

The extensive Indo-Pacific radiation of *Phaenomenella* Fraussen & Hadorn, 2006 (Gastropoda: Buccinidae) with description of a new species

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ABSTRACT. The genus *Phaenomenella* is briefly reviewed. *Phaenomenella vexabilis* sp. nov. is described from deep-water off Taiwan. It is compared with *P. mokenorum* Fraussen, 2008 and *P. inflata* (Shikama, 1971). The shell shape and the spiral sculpture serve to distinguish the single known broken shell from all other known *Phaenomenella* species.

INTRODUCTION

The genus *Phaenomenella* Fraussen & Hadorn, 2006 was described to accomodate *Manaria inflata* Shikama, 1971 together with other species sharing the peculiar, angulated or pagodoid shape of the apical teleoconch whorls. The radula morphology proves also that genus to belong to Pisaniinae.

Quite early after the description of the genus new species have turned up from the ANTUN BRUUN expedition to the Andaman Sea (Fraussen, 2008) and from commercial trawlings by Vietnamese fishermen (Fraussen & Stahlschmidt, 2012). In addition two further species, described as "*Manaria*" *callophorella* Fraussen, 2004 and *Nassaria cirsinoides* Fraussen, 2004, were also recognized to belong to *Phaenomenella* (Fraussen & Stahlschmidt, 2012).

The growing knowledge of the biodiversity and the questions regarding the number of undescribed species (Bouchet et al, 2008) are well reflected in *Phaenomenella* and this genus was one of the examples given to estimate that the possible number of buccinid species may be twice as large as the already described ones, if not triple (Fraussen, 2012: 21-22, fig. 2).

In the present paper we add one more species to the Indo-West Pacific fauna: *Phaenomenella vexabilis* sp. nov. from Taiwan.

Material and Methods

Part of the material reported on in the present study originates from the TAIWAN 2000, 2001 and 2002

expeditions to Taiwan; this material is, unless otherwise stated, deposited in MNHN.

Abbreviations

ANSP: Academy of Natural Science, Philadelphia, U.S.A.

KF: collection Koen Fraussen, Aarschot, Belgium.

MNHN: Muséum national d'Histoire naturelle, Paris, France.

NMMBM: National Museum of Marine Biology and Aquarium, Mollusca, Checheng, Taiwan.

NMNS: National Museum of Natural Science, Taichung, Taiwan.

NNT: collection Dr. Nguyen Ngoc Thach, Nha Trang, Vietnam.

CP: chalut à perche (beam trawl).

dd: empty shell, dead collected.

SYSTEMATICS

Family **BUCCINIDAE** Rafinesque, 1815

Genus *Phaenomenella* Fraussen & Hadorn, 2006: 104.

Type species: *Manaria* (?) *inflata* Shikama, 1971: 31, pl. 3, figs. 7-8 (Taiwan).

Range. Mainly known from around Taiwan and the adjacent East and South China Seas. One species from eastern Indian Ocean (Andaman Sea).

Remarks. *Phaenomenella* species are characterized by their broader than high protoconch with flattened tip and by a rather sharp angulation just above the suture with the subsequent whorl. The upper teleoconch whorls are shouldered, a shape which is accentuated by the axial knobs or ribs, or have the appearance of being shouldered by the presence of obviously convex axial ribs. The axial ribs on the first teleoconch whorls are slightly opisthocline, rather diagonally orientated and gradually becoming more longitudinally orientated on the abapical whorls (if still present). The radula has tricuspid outer teeth (Fraussen & Hadorn, 2006: 104, 109).

The variability in the genus is moderately high (Tabel 1). The general shape ranges from semi-oval to fusiform, the shape of the spire ranges from moderately high to elongate and from pagodoid to conical (laterally flattened whorls); the shape of the whorls ranges from sharply angulated over shouldered to rather convex (but within a species it may vary from angulated upper spire whorls to convex at the body whorl). The spiral sculpture may consist of fine primary spiral cords to alternating primary and finer secondary spiral cords (but the presence of secondary spiral cords may vary within a species: from absent to showing some fine traces) with a single species having broad, flattened spiral cords (*P. mokenorum* Fraussen, 2008). The axial sculpture may vary from being present on the uppermost spire whorls only to being present on all whorls including the body whorl. The shape of the protoconch, however, is together with the slightly diagonally orientated axial ribs on the upper spire whorls a constant feature.

Manaria Smith, 1906 (type species: *Manaria thurstoni* Smith, 1906, by original designation) differs by having a smaller protoconch consisting of a slightly higher number of whorls with a small naticoid tip; by the usually weakly convex upper spire whorls; by the simple outer lip, and by a cominelloid radula.

Eosipho Thiele, 1929 (type species: *Chrysodomus (Sipho) smithi* Schepman, 1911, by original designation) differs by having smoother whorls with flattened spiral cords with axial sculpture on the uppermost whorls only; fine grooves on top of the spiral cords, and by having a cominelloid radula.

Included species

Phaenomenella angusta Fraussen & Hadorn, 2006

Phaenomenella callophorella (Fraussen, 2004)

Phaenomenella cirsiunoides (Fraussen, 2004)

Phaenomenella inflata (Shikama, 1971)

Phaenomenella insulapratensis (Okutani & Lan, 1994)

Phaenomenella mokenorum Fraussen, 2008

Phaenomenella thachi Fraussen & Stahl Schmidt, 2012

Phaenomenella venusta Fraussen & Stahl Schmidt, 2012

Phaenomenella vexabilis sp. nov.

Phaenomenella angusta Fraussen & Hadorn, 2006
Figs 8, 13

Phaenomenella angusta Fraussen & Hadorn, 2006: 106-108, figs. 6-9, 20-21.

Type locality. South China Sea, Taiwan, TAIWAN 2000, stn CP27, 22°13.3'N, 120°23.5'E, 326 m.

Remarks. *Phaenomenella angusta* is characterized by having a rather thin shell with a slender, fusiform shape; strongly convex teleoconch whorls with a slightly shouldered appearance accentuated by the axial ribs; a fine spiral sculpture consisting of alternating fine (primary) and finer (secondary) spiral cords; axial sculpture on the spire whorls only and a thin, slightly expanded outer apertural lip.

Phaenomenella callophorella (Fraussen, 2004)
Fig. 9

"*Manaria*" *callophorella* Fraussen, 2004: 86-88, figs. 5-10, 13.

Type locality. East China Sea between Japan and Taiwan, 800-900 m deep, trawled by fishermen from Kyushu, Japan.

Transferred to *Phaenomenella* by Fraussen & Stahl Schmidt (2012: 86).

Remarks. *Phaenomenella callophorella* is characterized by the broadly fusiform shell with shouldered, rather tabulated teleoconch whorls which give the shell a rather pagodoid shape; a fine spiral sculpture consisting of sharp primary spiral cords with broad interspaces; occasional presence of traces of minute, obscure secondary spiral cords on the adapical part of the body whorl; the presence of axial sculpture (running from suture to suture on the spire whorls and running from suture to the periphery at the body whorl) on all whorls and a thick, corneous, yellowish-brown periostracum which may be hirsute on top of the axial sculpture.

Phaenomenella cirsiunoides (Fraussen, 2004)
Fig. 10

Nassaria cirsiunoides Fraussen, 2004: 85-86, figs. 1-4, 11-12.

Type locality. East China Sea, between Japan and Taiwan, 800-900 m deep, trawled by fishermen from Kyushu, Japan.

Transferred to *Phaenomenella* by Fraussen & Stahl Schmidt (2012: 86).

Remarks. *Phaenomenella cirsiunoides* is characterized by having a moderately broad, rather thin shell; an angulated shoulder on all whorls, accentuated by the axial ribs; a fine spiral sculpture consisting of sharp primary spiral cords with broad

interspaces; in having secondary spiral cords on the
adapical part of the whorls only; axial sculpture
(knobs) present on all whorls; a thin, slightly

expanded outer lip and a rather smooth, yellowish-
brown periostracum.

| Character | <i>P. inflata</i> | <i>P. insulapratasensis</i> | <i>P. cirsiunoides</i> | <i>P. calloporella</i> | <i>P. augusta</i> | <i>P. thachi</i> | <i>P. venusta</i> |
|---|--|--|--|--|---|---|---|
| General shape | semi-oval | semi-oval | semi-oval | fusiform, slender | fusiform, slender | fusiform, slender | fusiform, slender |
| Spire | moderately high | low rather conical | moderately high | rather elongate pagodoid | elongate | elongate | Elongate |
| Upper spire whorls | angulated | angulated | angulated | shouldered | shouldered | rather convex | weakly angulated |
| Subsutural slope | convex | convex | concave | steep | convex | convex | rather convex |
| Whorls | weakly convex | laterally flattened | angular | strongly convex | convex | convex | Convex |
| Primary spiral cords | fine 1st whorl: Unknown 3rd whorl: 6-7 penultimate: 8-13 | fine 1st whorl: 7 3rd whorl: 9-10 penultimate: 8-12 | sharp 1st whorl: 6 3rd whorl: 8-9 penultimate: 9-10 | sharp 1st whorl: 5-6 3rd whorl: 6 penultimate: 10 | fine 1st whorl: 5 3rd whorl: 6 penultimate: 8-10 | fine 1st whorl: Unknown 3rd whorl: 8 penultimate: 9 | fine 1st whorl: 6 3rd whorl: 7-8 penultimate: 13 |
| Secondary spiral cords (nr. per interspace) | some traces 1 | none | occasionally 1 | some traces 1 | on whorl and base 1 | on whorl and base 1 | occasionally (growing quickly) |
| Spiral interspaces | broad, on base narrow | moderately broad | broad | moderately narrow | broad | broad | moderately broad |
| Siphonal canal | medium | short | medium | medium | medium | medium | Medium |
| outer lip | expanded lip | moderately thick varix | expanded lip | moderately thick | expanded lip | thick varix | thick varix |
| Periostracum | smooth | smooth | smooth to velvety | smooth to velvety | smooth | unknown | Unknown |
| Range | Taiwan | South China Sea | East China Sea | East China Sea | East China Sea | South China Sea Vietnam | South China Sea Vietnam |

Table 1. Characteristics of *Phaenomenella* species.

Phaenomenella inflata (Shikama, 1971)
Figs 3, 11

Manaria inflata Shikama, 1971: 31, pl. 3, figs. 7-8.

Type locality. Taiwan.

Remarks. *Phaenomenella inflata* is characterized by the moderately broad, rather thin shell with a semi-oval shape; a strongly angulated shoulder on the upper spire whorls, accentuated by the axial ribs; a fine spiral sculpture consisting of alternating fine (primary) and finer (secondary) spiral cords; by the presence of axial sculpture on the upper spire whorls only; a thin, slightly expanded outer apertural lip and a rather smooth, yellowish-brown periostracum.

Phaenomenella insulapratasensis
(Okutani & Lan, 1994)
Figs 5, 12

Aulacofusus insulapratasensis Okutani & Lan, 1994: 1-3, figs. 1-4.

Type locality. Pratas Islets (Reef), South China Sea, 300 m deep.

Remarks. *Phaenomenella insulapratasensis* is characterized by the inflated, rather heavy shell with a broad, oval shape; a strongly angulated shoulder on the upper spire whorls, accentuated by the axial ribs; fine spiral cords of same strenght; the presence of axial sculpture on the upper spire whorls only; a thick outer apertural lip which is elegantly pinched where connected to preceeding whorl and a rather smooth, yellowish-brown periostracum.

The species is known from the South China Sea off Vietnam and from Taiwan (3 empty shells from SW coast of Taiwan, TAIWAN 2002: Stn CP166, 22°23.8'N, 120°15.3'E, MNHN).

Phaenomenella mokenorum Fraussen, 2008
Figs 4, 14

Phaenomenella mokenorum Fraussen, 2008: 48-50, fig. 1-4.

Type locality. Andaman Sea, E-SE Phuket Island, ANTON BRUUN stn 17, 07°40'N, 97°08'E, 512-503 m.

Remarks. *Phaenomenella mokenorum* is characterized by the rather thin and fragile shell with a

semi-oval shape with high conical spire; laterally flattened upper spire whorls; a weak spiral sculpture consisting of broad but weak spiral cords with narrow interspaces; the presence of axial sculpture on the upper spire whorls only; a rather smooth body whorl; a thin outer apertural lip and a rather velvety, greenish brown periostracum.

Phaenomenella insulapratensis has similar laterally flattened upper spire whorls but differs by the broader shape with much shorter spire and the finer spiral cords.

Phaenomenella thachi

Fraussen & Stahlschmidt, 2012

Fig. 6

Phaenomenella thachi Fraussen & Stahlschmidt, 2012: 87-88, fig. 1-5.

Type locality. South China Sea, Vietnam, Khanh Hoa Province, Nha Trang, trawled by local fishermen, 150-200 m deep.

Remarks. *Phaenomenella thachi* is characterized by the rather solid shell with fusiform shape, the big prelabral varix running from suture down to the lower part of the base. The prelabral lip has a shape one may also recognize in some species belonging to *Nassaria* Link, 1807 such as *Nassaria visayensis* Fraussen & Poppe, 2007 (type locality: Philippines, Aliguay, trawled between 60 and 120 m deep) and the fossil *N. wanneri* (Tesch in Wanner, 1915) (type locality: Indonesia, Timor, between Noil and Noil Taimetan, Pliocene). *Nassaria*, however, differs in many aspects such as the protoconch morphology and the radula characters, to mention the most important ones.

Phaenomenella angusta has a similar shape and sculpture but differs by the slightly slenderer shape,

the simple suture (instead of a shallow canaliculation), the slightly lower number of primary spiral cords on the upper spire whorls (6 instead of 8), the lower number of axial ribs, and the weaker prelabral varix.

Phaenomenella venusta differs by the slenderer shape with narrower aperture, the secondary spiral cords which grow quickly to the same strength as the primary ones, giving the appearance as if the sculpture consists of cords of equal strength, the axial sculpture which is weak along the penultimate whorl and absent on the body whorl, and the much smaller adult size.

Phaenomenella venusta

Fraussen & Stahlschmidt, 2012

Fig. 7

Phaenomenella venusta Fraussen & Stahlschmidt, 2012: 88-90, fig. 6-10.

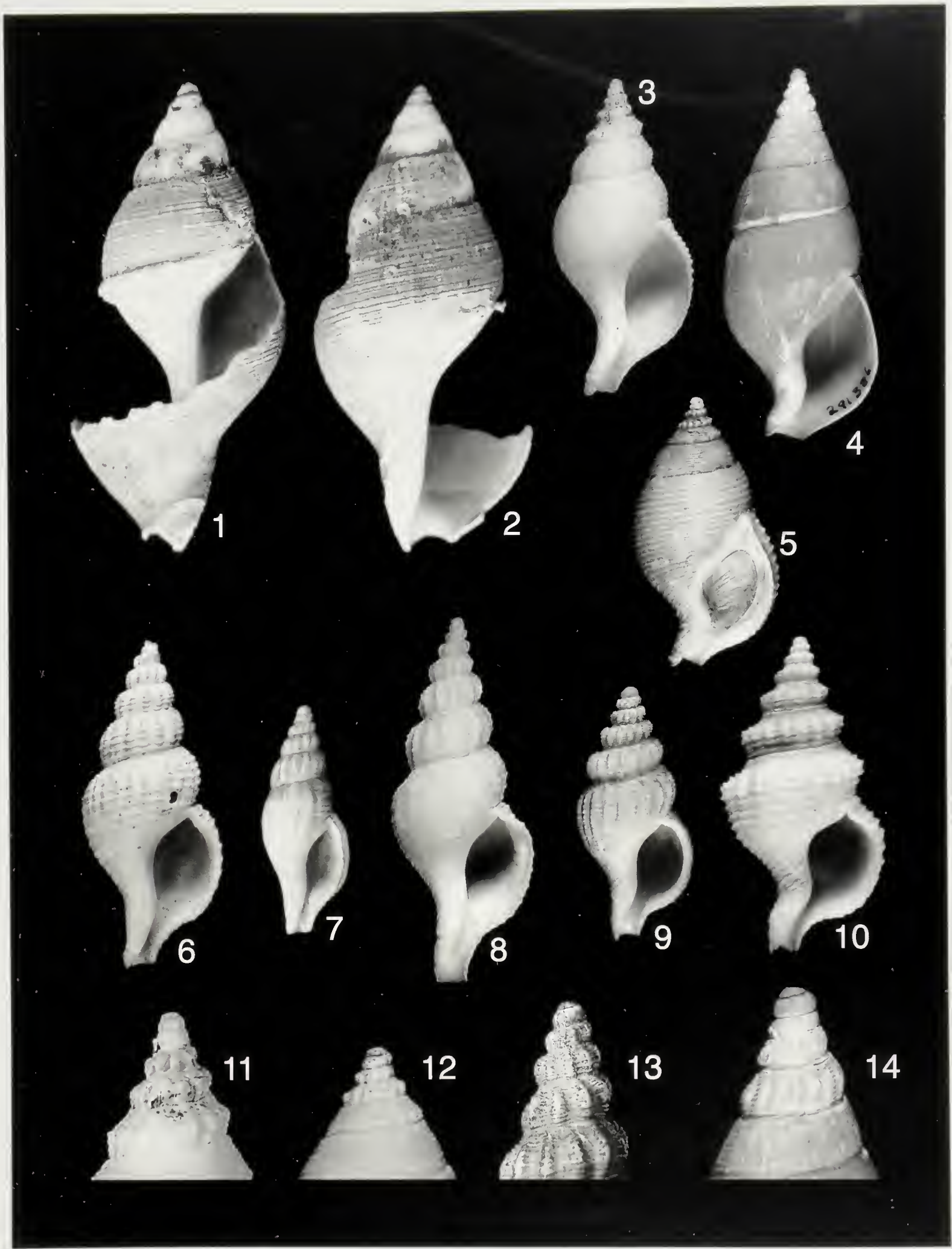
Type locality. South China Sea, Vietnam, Khanh Hoa Province, Nha Trang, trawled by local fishermen, 150-200 m deep.

Remarks. *Phaenomenella venusta* is characterized by the narrow aperture, the secondary spiral cords which grow quickly to reaching a similar strength as the primary ones and give the appearance as if the sculpture consists of cords of equal strength, the absence of axial sculpture on the body whorl and the small adult size.

Phaenomenella thachi differs by the broader shape with wider aperture, the spiral sculpture consisting of cords of clearly unequal strength, the stronger axial sculpture which is still present on the body whorl and the larger adult size.

Figures 1-14

1-2. *Phaenomenella vexabilis* sp. nov., holotype, 45.3 mm, Taiwan, off Tashi, TAIWAN 2001 stn CP111, 24°52.2'N, 122°04.3'E, 540-700 m, NMMBM008154; **3.** *Phaenomenella inflata* (Shikama, 1971), 33.8 mm, Taiwan, off Suao, dredged, 190 m, KF-0524; **4.** *Phaenomenella mokenorum* Fraussen, 2008, holotype, 55.6 mm, Andaman Sea, E-SE off Phuket Island, ANTON BRUUN stn 17, 07°40'N, 97°08'E, 512-503 m, ANSP 291386; **5.** *Phaenomenella insulapratensis* (Okutani & Lan, 1994), 26.0 mm, off Vietnam, trawled by fishermen, KF-3260; **6.** *Phaenomenella thachi* Fraussen & Stahlschmidt, 2012, holotype, 34.4 mm, South China Sea, Vietnam, Khanh Hoa Province, off Nha Trang, trawled by local fishermen, 150-200 m deep, MNHN-25084; **7.** *Phaenomenella venusta* Fraussen & Stahlschmidt, 2012, paratype 2, 22.2 mm, South China Sea, Vietnam, Khanh Hoa Province, off Nha Trang, trawled by local fishermen, 150-200 m deep, coll. NNT; **8.** *Phaenomenella angusta* Fraussen & Hadorn, 2006, paratype 2, 34.6 mm, between Japan and Taiwan, 800-900 m deep, trawled by fishermen from Kyushu, Japan, KF-3459; **9.** *Phaenomenella callophorella* (Fraussen, 2004), paratype 4, 19.9 mm, South China Sea, Helen Bank, 500 m deep, KF-2833; **10.** *Phaenomenella cirsiunoides* (Fraussen, 2004), paratype 4, 31.4 mm, between Japan and Taiwan, 800-900 m deep, trawled by fishermen from Kyushu, Japan, KF; **11.** Apex of *Phaenomenella inflata* (Shikama, 1971), same as fig. 3; **12.** Apex of *Phaenomenella insulapratensis* (Okutani & Lan, 1994), off Vietnam, trawled by fishermen, KF-1495; **13.** Apex of *Phaenomenella angusta* Fraussen & Hadorn, 2006, holotype, Taiwan, TAIWAN 2000 stn CP27, 22°13.3'N, 120°23.5'E, 326 m, NMNS-5070-001; **14.** Apex of *Phaenomenella mokenorum* Fraussen, 2008, holotype, same as Fig. 14.



Phaenomenella vexabilis sp. nov.

Figs 1-2

Type material. Holotype, 45.3 mm, TAIWAN 2001, stn CP111, NMMBM-008154.

Type locality. Taiwan, Tashi, TAIWAN 2001, stn CP111, 24°52.2'N, 122°04.3'E, 540-700 m.

Range. Only known by the broken (most probably by crab-attack) holotype.

Description. Shell rather large for genus, 45.3 mm in length, thin, fragile, white, broadly fusiform with moderately high spire, whorls convex, siphonal canal short.

Protoconch missing, apex eroded, resulting in shape still suggesting a big apex; subsutural concavity visible. Remaining teleoconch whorls 6 3/4 in number, septum included. Suture deep, forming narrow canal.

Penultimate whorl with 22 spiral cords: 9 adapical rather broad spiral cords, equally spaced, except for 2 slightly finer subsutural cords; 13 abapical spiral cords alternating 1 broad and 3 finer. Interspaces narrow. Most part of body whorl missing, base with numerous equally spaced spiral cords.

Axial sculpture eroded on apex, absent on remaining teleoconch whorls.

Aperture semi-oval, narrow. Columella bently curved, callus thin, smooth. Outer lip broken, thin, without internal lirae. Siphonal canal short, broad, widely open.

Periostracum greenish, well adherent, rather velvety, forming numerous fine incremental lamellae in spiral interspaces.

Animal, radula and operculum unknown.

Comparison. *Phaenomenella vexabilis* sp. nov. is characterized by the fine spiral sculpture with alternating 1 broad and 3 fine spiral cords near the periphery.

The generic placement of this species is based on conchological resemblance with *P. mokenorum* (shape) and *P. inflata* (identical periostracum). The apical sculpture which is characteristic for the genus (a strongly angulated shape) cannot be proved with certainty, but the shape of the eroded apex is very close to similiary eroded specimens of *Ph inflata*.

Phaenomenella mokenorum from NE Indian Ocean is similar in shape but differs by having a slenderer shape with a higher spire, broader spiral cords with narrow interspaces and a straight columella.

Phaenomenella inflata has an identical periostracum and fine axial lamellae in the spiral interspaces but differs by the regular spiral sculpture, a rather conical spire and a smaller adult size.

Etymology. *Phaenomenella vexabilis* sp. nov. is named after the Latin expression *vexabilis* (adj.), meaning "being maltreated" or "exposed to cruelty", which refers to the badly broken shell of the single specimen known yet, witness of a fatal crab attack.

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