

The genus *Echinofabricia* (Annelida: Fabriciidae) in the Mediterranean Sea with the description of *E. rousei* sp. nov.

ADRIANA GIANGRANDE¹, MARGHERITA LICCIANO¹ AND ALBERTO CASTELLI²

¹Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, Università del Salento, CoNISMa, I-73100 Lecce, Italy,

²Dipartimento di Biologia, Università di Pisa, Via Derna, 1. I-56126 Pisa, Italy

The new species Echinofabricia rousei is described for the Mediterranean Sea based on specimens collected along the Sardinia Coast (Porto Conte). The genus Echinofabricia is reported for the first time in the Mediterranean area. At present three species are described within the genus: E. goodhartzorum, described from the Caribbean, E. dubia, described from the East Pacific (Hawaii) and E. alata from Australia.

Keywords: Annelida, Fabriciidae, *Echinofabricia rousei*, Mediterranean Sea

Submitted 18 September 2012; accepted 2 March 2013; first published online 15 April 2013

INTRODUCTION

Fabriciidae is a family composed of small sized polychaetes with a worldwide marine distribution. Most of the species inhabit shallow waters or are intertidal on hard substrates. Few species are known from depths of up to 100 m, and the only species, *Raficiba barryi*, is known from continental shelf depths (317–335 m).

Until recently, Fabriciidae was regarded as a subfamily, Fabriciinae Rioja (1923), within Sabellidae Latreille, 1825. Fitzhugh (1989) conducted the first cladistic analysis of Sabellidae showing series of synapomorphies supporting the monophyly of newly formulated Fabriciinae and Sabellinae Chamberlin, 1919 subfamilies. However, synapomorphies grouping Fabriciinae and Sabellinae together as Sabellidae were limited. Based on molecular data, Kupriyanova & Rouse (2008) subsequently showed that Serpulidae Rafinesque (1815) is the sister group to Fabriciinae, with Sabellinae being the sister group to this assemblage. The inclusion of Serpulidae as a subfamily of Sabellidae would have led to radical changes to the taxonomy within Serpulidae, so these authors removed Fabriciinae from Sabellidae and gave the taxon the rank of family (i.e. Fabriciidae).

Following the systematic revision by Fitzhugh (1989), the monophyly of Fabriciidae is supported by a series of morphological synapomorphies. The relationships among genera have then been explored using morphological data in a series of papers by Fitzhugh *et al.* (1994) and Fitzhugh (1990, 1991, 1995, 1996, 1998, 1999, 2001, 2002). In addition, a further series of potential apomorphies for the taxon was identified by Rouse (1995a) based on reproductive characters.

The genus *Echinofabricia* was recently described by Huang *et al.* (2011), who conducted an integrative analysis based on

50 morphological characters and three nuclear sequence markers. This genus is the sister group to *Manayunkia* and is located in the most plesiomorphic area of the phylogenetic Fabriciidae tree. It is easily recognizable for the presence of four abdominal chaetigers, epidermal emergent spicules on the epithelium surface, and peristomial spermathecae in females.

In the present paper we describe a new species belonging to the *Echinofabricia* genus which is reported for the first time in the Mediterranean area.

MATERIALS AND METHODS

Examined material was present in the authors' collection and derived from faunistic work conducted at Porto Pozzo (Sardinia) during 1987. Samples were collected with a Van Veen Grab, fixed in 4% formalin and then preserved in 70% alcohol. One specimen was fixed for scanning electron microscopy (SEM) in 2.5% glutaraldehyde, dehydrated in a graded alcohol series, gold coated after critical point drying, and examined with a Phillips 505 scanning microscope. Holotype is deposited at the MNCN (Museo Nacional de Ciencias Naturales, Madrid, Spain). Paratypes are deposited at the PCZL (Polychaete collection at the Zoological Laboratory of Lecce).

SYSTEMATICS

Family FABRICIIDAE Kupriyanova and Rouse 2008
Genus *Echinofabricia* Huang, Fitzhugh and Rouse 2011
Echinofabricia rousei sp. nov.
(Figures 1 and 2)

TYPE MATERIAL

Holotype: a complete specimen preserved in 70% ethanol. Total length 4 mm and 0.4 mm wide, crown 1.00 mm. Porto Pozzo (Sardinia); 41.12°N 9.16°E, 6 m sand with *Caulerpa prolifera* (MNHN 16.01/14318.); July 1987.

Corresponding author:

A. Giangrande

Email: Adriana.giangrande@unisalento.it

Paratype: a complete specimen preserved in 70% ethanol. Total length 3.8 mm and 0.4 mm wide, crown 0.9 mm. Porto Pozzo (Sardinia); 41.12'N 9.16'E, 6 m sand with *Caulerpa prolifera*.

ADDITIONAL MATERIAL

One specimen from the same locality, one specimen from the Gulf of Naples collected on hard bottom at 2 m depth. Coll. M. Cristina Gambi, 2004.

DIAGNOSIS

Body with eight thoracic segments and four abdominal segments. Epithelium of most of the body surface with emergent spicules (upon fixation) that may splay out. Branchial crown with three pairs of radioles, each radiole with 5–6 pairs of pinules terminating at the same height. Branchial hearts present, but poorly developed (Figure 1A, B). Ventral filamentous appendage at ventral margin of each branchial lobe,

vascularized, unbranched, about half of the length of radioles (Figure 1A, B). Dorsal lips well developed, triangular ridges with dorsal margins separated from proximalmost pinnules of dorsal radioles (Figure 1D). Anterior peristomial ring dorsally shorter than posterior peristomial ring. Anterior margin of anterior peristomial ring with a wide subsquared ventral lobe (Figure 1B). Superior thoracic notochaetae elongate, narrowly hooded (Figure 1E), three chaetae per fascicle (Figure 2A). Inferior thoracic notochaetae of all chaetigers elongate and narrowly hooded (Figure 1E), six per fascicle (Figure 2A). Pseudospatulate absent. Acicular thoracic uncini in chaetigers 2–8, 8–9 per fascicle (Figure 2B), with dentition above main fang present as a series of uniformly small teeth (Figure 2C), appearing as a hood and difficult to see under light microscope (Figure 1C). Abdominal neuropodia with elongate narrowly hooded chaetae (Figure 1F), 2–3 per fascicle. Abdominal uncini with dentate region with 10–11 teeth in profile, 5–6 teeth per row and with a manubrium

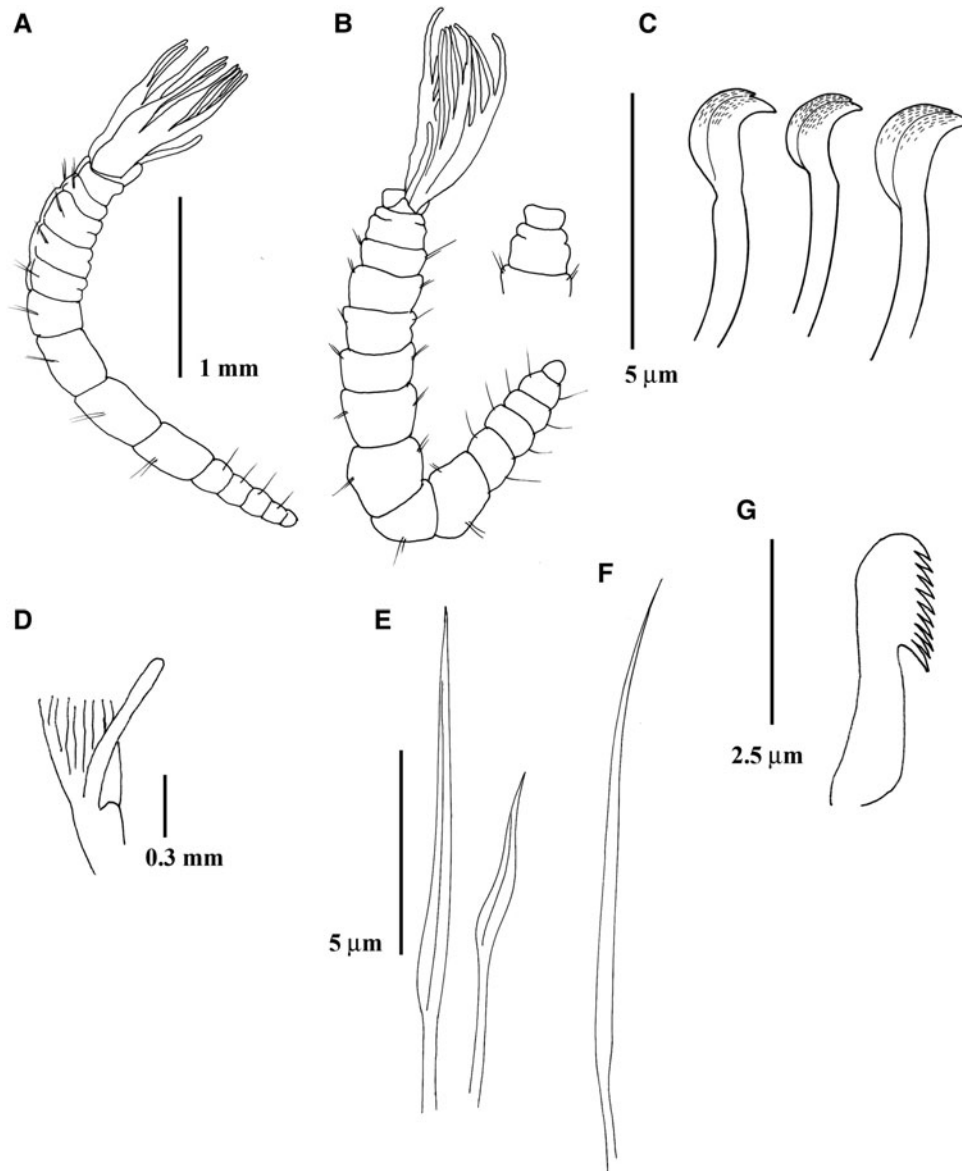


Fig. 1. *Echinofabricia rousei* sp. nov. (A) entire worm, lateral view; (B) entire worm, dorsal view, and close-up of ventral view of the anterior end; (C) thoracic uncini; (D) part of radiolar crown showing a dorsal lip and an unbranched vascularized ventral filamentous appendage; (E) superior and inferior thoracic chaetae; (F) abdominal chaeta; (G) abdominal uncinus.

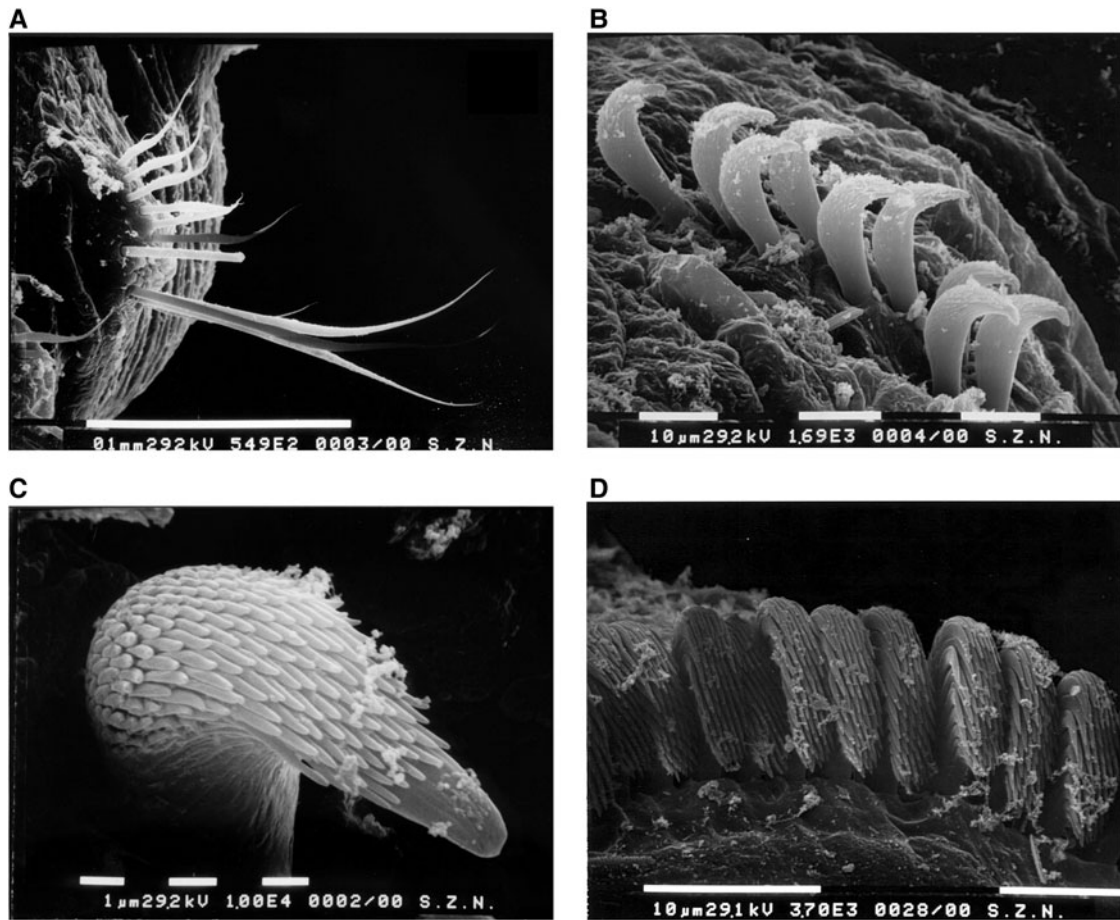


Fig. 2. *Echinofabricia rousei* sp. nov. Scanning electron microscopy photographs: (A) thoracic chaetae; (B) thoracic uncini; (C) details of thoracic uncinus head; (D) abdominal uncini.

about two times as long as dentate region (Figures 1G & 2D). From 21 to 33 abdominal uncini in each torus. Peristomial and pygidial eyes absent.

ETYMOLOGY

The species was named after Gregory Rouse (Scripps Institution of Oceanography) who made significant contribution to the study on Sabellidae and Fabriciidae.

REMARKS

According to Fitzhugh (1989), this genus is very distinctive in that its species produces calcareous spicules over the body surface. This feature, however, was not so evident in the Mediterranean material, probably due to the bad preservation. The same can be true for the absence of eyes which usually are visible only in live material (Huang *et al.*, 2011). The genus is also distinctive in having four abdominal chaetigers. The number of abdominal chaetigers may be size related, with smaller specimens having three chaetigers, while larger ones have four. However, the specimens of *E. cf. dubia* described by Rouse (1995b) (= *A. alata*), which were very small sized though sexually mature, showed four chaetigers. Due to the bad preservation of the Mediterranean material it was impossible to distinguish the spermathecae, or to establish the sex of the specimens. Lastly, another peculiar feature of the genus is the shape of thoracic uncini where teeth above the main fang are very numerous and uniform in size, imparting a very

characteristic shape to the distal ends. This feature was considered the plesiomorphic type of thoracic uncinus within the Fabriciidae (Fitzhugh, 1998).

This is the first finding of this genus in the Mediterranean Sea. The presently described material was collected in the Mediterranean about 25 years ago, and due to its peculiarity, it was hypothesized that it was a new genus closely related to *Augeneriella dubia* described by Hartmann-Schröder (1965) (Giangrande, personal observation). At that time it was impossible to examine Hartmann-Schröder's material, however Fitzhugh (1989) confirmed that *A. dubia* belonged to this new taxon. The genus was partially described by Fitzhugh (1989) under the name of Genus A and has always been referred to subsequently under this name. After the Fitzhugh revision, another *Augeneriella* species was described from the Great Barrier Reef (Hartmann-Schröder, 1991) as *A. alata* on the basis of a single specimen, which was proved to belong to the *Echinofabricia* genus as well (Huang *et al.*, 2011). At present three species belong within the genus: *E. goodhartzorum* Huang *et al.*, 2011, described for the Caribbean, *E. dubia* (Hartmann-Schröder, 1965) described for the East Pacific (Hawaii) and *E. alata* (Hartmann-Schröder, 1991) for Australia.

The Mediterranean material differs from *E. goodhartzorum* and *E. dubia* in more squared ventral peristomial lobe, in the larger number of abdominal uncini having a shorter manubrium, and in the larger number of inferior thoracic chaetae.

It differs from *E. goodhartzorum* also in the longer unbranched ventral filamentous appendage. Lastly, it differs from *E. alata* in the distribution of denticles over the main fang of the thoracic uncini, that in the Mediterranean specimens leave only a small portion not covered. Moreover, Mediterranean specimens have a number of thoracic chaete and abdominal uncini different from that reported for *E. alata* (33 uncini with 10 teeth vs 21 uncini with 7 teeth) and a bigger size.

REFERENCES

- Fitzhugh K.** (1989) A systematic revision of the Sabellidae–Caobangidae–Sabellongidae complex (Annelida: Polychaeta). *Bulletin of the American Museum of Natural History* 192, 1–104.
- Fitzhugh K.** (1990) Revision of the Fabriciinae genus *Fabriciola* Friedrich, 1939 (Polychaeta: Sabellidae). *Zoologica Scripta* 19, 153–164.
- Fitzhugh K.** (1991) Further revisions of the sabellidae subfamilies and cladistic relationships among the Fabriciinae (Annelida: Polychaeta). *Zoological Journal of the Linnean Society* 102, 305–332.
- Fitzhugh K.** (1995) Additions to the description of the fanworm genus *Pseudofabricia* Cantone, 1972 (Polychaeta: Sabellidae: Fabriciinae). *Contributions in Science* 456, 1–6.
- Fitzhugh K.** (1996) New fanworm species (Polychaeta: Sabellidae: Fabriciinae) in the genus *Pseudofabriciola* Fitzhugh. *Journal of Natural History* 30, 1267–1286.
- Fitzhugh K.** (1998) New fan worm genera and species (Polychaeta, Sabellidae, Fabriciinae) from the western Pacific, and cladistic relationships among genera. *Zoologica Scripta* 27, 209–245.
- Fitzhugh K.** (1999) New fanworm species (Polychaeta: Sabellidae: Fabriciinae) from Phuket, Thailand, with comments on *Fabriciola flammula* Rouse and *Fabriciola cri* Rouse. *Contributions in Science* 477, 1–17.
- Fitzhugh K.** (2002) New species of *Fabricinuda* Fitzhugh and *Pseudofabriciola* Fitzhugh (Polychaeta: Sabellidae: Fabriciinae), with an emendation of *Pseudofabriciola australiensis* (Hartmann-Schröder). *Journal of Natural History* 36, 893–925.
- Fitzhugh K.** (2001) A new deep-water genus and species of Fabriciinae fanworm (Polychaeta: Sabellidae) from Antarctica. *Contributions in Science* 491, 1–8.
- Fitzhugh K., Giangrande A. and Simbora N.** (1994) New species of *Pseudofabriciola* Fitzhugh, 1990 (Polychaeta: Sabellidae: Fabriciinae) from the Mediterranean Sea. *Zoological Journal of the Linnean Society* 110, 219–241.
- Hartmann-Schröder G.** (1965) Zur Kenntnis der eulitoralen Polychaetenfauna von Hawaii, Palmyra und Samoa. *Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins zu Hamburg* 9, 81–161.
- Hartmann-Schröder G.** (1991) Teil 16. Die Polychaetes der subtropisch-tropischen bis tropischen Ostküste Australiens Zwischen Maclean (New South Wales) und Gladstone (Queensland) sowie von Heron Island (Großes Barriere-Riff). In Hartmann-Schröder G and Hartmann G. (eds) *Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* 88, 17–71.
- Huanga D., Fitzhugh K. and Rouse G.W.** (2011) Inference of phylogenetic relationships within Fabriciidae (Sabellida, Annelida) using molecular and morphological data. *Cladistics* 27, 356–379.
- Kupriyanova E.K. and Rouse G.W.** (2008) Yet another example of paraphyly in Annelida: molecular evidence that Sabellidae contains Serpulidae. *Molecular Phylogenetics and Evolution* 46, 1174–1181.
- Rioja E.** (1923) Estudio sistemático de las especies ibéricas del suborden Sabelliformia. *Trabajos del Museo Nacional de Ciencias Naturales Madrid (Serie Zoologica)* 48, 1–144.
- Rouse G.W.** (1995a) Is sperm ultrastructure useful in polychaete systematics? An example using 20 species of the Fabriciinae (Polychaeta: Sabellidae). *Acta Zoologica (Stockholm)* 76, 57–74.
- and
- Rouse G.W.** (1995b) Spermathecae of *Fabricia* and *Manayunkia* (Sabellidae, Polychaeta). *Invertebrate Biology* 114, 248–255.

Correspondence should be addressed to:

A. Giangrande
 Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, Università del Salento, Via Provinciale Lecce-Monteroni 73100 Lecce, Italy.
 email: Adriana.giangrande@unisalento.it