

Species of *Fabriciola* Friedrich, 1939 (Polychaeta: Sabellidae: Fabriciinae), from the California Coast¹

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ABSTRACT: *Fabriciola berkeleyi* Banse is the only species of *Fabriciola* reported from the California coast. It was described by Hartman as *Fabricia berkeleyi* in her Atlas of Sedentariate Polychaetous Annelids from California. Hartman's specimens are redescribed and compared to the type specimens from British Columbia. California specimens differ from type specimens in that the former have abdominal neuropodial pin-head setae and the extent of body pigmentation is more restricted. Because the type series is in poor condition, the California specimens are referred to *F. cf. berkeleyi* until better comparative material from the type locality can be examined. A new species from southern California, *Fabriciola brevibranchiata*, is described. Current cladistic relationships among *Fabriciola* species are discussed.

THE SABELLID POLYCHAETE GENUS *Fabriciola* Friedrich, 1939, is only known from the California coast through the occurrence of *F. berkeleyi* Banse, 1956, based on material described by Hartman (1969:691, as *Fabricia berkeleyi*) from "estuarine and intertidal muds..." At the time of my revision (Fitzhugh 1990) of *Fabriciola*, I had not examined Hartman's specimens, noting only that her description was the first to illustrate non-vascularized, ventral filamentous appendages in this species, as well as one of the few (see also Friedrich 1939: fig. 2 and Banse 1959b: fig. 9a) to illustrate such appendages in *Fabriciola*, the synapomorphy for the genus (Fitzhugh 1989, 1990, 1991, in press). My redescription of *F. berkeleyi* was based on the holotype and all paratypes at the U.S. National Museum of Natural History, Smithsonian Institution (USNM). Subsequently, I have had the opportunity to examine an additional paratype as well as the specimens upon which Hartman (1969) based her description. A redescription of Hartman's material is presented here for comparison with specimens from the type locality (British Columbia). In

addition, a new *Fabriciola* species is described from southern California and cladistic relationships among *Fabriciola* species are reviewed. Specimens of both species have been deposited in the Allan Hancock Polychaete Collection of the Los Angeles County Museum of Natural History (LACM-AHF), the Australian Museum, Sydney (AM), and the USNM.

SYSTEMATIC ACCOUNT

Genus *Fabriciola* Friedrich, 1939

Fabriciola cf. berkeleyi Banse, 1956
Figures 1, 2

Fabricia berkeleyi, Hartman, 1969:691–692, figs. 1–6

MATERIAL EXAMINED: Northern California, Casper. Numerous specimens (LACM-AHF Poly 3381), 3 specimens (USNM 139308), 3 specimens (AM W 202519), from among tunicates and *Leucosolenia*-type sponges, 2 July 1934; numerous specimens (LACM-AHF Poly 3383), 1933, collected by O. Hartman.

DESCRIPTION: Complete specimens in good condition with 8 thoracic and 3 abdominal setigers (Figure 1A). Total length about 2.50 mm (branchial crown composing about 0.50 mm of this length); maximal width about

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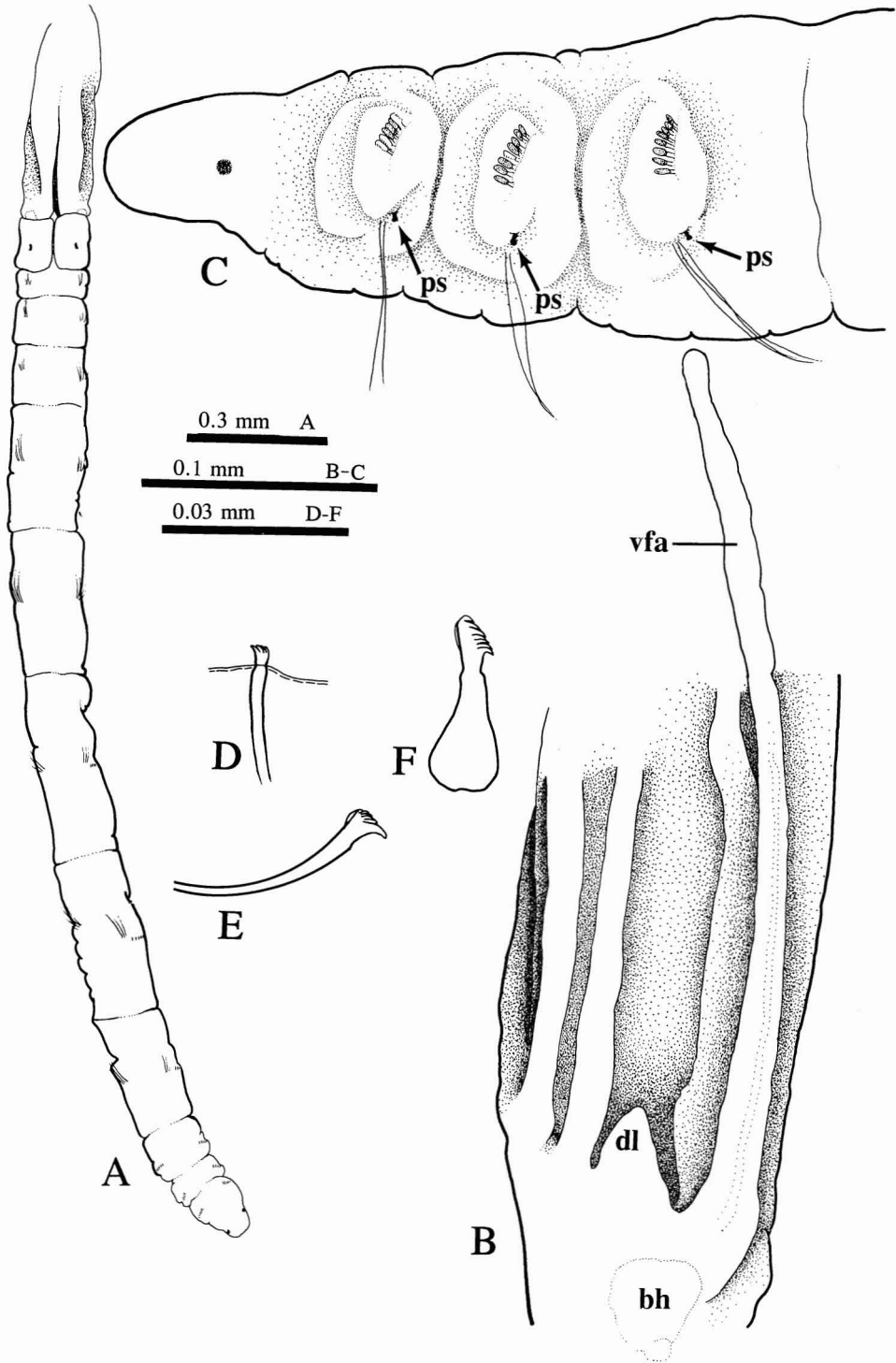


FIGURE 1. *Fabriciella* cf. *berkeleyi* (LACM-AHF Poly 3381): *A*, entire animal in dorsal view; *B*, proximal end, inner margin of left half of branchial crown; *C*, lateral view (right side) of abdominal setigers and pygidium; *D*, abdominal neuropodial pin-head seta from setiger 9; *E*, thoracic uncinus from setiger 4; *F*, abdominal uncinus from setiger 10. Abbreviations: bh, branchial heart; dl, dorsal lip; ps, pin-head setae; vfa, ventral filamentous appendage.

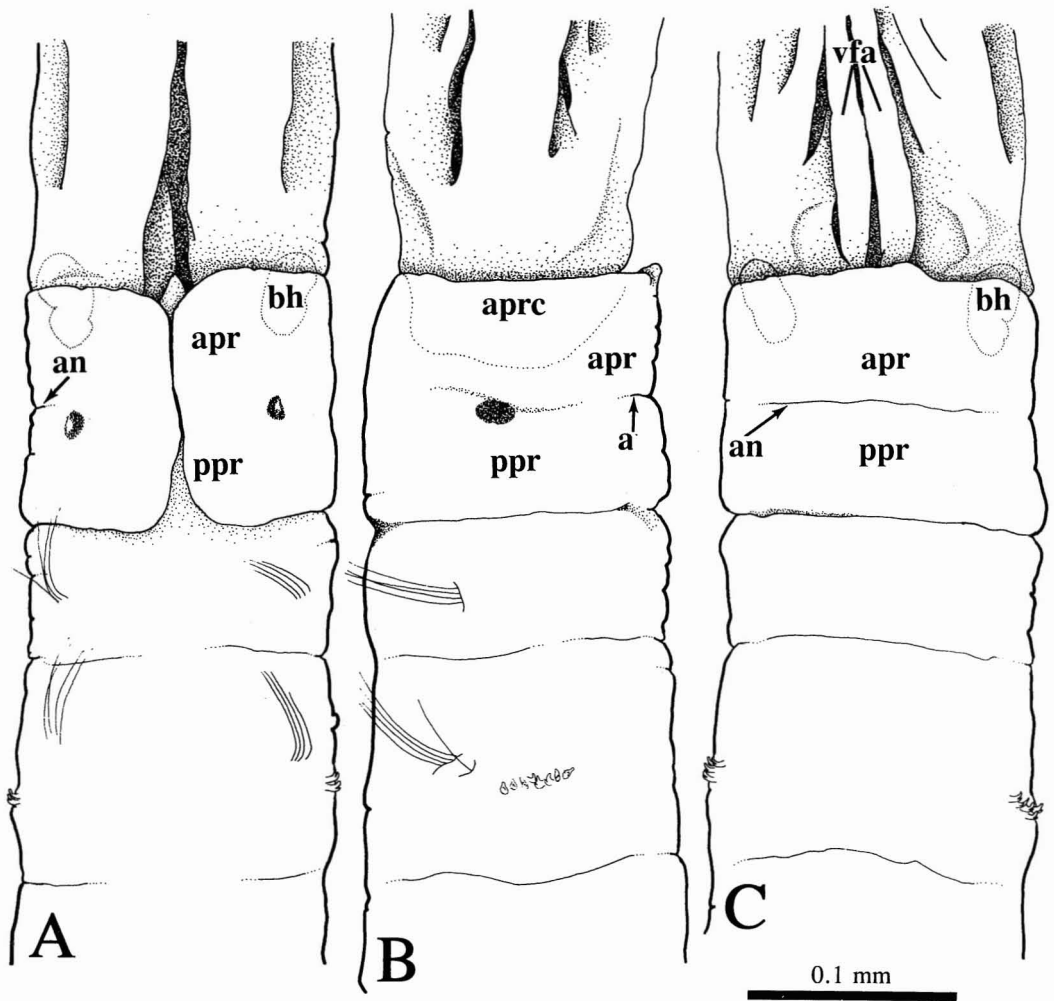


FIGURE 2. *Fabricioloa* cf. *berkeleyi* (LACM-AHF Poly 3381): A–C, dorsal, lateral (right side), and ventral views, respectively, of anterior end. Abbreviations: an, annulation between anterior and posterior peristomial rings; apr, anterior peristomial ring; aprc, anterior peristomial ring collar; bh, branchial heart; ppr, posterior peristomial ring; vfa, ventral filamentous appendages.

0.19 mm. Three pairs of radioles; distal ends filamentous, same width as pinnules. Branchial crown about $\frac{1}{5}$ to $\frac{1}{7}$ total body length. Radioles each with 4–5 pairs of pinnules, all extending to same height as radioles. Dorsal lips erect, triangular, distally blunt (Figure 1B). Ventral lips absent. Ventral filamentous appendages filiform, same length as radioles (Figures 1B, 2C), slightly thickened proximally, gradually narrowing distally to same width as pinnules; surfaces smooth,

ciliated; distal end bluntly rounded. Branchial hearts present (Figures 1B, 2A, 2C). Dorsal margins of branchial lobes not fused. Body cylindrical; width uniform in thorax, abdomen slightly tapered (Figure 1A). Membranous collar of anterior peristomial ring separated middorsally by narrow gap (Figure 2A); collar low, even in height all around (Figure 2); edges smooth. Anterior peristomial ring (including collar) about same length as posterior peristomial ring. Demarcation between

rings evident ventrolaterally and ventrally. Peristomial eyes rounded to crescentic (Figure 2A, B), light brown. Pygidial eyes rounded (Figure 1A, C); very faint, light reddish brown. Setiger 1 about same length as posterior peristomial ring, about $\frac{1}{2}$ length of setiger 2. Setiger 3 slightly longer, almost as long as wide. Setigers 4–7 each distinctly longer than wide; setiger 8 as long as setiger 4. Setiger 9 about $\frac{2}{3}$ length of setiger 8; setigers 10–11 each slightly narrower, shorter. Pygidium about as long as setiger 11 or slightly longer; bluntly rounded. Superior thoracic notosetae elongate, narrowly hooded; 4 per fascicle. Inferior thoracic notosetae of setigers 2–8 short, elongate, narrowly hooded; 1–2 per fascicle. Abdominal neurosetae of two types: superior part of each fascicle with single pin-head seta (sensu Ben-Eliahu 1975; Figure 1C, D) with 4–5 teeth set oblique to main axis, setal shaft slightly constricted at point of emergence through body wall; inferior part of fascicle with 2–3 modified, elongate, narrowly hooded setae. Thoracic neuropodia with 5–8 acicular uncini per fascicle (Figure 1E); in irregular, single rows (Figure 2B); teeth above main fang of equal size; hood present. Manubrium of abdominal uncini slightly constricted below dentate region, expanded proximally to thin, broadly rounded base (Figure 1F); manubrium more than twice length of dentate region; 6–7 teeth in profile, 3–5 teeth per row; 9–10 uncini per fascicle. Pigmentation limited to dorsolateral regions of posterior peristomial ring, extremely faint; remainder of body unpigmented, cream colored. Tubes usually unattached; very firm, about same length as animals or slightly longer; composed of fine detritus. Some adult females brooding 1–2 juveniles in tubes. Methyl green staining produces dark band on posterior $\frac{1}{2}$ of posterior peristomial ring; ventrum of setigers 1–3 and 7–8 staining dark, setigers 4–6 lightly stained; abdomen and pygidium staining dark.

REMARKS: The most notable difference between *Fabriciols berkeleyi* from the type locality (British Columbia) and *F. cf. berkeleyi* is that the latter have pin-head setae in all abdominal setigers (Figure 1C), whereas pin-

head setae have not been found in the former. This observed lack of pin-head setae in specimens from the type locality is, however, only based on the type material, which consists of the holotype and seven paratypes from the USNM (Fitzhugh 1990:157) and a paratype from the LACM-AHF (Poly 0208). None of the type material is in good condition; most specimens have lost their setae and their bodies have turned dark brown and brittle, making it difficult to determine for certain whether pin-head setae were ever present. It is mainly for this reason that I am hesitant to regard the specimens from California as a new species.

The problem of discoloration in the types also makes comparisons with the northern California specimens difficult. Pigmentation in the types does, however, appear to be more extensive, extending from the anterior peristomial rings and into some anterior abdominal setigers. The California specimens have not suffered any discoloration and are in much better condition, yet have very limited pigmentation.

Fabriciols cf. berkeleyi most closely resembles those *Fabriciols* species in which the anterior peristomial ring collar is roughly even in height (e.g., *F. ghardaqa* Banse, 1959a; *F. mediaseta* Fitzhugh, 1990; and *F. berkeleyi*). In terms of the presence of pin-head setae, *F. cf. berkeleyi* is allied with *F. mediaseta* and two indeterminable species (pers. obs.) described by Ben-Eliahu (1975) as *F. cf. baltica* and *F. ghardaqa*.

Fabriciols brevibranchiata Fitzhugh, n. sp.

Figures 3, 4

MATERIAL EXAMINED: Southern California, Point Fermin, mid-tide horizon [sic], among filamentous green algae, 4 October 1949, collected by D. J. Reish. Holotype (LACM-AHF Poly 1534). Paratypes: numerous specimens (LACM-AHF Poly 1535), 5 specimens (USNM 139309), 5 specimens (AM W 202520).

DESCRIPTION: Holotype complete and in good condition, with 8 thoracic and 3 abdominal setigers (cf. Figure 3A). Total length 1.70 mm (branchial crown composing 0.20 mm of this length); maximal width 0.15 mm. Three

pairs of radioles; distal ends filamentous, same width as pinnules. Branchial crown ranging from $\frac{1}{5}$ to $\frac{1}{8}$ total body length. Radioles each with 3–5 pairs of pinnules, all extending to same height as radioles or with proximalmost pinnules slightly shorter. Dorsal lips erect, triangular, distally blunt (Figure 3B). Ventral lips absent. Ventral filamentous appendages filiform, same length as radioles, slightly tapering distally to same width as pinnules; surfaces smooth to partially wrinkled and ciliated; distal end bluntly rounded (Figure 3B). Branchial hearts present (Figure 4). Dorsal margins of branchial lobes not fused. Body cylindrical; anterior and posterior ends slightly tapered, widest at setigers 4–5 (Figure 3A). Membranous collar of anterior peristomial ring separated middorsally by narrow to wide gap (Figure 4A); collar low, even in height dorsally and laterally, slightly higher ventrally with broadly rounded margin (Figure 4B, C); margin smooth all around. Anterior peristomial ring (including collar) about same length as posterior peristomial ring. Demarcation between rings distinct all around except middorsally (Figure 4). Peristomial eyes round, situated deep within posterior peristomial ring. Pygidial eyes extremely faint light brown, rounded (Figure 3A). Setiger 1 about same length as posterior peristomial ring, about $\frac{1}{2}$ length of setiger 2. Setigers 2–3 each slightly longer, with setigers 4–5 and 8 each about as long as wide; setigers 6–7 slightly longer than wide. Setiger 9 about $\frac{2}{3}$ length of setiger 8; setigers 10–11 each slightly narrower, shorter. Pygidium about as long as setiger 11 or slightly longer; bluntly rounded. Superior thoracic notosetae elongate, narrowly hooded; 2–4 per fascicle. Inferior thoracic notosetae of setigers 2–8 short, elongate, narrowly hooded; 1 per fascicle. Abdominal neurosetae modified, elongate, narrowly hooded, 2–3 per fascicle. Pin-head setae absent. Thoracic neuropodia with 5–8 acicular uncini per fascicle in irregular, single rows; teeth above main fang of equal size; hood present (Figure 3C). Manubrium of abdominal uncini slightly constricted below dentate region, expanded proximally to thin, broadly rounded base; manubrium more than twice length of dentate region (Figure 3D);

7–8 teeth in profile, 3–4 teeth per row; 8–10 uncini per fascicle. Light brown pigmentation extending from posterior peristomial ring to about setiger 5; remainder of body unpigmented, cream colored or discolored light brown. Tubes present, usually unattached; soft, pliable, about same length as animals or slightly longer; composed of fine detritus and small quartz sand grains. No brooding observed. Methyl green staining produces dark band on posterior $\frac{1}{2}$ of posterior peristomial ring; remainder of body shows no distinctive patterns.

ETYMOLOGY: The species is named for the very short branchial crown.

REMARKS: *Fabriciola brevibranchiata* is a small-bodied species that most closely resembles those species with an anterior peristomial ring collar that is distinctly higher along the ventral margin (i.e., *F. tonerella* Banse, 1959b, and *F. baltica* Friedrich, 1939). *Fabriciola brevibranchiata* differs from *F. baltica* in that the latter has only 2–3 thoracic uncini per fascicle. Based on Banse's (1959b: fig. 9a) illustration of *F. tonerella*, the branchial crown is considerably larger relative to the remainder of the body than what is seen in *F. brevibranchiata* and the ventral margin of the collar is much longer in the former (Banse 1959b: fig. c).

CLADISTIC RELATIONSHIPS AMONG *Fabriciola* SPECIES

Relationships among most species of *Fabriciola*, as well as the relationship of this genus to other Fabriciinae genera, have been examined by Fitzhugh (1991, in press). Results of the cladistic analysis presented here include the *Fabriciola* species used by Fitzhugh (1991, in press) as well as the two species described here. *Fabriciola pacifica* (Annenkova) and *F. spongicola* (Southern) were not included because of lack of information (see Fitzhugh 1990) and *F. tonerella* Banse, 1959b was included based on the original description.

Three characters (Table 1) were used, two of which were derived from the larger character sets used by Fitzhugh (1991, in press) with

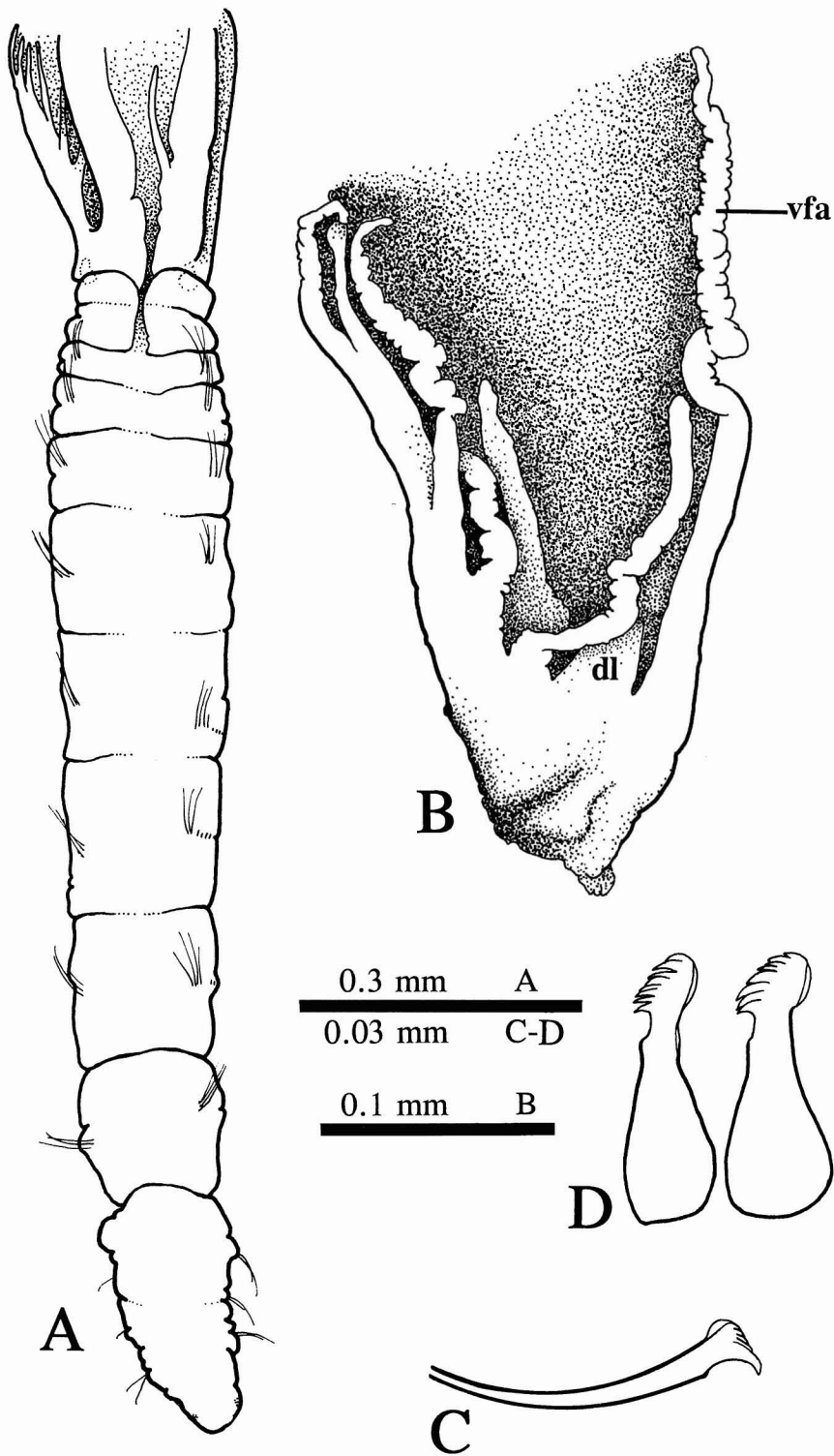


FIGURE 3. *Fabriciola brevibranchiata* (Paratypes, LACM-AHF Poly 1535): *A*, entire animal in dorsal view; *B*, inner margin of left half of branchial crown; *C*, thoracic uncinus from setiger 5; *D*, abdominal uncini from setiger 10. Abbreviations: dl, dorsal lip; vfa, ventral filamentous appendage.

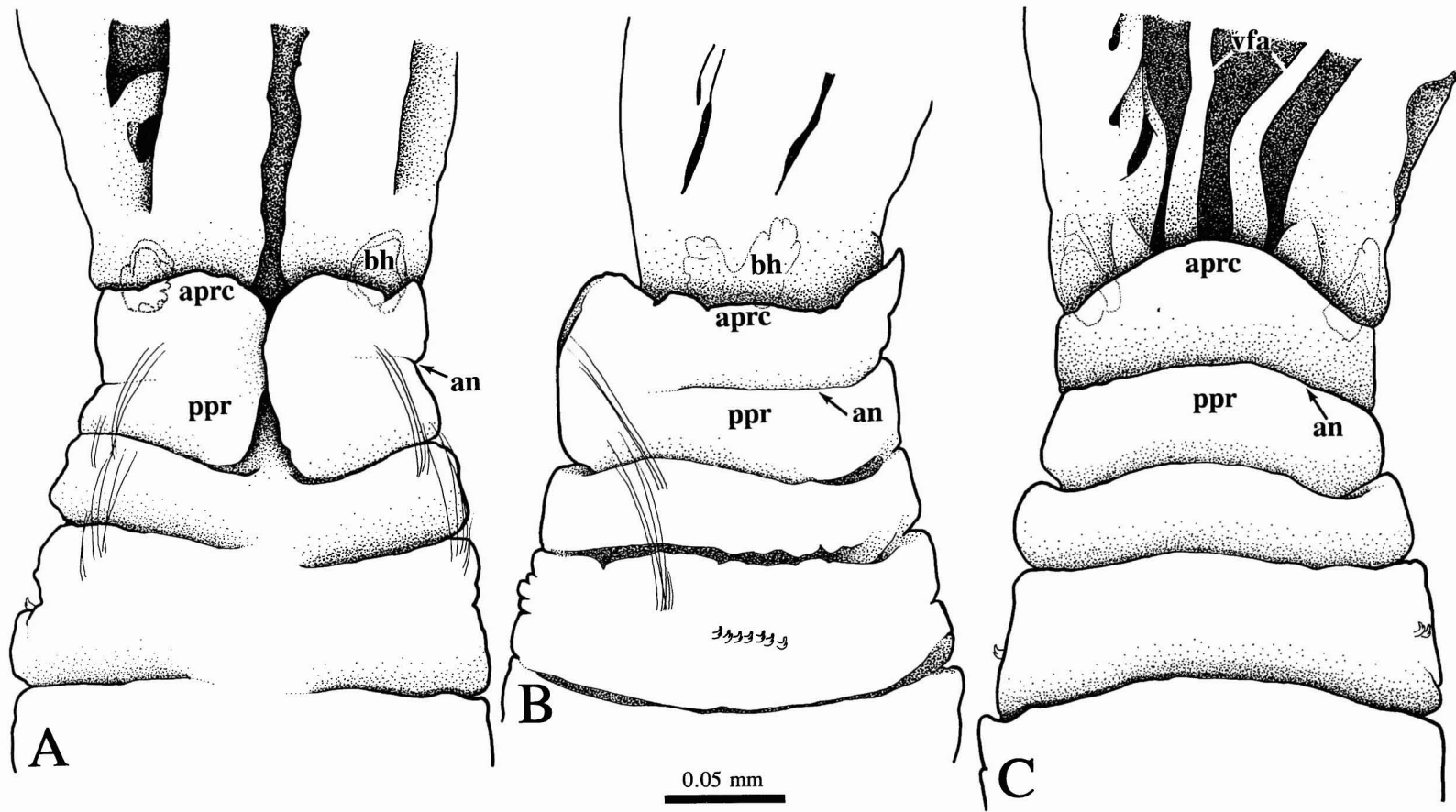


FIGURE 4. *Fabriciola brevibranchiata* (Paratypes, LACM-AHF Poly 1535): A–C, dorsal, lateral (right side), and ventral views, respectively, of anterior end. Abbreviations: an, annulation between anterior and posterior peristomial rings; aprc, anterior peristomial ring collar; bh, branchial heart; ppr, posterior peristomial ring; vfa, ventral filamentous appendages.

TABLE 1

CHARACTERS AND STATES USED IN THE DETERMINATION OF CLADISTIC RELATIONSHIPS AMONG *Fabriciola* SPECIES

1. Ventral filamentous appendages: (0) absent, or present and vascularized; (1) present and nonvascularized.
2. Anterior margin of anterior peristomial ring: (0) membranous collar of even height all around; (1) membranous collar low dorsally and laterally, higher ventrally.
3. Abdominal neuropodial pin-head setae: (0) absent; (1) present.

NOTE: State (0) is plesiomorphic in characters 1 and 3; polarity for character 2 is dependent upon the outgroup condition (cf. Table 2). See text for discussion of polarity assessments.

TABLE 2

CHARACTER-STATE MATRIX FOR *Fabriciola* SPECIES BASED ON CHARACTER STATES PRESENTED IN TABLE 1

	CHARACTERS AND STATES		
	1	2	3
Outgroup	0	?	0
<i>F. baltica</i>	1	1	0
<i>F. berkeleyi</i>	1	0	0
<i>F. cf. berkeleyi</i>	1	0	1
<i>F. brevibranchiata</i>	1	1	0
<i>F. ghardaqa</i>	1	0	0
<i>F. mediaseta</i>	1	0	1
<i>F. tonerella</i>	1	1	?

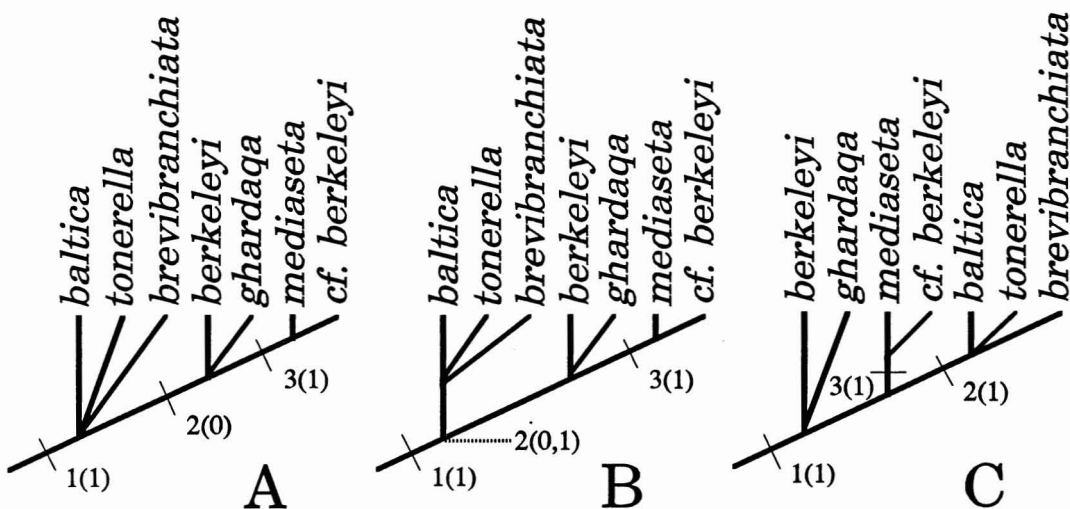


FIGURE 5A-C. Possible cladistic relationships among most *Fabriciola* species based on character-state distributions in Table 2. Synapomorphies are indicated as slashes on stems; placement of states for character 2 is ambiguous in B as indicated at the node.

the exception of pin-head setae (character 3), which has been added here. The outgroup and resultant polarity decisions were based on the higher-level analyses of Fitzhugh (1991, in press). Patterns of relationship were determined from a data matrix of seven species (Table 2) using the ie* command of the cladistics program Hennig86 (Farris 1988).

Three cladograms were produced, each with three steps and respective consistency and retention indices of 1.00. Two topologies are consistent with results obtained by Fitzhugh (1991, in press), in which (1) *F.*

baltica, *F. tonerella*, and *F. brevibranchiata* form a trichotomy relative to a clade containing *F. berkeleyi*, *F. ghardaqa*, *F. mediaseta*, and *F. cf. berkeleyi* (Figure 5A), and (2) *F. berkeleyi* and *F. ghardaqa* form a trichotomy with a clade containing *F. mediaseta* and *F. cf. berkeleyi* and another clade containing *F. baltica*, *F. tonerella*, and *F. brevibranchiata* (Figure 5C). A third topology results in two clades (Figure 5B), with *F. baltica*, *F. tonerella*, and *F. brevibranchiata* being grouped by the presence of an uneven collar [state 2(1)] and remaining species grouped by

the presence of a collar of even height [state 2(0)]. The different possible topologies is directly related to the ambiguous outgroup condition for the anterior peristomial ring collar (character 2; cf. Fitzhugh 1991, in press). In all cladograms, *F. cf. berkeleyi* forms an exclusive sister group with *F. mediaseta* by the presence of pin-head setae [state 3(1)], whereas *F. berkeleyi* is always a sister group to these two species. At the generic level, the addition of *F. cf. berkeleyi* and *F. brevibranchiata* does not alter those patterns of relationship of *Fabriciola* to other Fabriciinae genera (pers. obs.) as reported by Fitzhugh (1991, in press).

LITERATURE CITED

- BANSE, K. 1956. Beiträge zur Kenntnis der Gattungen *Fabricia*, *Manayunkia*, und *Fabriciola* (Sabellidae, Polychaeta). Zool. Jahrb. (Syst.) 84:415–438.
- . 1959a. *Fabricia acuseta* n.sp., *Fabriciola ghardaqa* n.sp. und *Oriopsis armandi* (Claparède) aus dem Roten Meer (Sabellidae, Polychaeta). Kiel. Meeresforsch. 15:113–116.
- . 1959b. Über die Polychaeten—Besiedlung einigen submariner Höhlen. Ergebnisse der österreichischen Tyrrhenia-Expedition 1952, Teil XII. Pubbl. Stn. Zool. Napoli 30:417–469.
- BEN-ELIAHU, M. N. 1975. Polychaete cryptofauna from rims of similar intertidal vermetid reefs on the Mediterranean coast of Israel and in the Gulf of Elat: Sabellidae (Polychaeta Sedentaria). Isr. J. Zool. 24:54–70.
- FARRIS, J. S. 1988. Hennig86 reference, version 1.5. Distributed by the author, 41 Admiral St., Port Jefferson Station, New York 11776.
- FITZHUGH, K. 1989. A systematic revision of the Sabellidae-Caobangiidae-Sabellongidae complex (Annelida: Polychaeta). Bull. Am. Mus. Nat. Hist. 192:1–104.
- . 1990. Revision of the Fabriciinae genus *Fabriciola* Friedrich, 1939 (Polychaeta: Sabellidae). Zool. Scr. 19:153–164.
- . 1991. Further revisions of the Sabellidae subfamilies and cladistic relationships among the Fabriciinae (Annelida: Polychaeta). Zool. J. Linn. Soc. 102:305–332.
- . in press. On the systematic position of *Monroika africana* (Monro) (Polychaeta: Sabellidae: Fabriciinae) and a description of a new fabriciine genus and species from Australia. Proc. Biol. Soc. Wash.
- FRIEDRICH, H. 1939. Polychaeten-studien V–X. Zur Kenntnis einiger wenig bekannter oder neuer Polychaeten aus der westlichen Ostsee. Kiel. Meeresforsch. 3:362–373.
- HARTMAN, O. 1969. Atlas of sedentariate polychaetous annelids from California. Allan Hancock Foundation, University of Southern California, Los Angeles.