrical shape, narrowing in the apical part, and about the same minute catenoid spirals as *P. aquila*,



Figs. 5a-c. *Philine* sp. 1, Aruba, West Indies (Caribbean); shell height 2.5 mm, ZMA collection; a: ventral view; b: dorsal view, c (below): microsculpture (scale 0.1 mm).

Fig. 6. *Philine sagra* (d'Orbigny, 1841), microsculpture (after d'Orbigny, in De Jong & Coomans, 1988).

but differs in the shell height of 3-6 mm, the numerous equidistant spiral lines, the finely denticulate apertural margin, and the flat, non-catenoid spirals at both ends of the shell. A sample of 40 specimens from Aruba (West Indies, Caribbean; ZMA collection) was investigated. *P. sagra* - only known from the literature - has almost the same characters as *Philine* sp. 1, but differs somewhat in microsculpture. According to Pilsbry (1895-1896: 25) there are wavy striae between the chain-like spiral lines, following the intervals of the rings (fig. 6). Therefore *P. sagra* does not agree with the new species.

We are greatly indebted to Mr. J.C.A. Eikenboom for making the drawing of the holotype of *P. aquila* and for his accurate observations on the microsculpture of the shell surface. We thank Mr. J. Goud (NNM) for making the SEM micrographs and Mr. R. Moolenbeek (ZMA) for the loan of the *Philine* sp. 1 sample. Dr. R. Marquet and Messrs. H.P.M.G. Menkhorst and J. van der Voort made material for comparison available to us. Dr. H.E. Coomans kindly permitted the reproduction of fig. 6.

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