

## A New Deep-water Species of *Forestiana* (Crustacea: Decapoda: Brachyura: Xanthidae) from Taiwan, with a Clarification of the Name *F. depressa* (White, 1848)

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**Abstract.** A new species of deep-water xanthid crab, *Forestiana lucius*, is described from Taiwan. The species can easily be distinguished from congeners by its well-developed anterolateral teeth, pigmentation on the chela and form of the male first gonopod. This is the fifth species of *Forestiana* described and the only one known from deep water. *Pilumnus granulatus* Krauss, 1843, is the senior subjective synonym of *Xantho depressus* White, 1848, the type of *Forestiana* Guinot & Low, 2010, and the species should now be known as *Forestiana granulata* (Krauss, 1843).

### Introduction

Guinot (1976: 260), in her reappraisal of the Actaeinae Alcock, 1898, redefined several genera using diagnostic characters based on the male thoracic sternum. This included *Forestia* Guinot, 1976, which was defined mainly on its elongated male anterior thoracic sternum (sternites 1–4), the male sternoabdominal cavity reaching to only about a third the length of thoracic sternite 4, and the presence of a longitudinal groove on male thoracic sternite 4 anterior of the sternoabdominal cavity. Guinot & Low (2010) later noted that the name *Forestia* Guinot, 1976, was preoccupied by *Forestia* Trinchese, 1881 (Mollusca) and proposed *Forestiana* as a replacement name. Four species of *Forestiana* are now known: *F. abrolhensis* (Montgomery, 1931), *F. depressa* (White, 1848) (type species by designation), *F. pascua* (Garth, 1985) and *F. scabra* (Odhner, 1925), all from the Indo-Pacific. Recently, a specimen of a new *Forestiana* collected from off deep-water port was obtained in northeastern Taiwan. The description of the new species and comparisons with congeners form the basis of the present paper.

### Methods

The terminology used follows that used in Serène (1984). The abbreviations G1 and G2 are used for the male first and second gonopods, respectively. Measurements provided, in millimetres, are of the carapace width and length, respectively. The type specimen is deposited in the National Taiwan Ocean University (NTOU), Keelung, Taiwan.

### Taxonomy

#### *Forestiana* Guinot & Low, 2010

*Forestia* Guinot, 1976 (type species *Xantho depressus* White, 1848, by original designation; name preoccupied by *Forestia* Trinchese, 1881 [Mollusca]; gender feminine)  
*Forestiana* Guinot & Low, 2010 (replacement name for *Forestia* Guinot, 1976; gender feminine)

**Remarks.** The name of the type species, *Xantho depressus* White, 1848b (type locality Philippines), needs to be clarified. This taxon has two synonyms: *Pilumnus granulatus* Krauss, 1843 (type locality South Africa), and *Pilumnus planus* Edmondson, 1931 (type locality Hawai'i) (cf. Odhner 1925,

Takeda 1980). While *Pilumnus granulatus* Krauss, 1843, predates *Xantho depressus* White, 1848, as was highlighted by Odhner (1825), the former name has never been used. Odhner (1925: 38) commented that “KRAUSS hat indessen wirklich ein kleines Exemplar der betreffenden Form unter einem anderen Namen beschrieben, nämlich als *Pilumnus granulatus* (Stg. M.), welcher Artname jedoch in Verbindung mit *Actaea* nicht verwendet werden kann”. This was probably because the type species of *Actaea* De Haan, 1833, was *Actaea granulata* (Audouin, 1826). However, because this species was originally described in *Cancer*, i.e. as *Cancer granulatus* Audouin, 1826, this name is a junior primary homonym of *Cancer granulatus* Linnaeus, 1758 (which is today a species of *Calappa*, Calappidae) (see discussion in Guinot & Cleve 2011: 112–115). As such, the name *Cancer savignii* H. Milne Edwards, 1834, a junior synonym *Cancer granulatus* Audouin, 1826, has to be used instead, and the species is now known as *Actaea savignyi* (H. Milne Edwards, 1834) (see Ng *et al.* 2008: 194). In any case, *Pilumnus granulatus* Krauss, 1843, is no longer regarded as a member of *Actaea*, as it was during Krauss’ (1843) time. Under the terms of Articles 59.2 and 60.2.1 of the Code (ICZN, 1999), *Pilumnus granulatus* Krauss, 1843, is now an available name as it is currently classified in *Forestiana* Guinot & Low, 2010. There is thus no reason to continue using *Xantho depressus* White, 1848, over *Pilumnus granulatus* Krauss, 1843 (cf. Guinot 1976, Ng *et al.* 2008); and the species should now be known as *Forestiana granulata* (Krauss, 1843). The type species for *Forestiana* Guinot & Low, 2010, however, remains as *Xantho depressus* White, 1848, a junior subjective synonym of *Pilumnus granulatus* Krauss, 1843.

***Forestiana lucius*, sp. nov.**

Figs. 1–4

**Material examined.** Male holotype (12.7 × 9.3 mm) (NTOU), Tashi deep-water port, from deep water greater than 200 m, Ilan Province, northeastern Taiwan, via trawlers, coll. T.-Y. Chan, 19 September 2011.

**Diagnosis.** Carapace 3M separated by submedian longitudinal groove, frontal margin distinctly bilobate (Figs. 1, 2A, B); external orbital tooth low, forming broad tuberculate lobe with low first anterolateral tooth; rest of margin with 3 well-developed sharp, triangular teeth, third tooth smallest (Figs. 1, 2A); third maxilliped with quadrate merus, anteroexternal angle acute (Fig. 3D); pigmentation on pollex extends to more than half length of palm, forming transverse band across inner surface (Fig. 3F–I); merus, carpus and propodus of ambulatory legs covered with granules and long, short stiff setae which do not obscure surface (Figs. 1, 3E); male abdomen transversely narrow, somite 6 rectangular, lateral margins sinuous, longer than telson (Figs. 3A, 4A); G1 gently sinuous, distal part distinctly hooked with sharply tapering tip, subdistal surfaces with long simple setae and spinules (Fig. 4B–D).

**Description.** Carapace wider than long; dorsal surface of carapace evenly convex longitudinally and transversely; regions clearly demarcated, separated by distinct grooves, regions covered with numerous granules of varying sizes, those on posterior areas relatively smaller; 3M separated by submedian longitudinal groove (Figs. 1, 2A). Frontal margin distinctly bilobate, lobes separated by deep U-shaped cleft; margins lined by small granules; lateral lobe acutely triangular, clearly separated from frontal margin by low cleft; supraorbital margin granulated; orbit ovate; eye completely filling orbit; peduncle elongated, cornea relatively large, completely pigmented (Figs. 1, 2A, B). External orbital tooth low, tuberculate; not clearly demarcated from first anterolateral tooth, together forming broad tuberculate lobe (Figs. 1, 2A). Anterolateral margin arcuate, with 3 distinct, well-developed sharp, triangular teeth, third tooth smallest; lateral margins and dorsal surfaces covered with small granules; clearly demarcated from gently concave posterolateral margins (Figs. 1, 2A). Posterior carapace margin gently sinuous, granulated; with submarginal row of small granules anterior to it (Figs. 2A, 3C). Suborbital margin distinctly granulated, inner tooth low, broad; pterygostomian, subhepatic and suborbital regions granulated (Figs. 2B). Antennules folding almost laterally; antenna with basal article quadrate, covered with 1 large and 1 small sharp granule, mobile; flagellum short, at



**Fig. 1.** *Forestiana lucius* sp. nov., male holotype 12.7 × 9.3 mm (NTOU), Taiwan. Color in life (photograph courtesy of T.-Y. Chan).

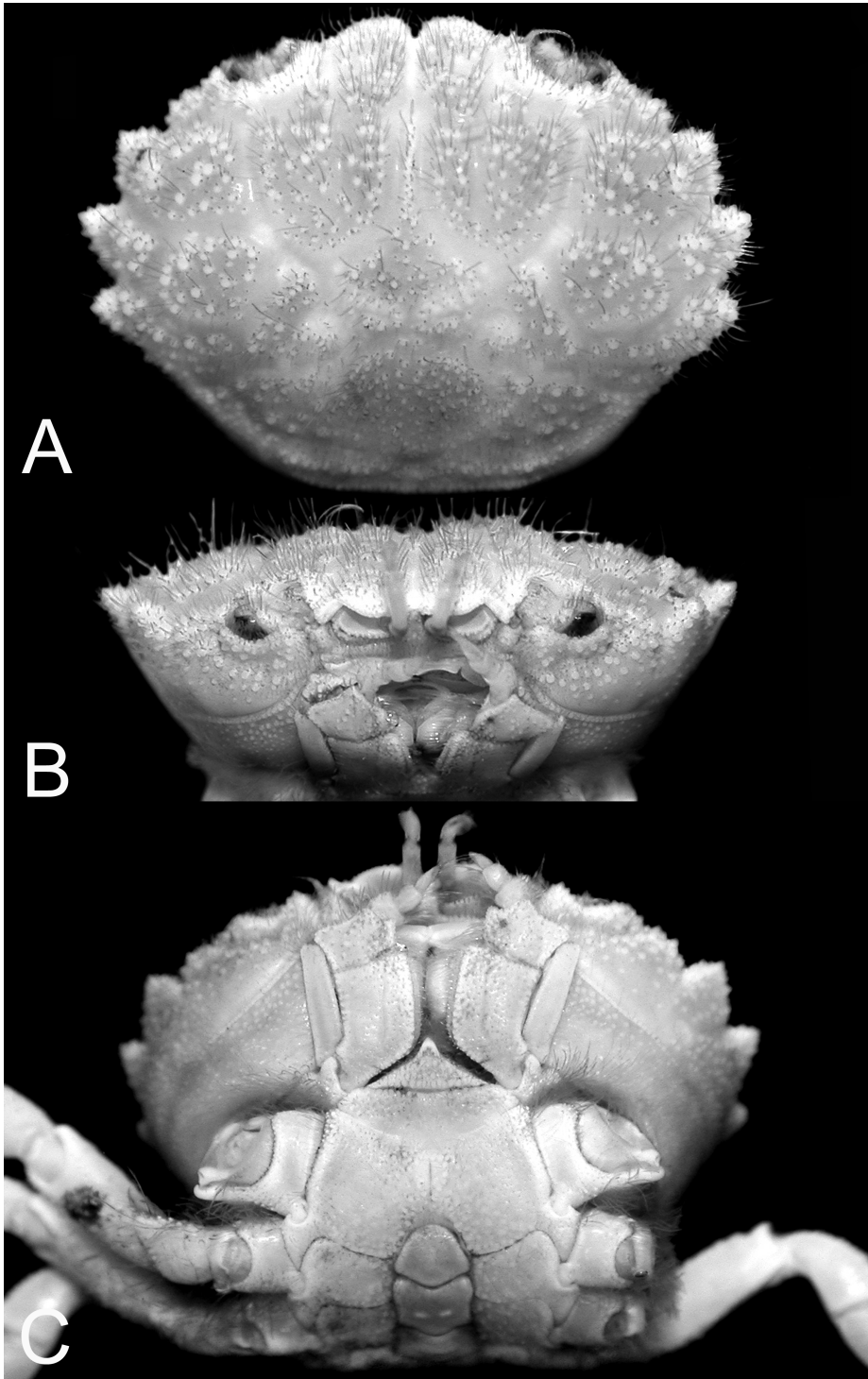
base of orbital hiatus (Fig. 2B). Epistome transversely rectangular; posterior margin sinuous with with broad median triangle separated by deep median fissure, lateral margins concave; endostome smooth, without ridge (Fig. 2B).

Third maxilliped relatively short; ischium subrectangular, with shallow submedian sulcus, inner margin dentate, margins and adjacent areas granulated; merus quadrate, margins and adjacent areas granulated, median art with several rounded granules, anteroexternal angle acute; exopod stout, distal end reaching to just before distal margin of merus, inner margin with subdistal tooth, flagellum elongate, as wide as merus (Fig. 3D).

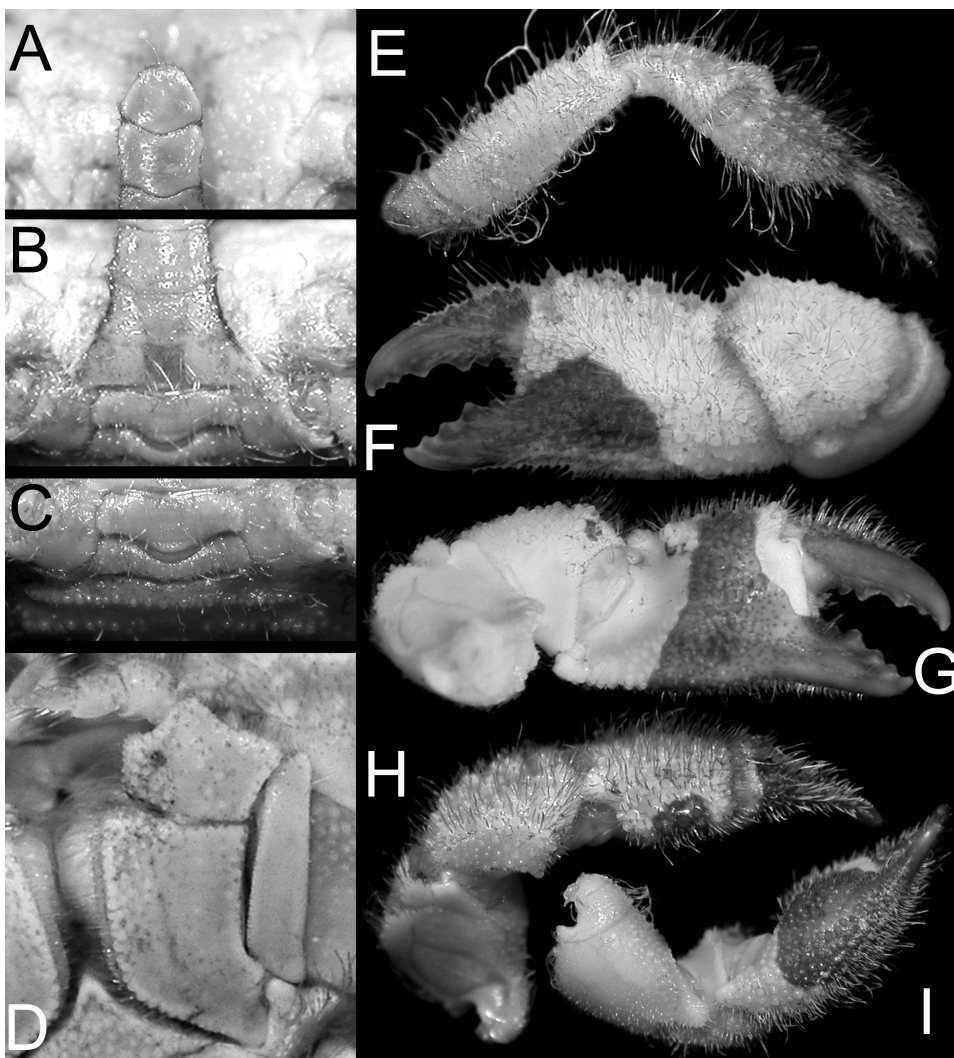
Only one cheliped present; outer surfaces with numerous tubercles and granules, with numerous interspersed long and short stiff setae which do not obscure margins or surfaces; inner surfaces relatively smooth (Fig. 3F–I). Basis-ischium lined with small granules; merus short, rounded; carpus ovate, inner angle with numerous rounded granules (Figs. 1, 3F–I). Chelae short, stout, fingers shorter than palm, pigmented black; pigmentation on pollex extending into outer and inner surfaces of palm, outer part forming large triangular patch on distal half of chela, inner part reaching to 2/3 of palm and extending dorsally to margin to form band-like pattern (Figs. 1, 3F–I). Pollex with 3 longitudinal grooves; cutting edge with 5 teeth; tip sharp; dactylus with 2 longitudinal ridges, proximal half of upper margin distinctly granulated, cutting edge with 4–6 teeth of various sizes, tip sharp (Figs. 3F–I).

Ambulatory legs relatively short, stout; second pair longest; fourth pair shortest; surfaces covered with long and short stiff setae which do not obscure surface (Figs. 1, 3E). Basis-ischium surface with small granules. Outer surfaces of merus, carpus and propodus covered with small tubercles or granules (Figs. 1, 3E). Merus dorsal margin armed with numerous sharp granules; ventral margin with smaller sharp granules (Figs. 1, 3E). Dorsal margin of carpus granulated, ventral margin smooth (Fig. 3E). Dorsal margin of propodus tuberculated, ventral margin of carpus with sharp tubercles (Figs. 1, 3E). Dactylus gently curved to almost straight, surface covered with setae; no dactylo-propodal lock discernible (Figs. 1, 3E).

Anterior thoracic sternum elongated, surface distinctly pitted, granulated; sternites 1 and 2 completely fused, triangular, with gently concave lateral margins; separated from sternite 3 by deep



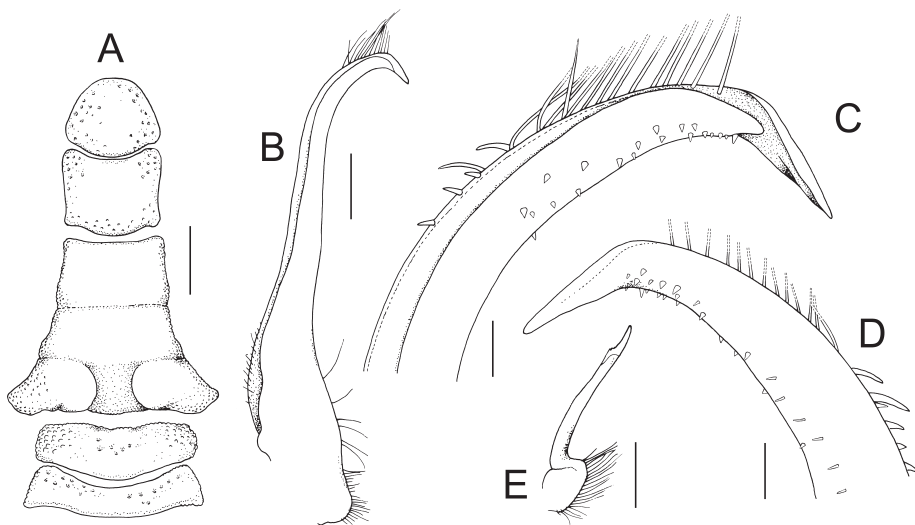
**Fig. 2.** *Forestiana lucius* sp. nov., male holotype  $12.7 \times 9.3$  mm (NTOU), Taiwan. **A**, dorsal view of carapace; **B**, frontal view of carapace; **C**, ventral view showing anterior thoracic sternum and abdomen.



**Fig. 3.** *Forestiana lucius* sp. nov., male holotype 12.7 × 9.3 mm (NTOU), Taiwan. **A**, male abdominal somite 6 and telson; **B**, male abdominal somites 2–5; **C**, male thoracic somites 1 and 2, and posterior margin of carapace; **D**, left third maxilliped; **E**, right fourth ambulatory leg; **F**, outer view of left chela; **G**, inner view of left chela; **H**, dorsal marginal view of left chela; **I**, ventral marginal view of left chela.

suture; sternites 3 and 4 fused but lateral sutures between them just visible, with shallow submedian grooves discernible; sternite 4 with distinct long, deep longitudinal groove (median line) anterior of sternoabdominal cavity, lateral surfaces granulated; sutures between sternites 4–6 medially interrupted; sutures between sternites 6–8 complete; longitudinal groove (median line) present between sternites 6–8; median part of sternite 6 constricted, very narrow compared to wider median parts of sternites 7 and 8 (cf. pattern 3 of Guinot *et al.* 2013: 263); sternoabdominal cavity reaching to ca. 1/3 length of fused sternites 3 and 4; surfaces near sutures and cavity distinctly granulated, other surfaces pitted to smooth (Fig. 2C). Male abdominal locking mechanism is short peg-like process on anterior third of sternite 5.

Male abdomen transversely narrow; surfaces of somites 1–5 pitted with lateral margins granulated (Figs. 3B, C, 4A). Somites 1 and 2 longitudinally narrow, completely covering surfaces of tho-



**Fig. 4.** *Forestiana lucius* sp. nov., male holotype 12.7 × 9.3 mm (NTOU), Taiwan. **A**, male abdomen; **B**, ventral view of left G1; **C**, ventral view of distal part of left G1; **D**, dorsal view of distal part of left G1; **E**, left G2. Scales: A = 1.0 mm; B, E = 0.5 mm; C, D = 0.1 mm.

racic sternum between coxae of last pair of ambulatory legs, sternite 8 completely covered; somites 3–5 completely fused, median sutures barely visible; lateral margins concave; somite 6 rectangular, lateral margins sinuous; slightly longer than telson; telson triangular, lateral margins gently convex, tip rounded (Figs. 3A–C, 4A).

G1 elongate, gently sinuous, distal part distinctly hooked, tip sharply tapering, subdistal surfaces with long simple setae and spinules (Figs. 4B–D). G2 short, ca. a third length of G1; proximal part sinuous, distal part spatuliform (Fig. 4E).

**Color.** In life (Fig. 1), the carapace, outer surfaces of the cheliped and parts of the ambulatory legs are bright orange. The posterior part of the carapace and ventral surfaces are white. The dark brown pigmentation on the fingers extends substantially into the palm.

**Etymology.** *Lucius*: named in honor and the memory of Lucius Gilbert Eldredge — an old friend, esteemed colleague and fellow carcinologist, whose many contributions in marine biology as well as his stewardship of the Pacific Science Association have left an indelible mark on Pacific science. Lu's extensive explorations of the Pacific included Taiwan, and it is therefore appropriate that this new species is named after him. His first name is here used as a noun in apposition.

**Remarks.** Serène (1984: 103) established *Meractaea* Serène, 1984, a genus which has a male thoracic sternum similar to that of *Forestiana* but the carapace is proportionately broader, the regions have strong rounded tubercles without setae, the ambulatory legs are proportionately longer and the median part of the merus of the third maxilliped has a prominent median tubercle or swelling (cf. Serène 1984; Davie 1993, 1997). The present new species is referred to *Forestiana* because the dorsal surfaces of the carapace are covered with small granules and scattered setae (Figs. 1, 2A, B), the ambulatory meri are relatively short (Figs. 1, 3E) and merus of the third maxilliped has no median swelling or tubercle (Fig. 3D).

All known *Forestiana* species are relatively shallow water species and have been collected in waters less than a hundred metres. *Forestiana granulata* has been reported from South Africa to Philippines, Japan, and Hawai'i; *F. scabra* is known from Malaysia, Sunda Islands, Vietnam and Australia; while *F. abrolhensis* has been found in Australia and Zanzibar (see Guinot, 1976; Serène,

1984). *Forestiana lucius* sp. nov. is unusual because it was trawled from waters below 200 m. In this respect, *F. lucius* has similar habits to species of *Meractaea* which are found at depths 100 m and deeper (see Serène 1984; Davie 1993, 1997; Komatsu & Takeda 2011).

*Forestiana lucius* can be distinguished from *F. abrolhensis*, *F. granulata* and *F. scabra* by its prominently developed anterolateral teeth that are large and dentiform (Figs. 1, 2A) (vs. low and rounded in the above three species, see Guinot 1976: pl. 18 figs. 1–3). In its well-developed anterolateral teeth, *F. lucius* resembles *F. pascua* (from Easter Island), which is known only from a female specimen. However, *F. lucius* can be separated from *P. pascua* in having the dorsal surface of the carapace (especially the posterior part) more prominently granulated (Figs. 1, 2A) (granules more sparse with the posterior part almost smooth in *F. pascua*, see Garth 1985: fig. 1); the anteroexternal angle of the merus of the third maxilliped more acute (Fig. 3D) (vs. more rounded in *F. pascua*, see Garth 1985: fig. 4); and the fingers of the chela are pigmented black with the pigmentation extending into a large part of the palm (Figs. 1, 3F–I) (vs. fingers brown with the pigmentation not extending to the palm in *F. pascua*, see Garth 1985: figs. 2, 3). The pigmentation pattern on the chela in *F. lucius* is the most extensive in any of the known *Forestiana* species. *Forestiana granulata* and *F. abrolhensis* have the pigmentation on the pollex extending partially onto the lower part of the palm (see Guinot 1976: pl. 18, fig. 1; Serène 1984: pl. 15, fig. D) while in *F. scabra*, it is restricted to the fingers (see Guinot 1976: pl. 18, fig. 2; Serène 1984: pl. 15, fig. E).

The G1 of *F. granulata* and *F. scabra* are quite different, with the distal part gently curved upwards (Guinot 1976: figs. 45a–c) while in *F. lucius*, it is distinctly hooked (Figs. 4B–D). *Forestiana abrolhensis* and *F. pascua* are only known from females.

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