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Revision of the *Rhamphobrachium* Complex (Polychaeta: Onuphidae)

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ABSTRACT. The *Rhamphobrachium* complex is revised. Three species each are recognized for *Brevibrachium* and *Longibrachium,* of which *B. augeneri* and *L. longipes* are newly described. Two subgenera of *Rhamphobrachium* are established: *R. (Rhamphobrachium)* containing two species, and *R. (Spinigerium)* n. subgen., containing 10 species, of which four [*R.(S.) hutchingsae, R.(S.) noeli, R.(S.) pettiboneae* and *R.(S.) pyriforme*] are described as new. Three additional species, *R.(S.) bipes, R.(S.) brevicornutum* and *R.(S.) cristobalensis,* known only from juveniles, are treated as *incertae sedis.* Keys to adults and descriptions of all species are provided.

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CONTENTS

The genus *Rhamphobrachium* was erected by Ehlers, 1887 for his previously described *Onuphis brevibrachiatum* and a new species, *R. agassizii*. The characteristics of the genus were given as three prolonged anterior pairs of parapodia with spiny, recurved hooks. This definition was later broadened by Monro (1937), Estcourt (1966) and Kucheruk (1979a) with the inclusion of species with two pairs of prolonged parapodia *(R. bipes),* with spineless recurved hooks *(R. maculatum),* and with four pairs of prolonged parapodia *(R. quadripes),* bringing the number of nominal species to 17.

Paxton (1986) demonstrated that specimens with two pairs of modified parapodia are juveniles, and that *R. maculatum* and several species with four or five pairs of modified parapodia differ also in a number of additional important characters (types of spines, distal ends of setae, length of setal sacs, prostomial characters, etc.). She restricted the definition of *Rhamphobrachium* to species with three pairs of modified parapodia with three hooks with moveable spines each and long setal sacs (extending to setiger 30–60), and described two new genera, *Brevibrachium* and *Longibrachium,* to accommodate the pre-empted species. She regarded the group as a complex of related genera, with *Brevibrachium* and particularly *Longibrachium* representing specialized survivors of a more plastic group, and *Rhamphobrachium* the most generalized and successful of the three genera.

The aim of this paper is to provide keys and descriptions to all species of the *Rhamphobrachium* complex.

Materials and Methods

The material examined was loaned by and/or is deposited in the following institutions:

AHF	Allan Hancock Foundation, Los Angeles, Calif., U.S.A.
AM	Australian Museum, Sydney, NSW, Australia
BMNH	British Museum (Natural History), London, U.K.
MU	Macquarie University, North Ryde, NSW, Australia
MCZ	Museum of Comparative Zoology, Cambridge, Mass., U.S.A.
MNHP	Muséum National d'Histoire Naturelle, Paris, France
NMV	Museum of Victoria, Melbourne, Vic., Australia
NZOI	New Zealand Oceanographic Institute, Wellington, New Zealand
PML	Portobello Marine Laboratory, Portobello, New Zealand
QM	Queensland Museum, Brisbane, Qld, Australia
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.
ZMB	Zoologisches Museum, Berlin, E. Germany
ZMH	Zoologisches Institut und Zoologisches Museum, Hamburg, W. Germany

Counts and measurements are of the holotype or only type specimen examined, the range for other specimens examined or reported in the literature are given in parentheses. The body length measurements and numbers of setigers of incomplete specimens are followed by plus signs. Body width (without parapodia) is of setiger 10 unless otherwise stated. Terminology follows Paxton (1986). All keys are for adults only.

Key to Genera of *Rhamphobrachium* Complex

1. Three pairs of modified parapodia (with 3 setae each) with spiny shafts and distally recurved (Fig. 9a). ..... *Rhamphobrachium*

——Four to 5 pairs of modified parapodia (with 4 or more setae each) with spiny shafts, or 3 pairs of modified parapodia with smooth shafts. 2

2. Antennae moderately long, to setiger 6–15; 4 pairs of modified parapodia with single postsetal lobes and setae with spiny shafts and distally curved (Fig. 4c). ..... *Longibrachium*

——Antennae short, to setiger 1; 3–5 pairs of modified parapodia with double postsetal lobes and setae with spiny shafts and distally uni- to tridentate (Fig. 1b) or smooth shafts and distally recurved (Fig. 3d). ..... *Brevibrachium*

Genus *Brevibrachium* Paxton

Brevibrachium Paxton, 1986: 41. Type species: *Rhamphobrachium capense* Day, 1960: 355, by original designation. Gender: neuter.

Diagnosis. Anterior 3–5 pairs of parapodia prolonged, with more than 3 hooks each; hooks smooth, distally recurved, or uni- to tridentate, with 2 rows of immoveable spines; setal sacs extending to setiger 4–8.

Remarks. For a full definition of the genus see Paxton (1986).

Key to Species of *Brevibrachium*

1. Branchiae from setiger 2, pectinate filaments (Fig. 1a); anterior 4 pairs of parapodia modified. ..... *B. augeneri*

——Branchiae from setiger 15–40, single filaments throughout; anterior 3 or 5 pairs of parapodia modified. 2

2. Branchiae from setiger 15–17; 3 pairs of modified parapodia; hooks of modified parapodia spineless, distally recurved (Fig. 2d). ..... *B. maculatum*

——Branchiae from setiger 30–40; 5 pairs of modified parapodia; hooks of modified parapodia spiny, uni- to tridentate. ..... *B. capense*

Brevibrachium capense (Day)

Rhamphobrachium capense Day, 1960: 355, fig. 11i–l (False Bay, South Africa; 27.5 m); 1967: 418, fig. 17.12g–k (False Bay to eastern Cape, South Africa).—Paxton, 1986: 41 fig. 25a–k (definition of genus).

Material examined. South Africa: False Bay, 34°07.5′S, 18°31′E, 27.5 m, 22 Feb. 1947—3 PARATYPES (BMNH ZK 1961.20.4-7 and ZK 1961.20.13); Algoa Bay, 34°00.4′S, 25°44.5′E, 39 m, 11 Apr. 1954—1 PARATYPE ZK 1961.20.14).

Diagnosis. Anterior 5 pairs of parapodia modified; branchiae from setiger 30–40, single filament throughout; uni- to tridentate hooded spiny hooks on modified setigers; subacicular hooks from setiger 10.

Description. Length of almost complete specimen 34 mm for 78 segments, width about 1.5 mm. Prostomium anteriorly rounded, posterior antennae on median part of prostomium, with ceratophores with 2–3 proximal rings and longer distal ring, styles subulate, short, to setiger 1; small eyespots between bases of posterior and anterior lateral antennae; tentacular cirri subulate, inserted far apart.

Anterior 5 pairs of parapodia modified (Paxton, 1986: fig. 25b,c), with oval presetal lobes on parapodia 1 becoming smaller towards parapodia 5; large subulate postsetal lobes with small ventral accessory lobes. Following parapodia short; low presetal and subulate postsetal lobes, latter reduced to rounded cone from about setiger 12. Dorsal cirri subulate on modified parapodia, thereafter decreasing in size, small after setiger 10 (Paxton, 1986: fig. 25d); ventral cirri subulate on anterior 5 setigers. Branchiae from setiger 30–40; single, strap-like filaments to near end of body.

Modified parapodia with simple to pseudocompound uni- to tridentate hooded spiny hooks (Paxton, 1986: fig. 25e,f) of varying sizes: 4 largest hooks emerging from small papillae, 4–6 slightly smaller hooks, 4–8 small hooks from ventral pocket of presetal fold. Spines on large hooks closely spaced, length half width of shaft, spines on small hooks far apart, length equalling width of shaft. Hooks of parapodia 1 and 2 bi- to tridentate, ends of hoods bent like claws; smaller hooks of parapodia 3 unidentate, hoods with straight ends, larger hooks as above; all hooks of parapodia 4 and 5 unidentate, hoods without claws. Tips of acicula projecting slightly from setal lobes of parapodia 1 to 5, becoming long and filiform from setiger 6 (Paxton, 1986: fig. 25g). Pectinate setae (comb with 12–16 teeth) and simple limbate setae from setiger 6. Anterior limbate setae with wide blades and filiform tips (Paxton, 1986: fig. 25h,i), becoming slenderer and longer more posteriorly. Two bidentate, usually hooded subacicular hooks (Paxton, 1986: fig. 25j) from setiger 10.

Mandibles calcified, shafts slender, cutting plates with middle notch; maxillae hardly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 6 + 6; Mx III = 5 + 0; Mx IV = 5 + 7; Mx V = 1 + 1. Thin mucous tube with adherent fragments of shells, coralline algae and sand (Day, 1960).

Remarks. The anterior hooks were described by Day (1960) as 'pseudocompound' and present on the first 3 setigers. However, they are present on the first 5 setigers, and the paratypes examined from False Bay do not show any fracture, nor did Day indicate any in his illustration (Day, 1960: fig. 11k). A single specimen from Algoa Bay differs in having pseudocompound hooks and lacking spines in the area of the fracture (Paxton, 1986: fig. 25k).

Distribution. False Bay to eastern Cape, South Africa; 12–72 m.

Brevibrachium augeneri n. sp.

Figs 1a–g; 2a,b

Rhamphobrachium chuni (not Ehlers, 1908).—Augener, 1927: 178, fig. 8 (Southeast Australia).

Material examined. Australia: New South Wales: Shelf Benthic Survey sta. III, 1.6 km E of Malabar, 33°58′15″S, 150°17′0″E, 66 m, 30 Jan. 1974—HOLOTYPE (AM W.6268).

Diagnosis. Anterior 4 pairs of parapodia modified; branchiae from setiger 2, reaching maximum of 5 filaments by setiger 12; tridentate hooded spiny hooks on modified setigers; subacicular hooks from setiger 9.

Description. Description based on 1 anterior portion; length 14 mm (26 setigers), width 2 mm. Ceratophores of antennae with 2–3 proximal rings and longer distal article, styles broken off; no eyes visible; tentacular cirri broken off, bases far apart.

Anterior 4 pairs of parapodia modified, with low presetal lobes, postsetal lobes broken off. Following parapodia short; low presetal and digitate postsetal lobes (Fig. 1a), reduced to rounded cone at end of fragment (setiger 26). Dorsal cirri initially subulate, later digitate; ventral cirri subulate on anterior 4 setigers. Branchiae as single filaments from setiger 2, reaching maximum of 5 filaments by setiger 12.

Modified parapodia with 4–5 tridentate hooded spiny hooks. Secondary and tertiary teeth vary from large (Fig. 1b) to very short (Fig. 1c). Spines on hooks closely spaced, length half to two-thirds width of shaft. Hooks of setiger 1 and 2 simple, those of 3 and 4 weakly pseudocompound, spines absent in area of fracture. Tips of acicula projecting slightly from setal lobes of parapodia 1 to 4, becoming long and filiform from setiger 5 (Fig. 1d). Pectinate setae (oblique comb with 15–20 teeth) (Fig. 1e) and simple limbate setae from setiger 5. Upper and median limbate setae weakly winged (Fig. 1f), lower limbate setae cultriform (Fig. 1g). Two bidentate, usually hooded subacicular hooks (Fig. 2a) from setiger 9.

Mandibles with slender shaft, calcified cutting plates of holotype dissolved in preservative; maxillae weakly sclerotized (Fig. 2b). Maxillary formula: Mx I = 1 + 1; Mx II = 8 + 12; Mx III = 8 + 0; Mx IV = 7 + 9; Mx V = 1 + 1. Tube unknown.

Etymology. The new species is named in honour of the late Dr Hermann Augener who reported the first specimens.

Remarks. Although the only specimen is in a poor state of preservation, it is described as a new species since it can be clearly distinguished from its most closely related species *B. capense,* which is the only other known species of *Brevibrachium* with hooded tridentate spiny hooks. However, *B. capense* has hooks of varying sizes in the modified parapodia, while those of *B. augeneri* are of equal size. *Brevibrachium augeneri* differs further from *B. capense* in having only 4 instead of 5 modified pairs of parapodia, branchiae from setiger 2 with a maximum of 5 filaments (instead of from setiger 30–40 with single filaments throughout) and in the structure of the limbate setae.

Augener (1927) reported two small specimens from off southeast Australia as *Rhamphobrachium chuni.* Although the specimens have not been located, it is clear from his description and illustration of the tridentate spiny hook (Augener, 1927: fig. 8) that the two specimens are members of the new species. Augener considered the specimens juveniles of *R. chuni* and interpreted the tridentate nature of the spiny hooks as a juvenile character, a statement which has been repeated by Fauvel (1953). However, the present study

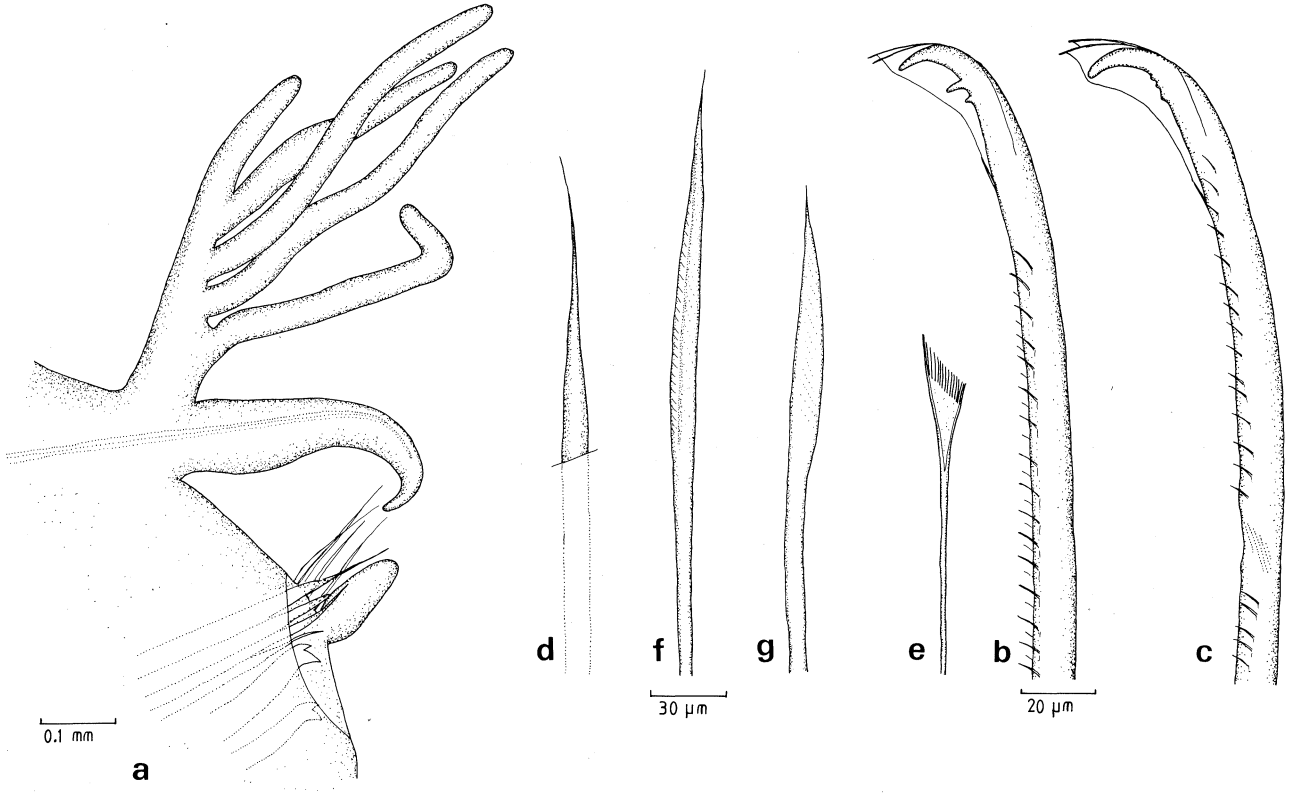

Fig. 1. *Brevibrachium augeneri* (holotype AM W.6268): **a,** parapodium 16, anterior view; **b,** simple spiny hook from setiger 1; **c,** pseudocompound spiny hook from setiger 3; **d,** aciculum from setiger 5; **e,** pectinate seta from setiger 9; **f,** upper limbate seta from setiger 5; **g,** lower limbate seta from same.

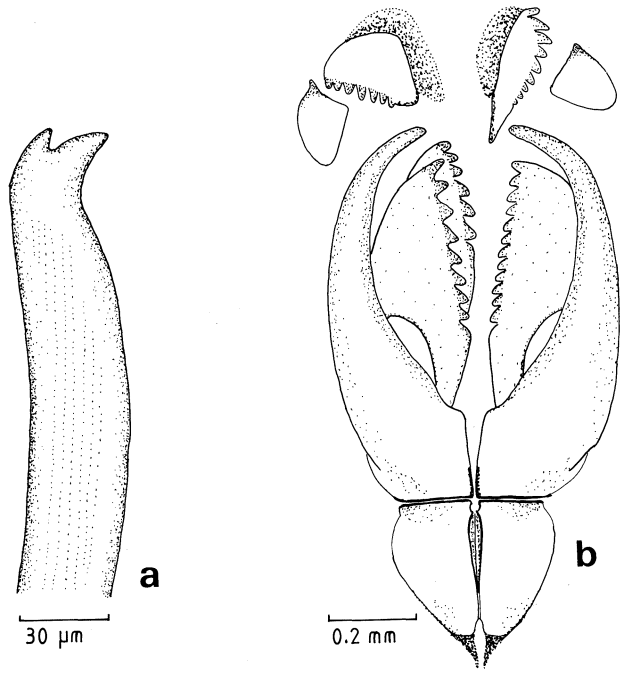

Fig. 2. *Brevibrachium augeneri* (holotype AM W.6268): **a**, subacicular hook from setiger 16; **b**, maxillae.

has proven this assumption to be incorrect, since *Rhamphobrachium* juveniles of much smaller size than the specimens examined by Augener have hooks with unidentate recurved distal ends, typical of the genus (Paxton, 1986).

Distribution. Pacific Ocean: southeast Australia; in 50–90 m.

Note. The two specimens reported by Augener (1972) as *Rhamphobrachium chuni* were located in the collections of the Zoological Museum, University of Copenhagen, while this paper was in press. It could be confirmed that the specimens are members of *B. augeneri* n. sp., as stated above.

Brevibrachium maculatum (Estcourt)

Fig. 3a–e

Rhamphobrachium maculatum Estcourt, 1966: 205, figs 1–3 (Three Kings Island, New Zealand, intertidal).—Knox & Hicks, 1973: 290, figs 33–43 (Coromandel and Kaikoura Peninsula, New Zealand); Day & Hutchings, 1979: 119 (previous records).

*Rhamphobrachium chuni (*not Ehlers, 1908).—Augener, 1924: 412 (Colville Channel, New Zealand).

Rhamphobrachium sp. Smith & Jensz,1968: 777, fig. 1 (Victoria, Australia).

Material examined. Australia: Victoria: Aireys Inlet, Victoria, 23 Mar. 1968, R. L. Jensz & B. J. Smith, collectors—11 (NMV G1287-93). **New Zealand:** Auckland, rock pools, J. Whitley, collector—1 (USNM 33125).

Diagnosis. Anterior 3 pairs of parapodia modified; branchiae from setiger 15–17, single filament throughout; spineless, distally recurved hooks on modified setigers; subacicular hooks from setiger 8–9.

Description. Length up to 42 mm, width up to 2 mm, number of setigers up to 107. Brownish pigmentation on prostomium, antennae, peristomium and anterior parapodia (Knox & Hicks, 1973: figs 33,34). Prostomium anteriorly rounded (Fig. 3a,b); posterior antennae on anterior part of prostomium, with ceratophores with 1–2 proximal rings and longer distal article, styles subulate to oval, reaching to setiger 1; small eyespots between bases of posterior and anterior lateral antennae; tentacular cirri subulate, far apart.

Anterior 3 pairs of parapodia modified, with rounded presetal lobes, truncate setal lobes and postsetal lobes with small accessory lobes (Fig. 3c). Following parapodia short, low presetal lobes, small round postsetal lobes, absent from setiger 8–10. Dorsal cirri subulate on modified parapodia, thereafter decreasing in size; ventral cirri subulate on anterior 3 setigers. Branchiae from setiger 15–17 as short processes, increasing rapidly in size, becoming strap-like, meeting in dorsal midline by setiger 20, shorter towards posterior region, absent on last 30 setigers.

Modified parapodia with 6–8 unidentate hooks of about equal size without hoods or spines (Fig. 3d), emerging in half-circle around setal lobe. All hooks simple, without any sign of fracture. Tips of acicula projecting slightly from parapodia 1–3, thereafter long and filiform. Bilimbate setae from parapodium 4, pectinate setae (comb with 20–25 teeth)in more posterior parapodia. Two hooded, bidentate subacicular hooks (Fig. 3e) from setiger 8–9.

Mandibles with slender shafts, calcified cutting plates dissolved in specimens examined; maxillae sclerotized (light brown in colour). Maxillary formula: Mx I = 1 + 1; Mx II = 5–7 + 5–6; Mx III = 4–6 + 0; Mx IV = 4–8 + 6–9; Mx V = 1 + 1. Tough, parchment-like tubes, often with right angle bends attached to holdfasts of algae (S. J. Whitley, collector), gastropod shells (Knox & Hicks, 1973), or lining burrows in hard limestone rock (Smith & Jensz, 1968).

Remarks. Knox & Hicks (1973) examined the holotype and gave a redescription of the species with which the specimens examined in this study agree well.

The two small specimens from Colville Channel, reported by Augener(1924) as juvenile *Rhamphobrachium chuni,* have not been found but were most likely *B. maculatum.* This decision is based on Augener's description of the dark pigmentation, and the origin and extent of branchiae. He mentioned that the hooks of the first three parapodia were 'characteristic' except for a weak pseudocompound fracture in the wrong direction. This fracture may have been an actual break in the hook. However, he did not state whether the hooks were spiny or not. Therefore, the record is considered uncertain.

Biology. This species lays spherical to ovoid eggs (0.3 to 0.5 mm diameter) in brood chambers partitioned off from the tube where the young undergo direct development. Sixteen young, ranging from 7 to 28

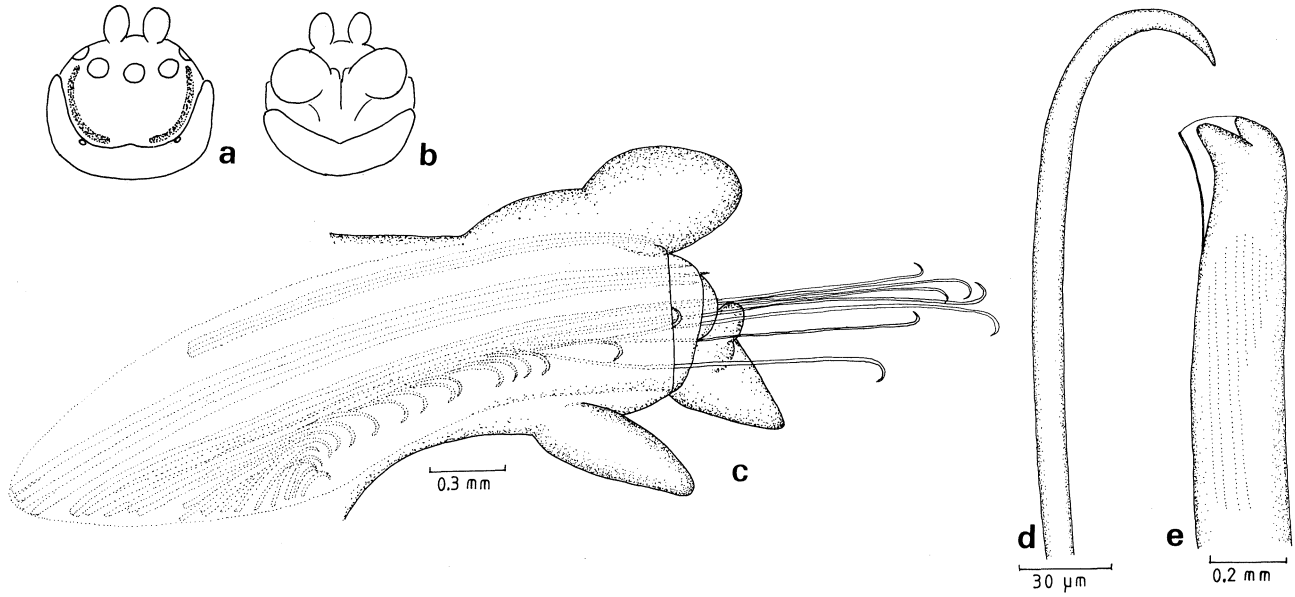

Fig. 3. *Brevibrachium maculatum* (NMV): **a**, stylized diagram of prostomium and peristomium, dorsal view; **b**, same, ventral view; **c**, parapodium 1, anterior view; **d**, spineless hook from setiger 1; **e**, subacicular hook from setiger 12.

setigers, were taken from one tube, suggesting that egg-laying is staggered (Smith & Jensz, 1968).

Distribution. New Zealand (Three Kings Island, Kaikoura Peninsula and Auckland); Australia (Victoria); intertidal to 64 m.

Note. The two specimens reported by Augener (1924) as *Rhamphobrachium chuni* were located in the collections of the Zoological Museum, University of Copenhagen, while this paper was in press. The anterior hooks were found to be distally recurved and spineless, i.e. typical of *B. maculatum*.

Genus *Longibrachium* Paxton

Longibrachium Paxton, 1986: 43. Type species: *Rhamphobrachium atlanticum* Day, 1973: 55, by original designation. Gender: neuter.

Diagnosis. Anterior 4 pairs of parapodia prolonged, with more than 3 distally recurved hooks each; hooks with 2 rows of immoveable spines; setal sacs extending to setiger 20–60.

Remarks. For a full definition of the genus see Paxton (1986).

Key to Species of *Longibrachium*

1. Modified parapodia enormously prolonged, longer than body from setiger 1–20 (Fig. 4c); with 3 large and 4–10 small hooks; dorsal cirri of unmodified segments with basal processes (Fig. 4e). ..... *L. longipes*

——Modified parapodia moderately to greatly prolonged, shorter than body from setiger 1–5; with large hooks only; dorsal cirri of unmodified segments without basal processes. 2

2. Median antenna to setiger 13–15; hooks with long spines spaced far apart, continued to near end of hook. . *L. atlanticum*

——Posterior antenna to setiger 6; hooks with short, closely spaced spines, absent from distal part of hook. ..... *L. quadripes*

Longibrachium atlanticum (Day)

Rhamphobrachium atlanticum Day, 1973: 55, fig. 8a–h (North Carolina, U.S.A.; 19 m).—Gardiner, 1976: 195, fig. 25h,i (same record); Paxton, 1986: 43, fig. 26 a–e (definition of genus).

Material examined. U.S.A.: North Carolina: c. 34°34′N, 76°25′W, 19 m, 24 Jun. 1965—HOLOTYPE (USNM 43124) and PARATYPE(USNM 43125) and 1 (USNM 98878); *Pierce* sta. 1E, c. 33°12′N, 77°36′W, 44 m, 10 May 1977—1 (USNM 060925). Florida: *Pierce* sta. 7C, c.29°31′N, 80°40′W, 18 m, 25 Nov. 1977—1 (USNM 061488).

Diagnosis. Median antenna longest, to setiger 13–15. Modified parapodia moderately prolonged; each with 4 large, spiny hooks; spines coarse, long, far apart, continued to near distal end of hook. Dorsal cirri on unmodified segments with basal swelling. Hooded subacicular hooks from setiger 20–25. Jaws without Mx VI.

Description. Length over 55 mm, segments over 85, width to 6 mm. Antennae and ventral surface of anterior parapodia with brown speckles (Paxton, 1986: fig. 26a). Ceratophores of antennae slender, with 4–5 proximal rings and longer distal ring; styles slender, anterior laterals to setiger 3(1–3), posterior laterals to 12(9–10), median posterior to 15(10–14). No eyes visible. Tentacular cirri long and slender, to distal end of frontal

palps; inserted close together, lying between median and posterior lateral antennae.

Modified parapodia moderately prolonged: parapodia 1–3 about equally long, extending slightly beyond prostomium when retracted; parapodia 4 shorter. Modified parapodia of all available specimens retracted; presetal, acicular and papilliform lobes not visible, postsetal lobes cirriform. Following parapodia short; low presetal lobes, conical postsetal lobes, reduced by setiger 25, continued posteriorly as small boss. Dorsal cirri long and stout on modified parapodia, thereafter shorter with basal swelling; ventral cirri conical on anterior 5 setigers. Small interramal papillae on setigers 7–12. Branchiae as single filaments from setiger 6, bifid from 8, maximum of 6–7 filaments from setiger 40–50.

Modified parapodia with 4 large, spiny hooks: spines coarse, long, far apart, continued to near distal end of hook. Setal sacs of hooks of parapodia 1–3 (holotype) extending in body cavity to setiger 60, hooks of parapodia 4 to setiger 40. Pectinate (comb with 15–20 teeth) and limbate setae from setiger 5. One hooded subacicular hook from setiger 31(20–25), 2 from 34(26–32), considerable variation with size of animal.

Mandibles weakly sclerotized; shafts long, cutting plates small and distally serrated (Paxton, 1986: fig. 26b). Maxillae brown (Paxton, 1986: fig. 26c); carriers rounded, maxillary formula: Mx I = 1 + 1; Mx II = 8 + 10; Mx III = 9 + 0; Mx IV = 8 + 10; Mx V = 1 + 1; Mx VI absent.

Remarks. The species was described by Day (1973) and Gardiner (1976) as having 3 pairs of modified anterior parapodia with spiny hooks. Examination of the types and other material shows that, although the fourth parapodia are shorter than the anterior 3, they are nevertheless modified, directed anteriorly (Paxton, 1986: fig. 26a) and bear spiny hooks.

Two types of tubes were in the vial together with the holotype. One tube consists of shell fragments, cemented together to form a smooth unlined inside. The other tube consists of a thin, parchment-like inner layer with sand grains attached on the outside. This type of tube is typical for members of the *Rhamphobrachium* complex and is considered as belonging to the holotype.

Biology. The three non-type specimens examined are much smaller than the two types. Their widths range from 1.1 to 3.0 mm. The smallest specimen (USNM 060925) is almost complete and measures 9.0 mm in length for 38 setigers. It has eyes at the bases of the posterior lateral antennae. Antennae are short; the longest, the median, reaches setiger 4. Only 3 pairs of parapodia are modified and bear spiny hooks, the fourth one has limbate setae like the following parapodia. Branchiae are present from setiger 6, as in adults, but reach only a maximum of 3 filaments. Bidentate subacicular hooks start on setiger 10.

Distribution. Western North Atlantic: U.S.A. (North Carolina and Florida); in 18–44 m.

Longibrachium longipes n. sp.

Figs 4a–e; 5a–k

Material examined. Australia: Queensland: Kimbla sta. Q11, off S end of Fraser Island, c. 25°48′S, 153°46′E, 73 m, 10 Nov. 1976, W. Ponder, R. Rowe, J. Lowry, collectors—HOLOTYPE (AM W.198973) and 2 PARATYPES (AM W.198974) and (USNM 98882).

Diagnosis. Median antenna longest, to setiger 9–12. Modified parapodia enormously prolonged; each with 3 large and 4–10 smaller spiny hooks; spines fine, short, closely set; continued to near distal end of hook. Dorsal cirri on unmodified segments with basal process. Subacicular hooks from setiger 26. Jaws with Mx VI.

Description. Length 34 + (17 + –20 +) mm, number of setigers 53 + (24 + –29 +), width 5.5(4.0–4.5) mm. Colour markings consisting only of light brown patches on middle part of posterior antennae. Prostomium short (Fig. 4a,b), ceratophores of antennae with 5–7 proximal rings and longer distal ring; anterior lateral styles to setiger 1, posterior laterals to 9 (7–8), median to ? (9–14). No eyes visible. Tentacular cirri to distal end of frontal palps; inserted close together, lying between median and posterior lateral antennae.

Modified parapodia enormously prolonged (Fig. 4c). When fully extended (as in USNM 98882) parapodia 1 about twice as long as medial posterior antenna, parapodia 2 and 3 progressively shorter, parapodia 4 shortest, about as long as posterior lateral antennae. In retracted state (as in holotype), parapodia only half as long and contracted into series of rings (Fig. 4d), becoming irregular at distal end. Modified parapodia with low acicular lobes, 3 papilliform lobes, digitiform postsetal lobes. Following parapodia short; low presetal lobes; conical postsetal lobes, reduced by setiger 25, continued posteriorly as small boss. Dorsal cirri digitiform with basal swelling developing into basal process by setiger 6 (Fig. 4e). Ventral cirri conical on 5 anterior setigers. Small interramal papillae on setigers 8–15. Branchiae as single filaments from setiger 7, bifid from 10(9–11), reaching maximum of 6 filaments by setiger 40.

Hooks of modified parapodia with short, closely spaced spines continued to near distal end. One thick, superior hook (Fig. 5a) projecting from each papilliform lobe, 4–10 thinner, shorter hooks (Fig. 5b) from lower fold. Setal sacs of hooks from parapodia 1–4 extending in body cavity to setigers 31, 27, 22, 17 respectively (in holotype). Limbate and pectinate setae from setiger 5 onwards; comb of anterior pectinate setae with 12 teeth (Fig. 5c), more posterior ones with 20–26 teeth (Fig. 5d). Anterior limbate setae with narrow wings; more posterior ones consisting of long unilimbate upper (Fig. 5e), shorter bilimbate median (Fig. 5f) and short (spine-like) bilimbate lower setae (Fig. 5g). One bidentate subacicular hook (Fig. 5h) from setiger 26, 2 from setiger 28.

Mandibles (Fig. 5i) white, strongly calcified; slender shafts and large cutting plates serrated at distal margin.

Maxillae (Fig. 5j) brown with whitish, calcified teeth; carriers oval, maxillary formula: Mx I = 1 + 1; Mx II = 7 + 8 (7 + 7); Mx III = 8 + 0 (7 + 0); Mx IV = 6 + 8 (5–6 + 7–8); Mx V = 1 + 1; Mx VI toothless plate. Tube unknown.

Etymology. The name *longipes* refers to the extremely prolonged anterior four pairs of parapodia which characterize this species.

Remarks. *Longibrachium longipes* differs mainly from its congeners by having two types of spiny hooks, and dorsal cirri with basal processes.

Biology. In one paratype (AMS W.198974) some of the anterior parapodia are partly regenerated. One parapodium of setiger 2 is very short. Incomplete internal hooks are of the normal type, but the protruding 3 hooks are very thin, with few spines, and are bidentate and hooded (Fig. 5k).

Distribution. South Pacific: Australia (Queensland); in 73 m.

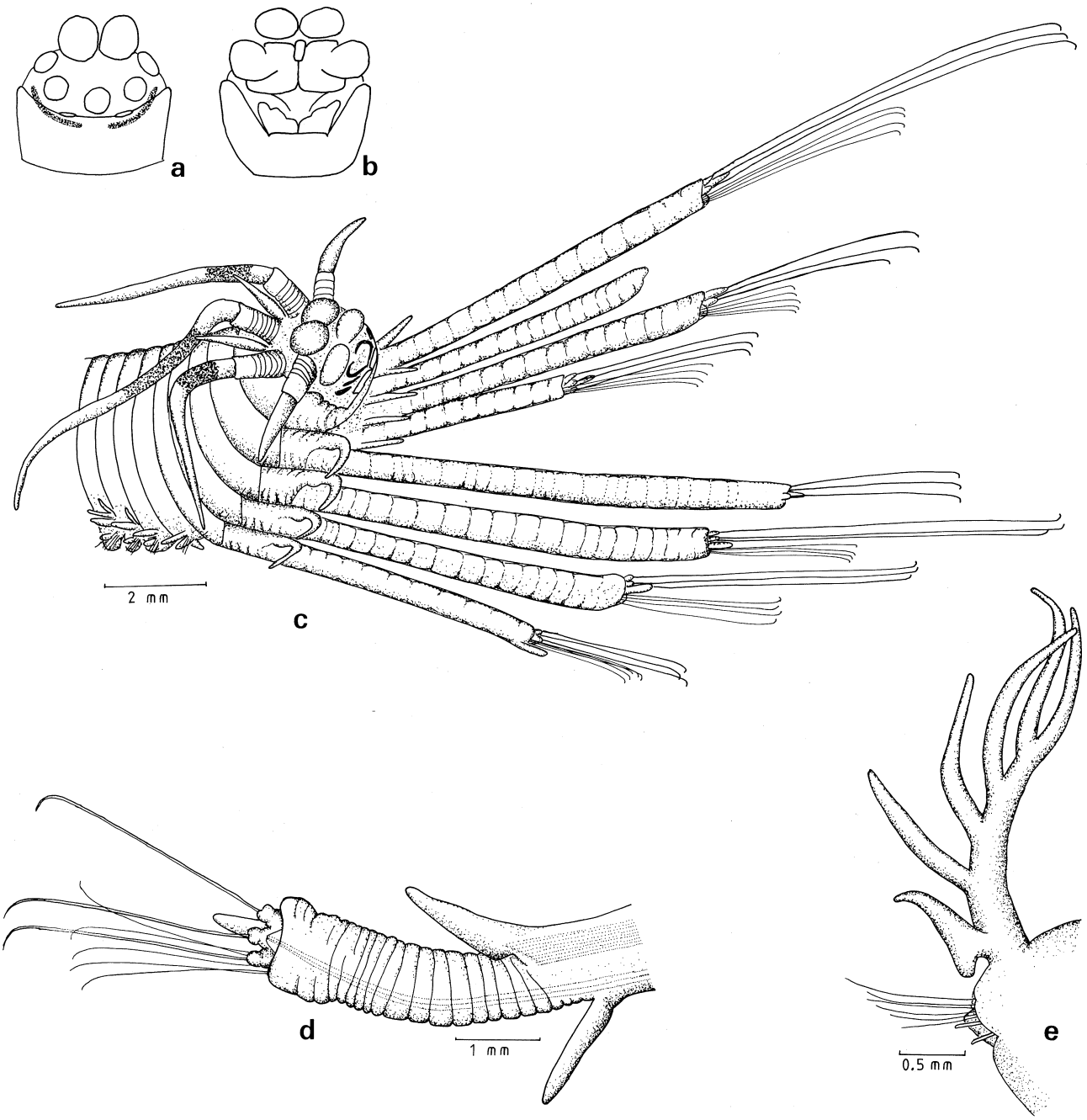

Fig. 4. *Longibrachium longipes* (c: paratype 1 USNM; d,e: holotype AM W.198973): **a,** stylized diagram of prostomium and peristomium, dorsal view; **b,** same, ventral view; **c,** anterior end, dorsolateral view; **d,** parapodium 3, anterior view; **e,** parapodium 45, anterior view.

Longibrachium quadripes (Kucheruk)

Rhamphobrachium quadripes Kucheruk, 1979a: 1229, fig. 3 (Gulf of Tonkin, 157 m).

Diagnosis. Posterior antennae equally long, to setiger 6. Modified parapodia greatly prolonged; each with large spiny hooks; spines fine, short, closely spaced; absent from distal part of hook. Dorsal cirri on unmodified segments with basal swelling. Hooded subacicular hooks from setiger 16. Jaws unknown.

Description. Length over 15 mm, setigers over 31, width 4.5 mm. Ceratophores of antennae with 6 rings; styles short, posterior median and laterals to setiger 6. Digitiform tentacular cirri.

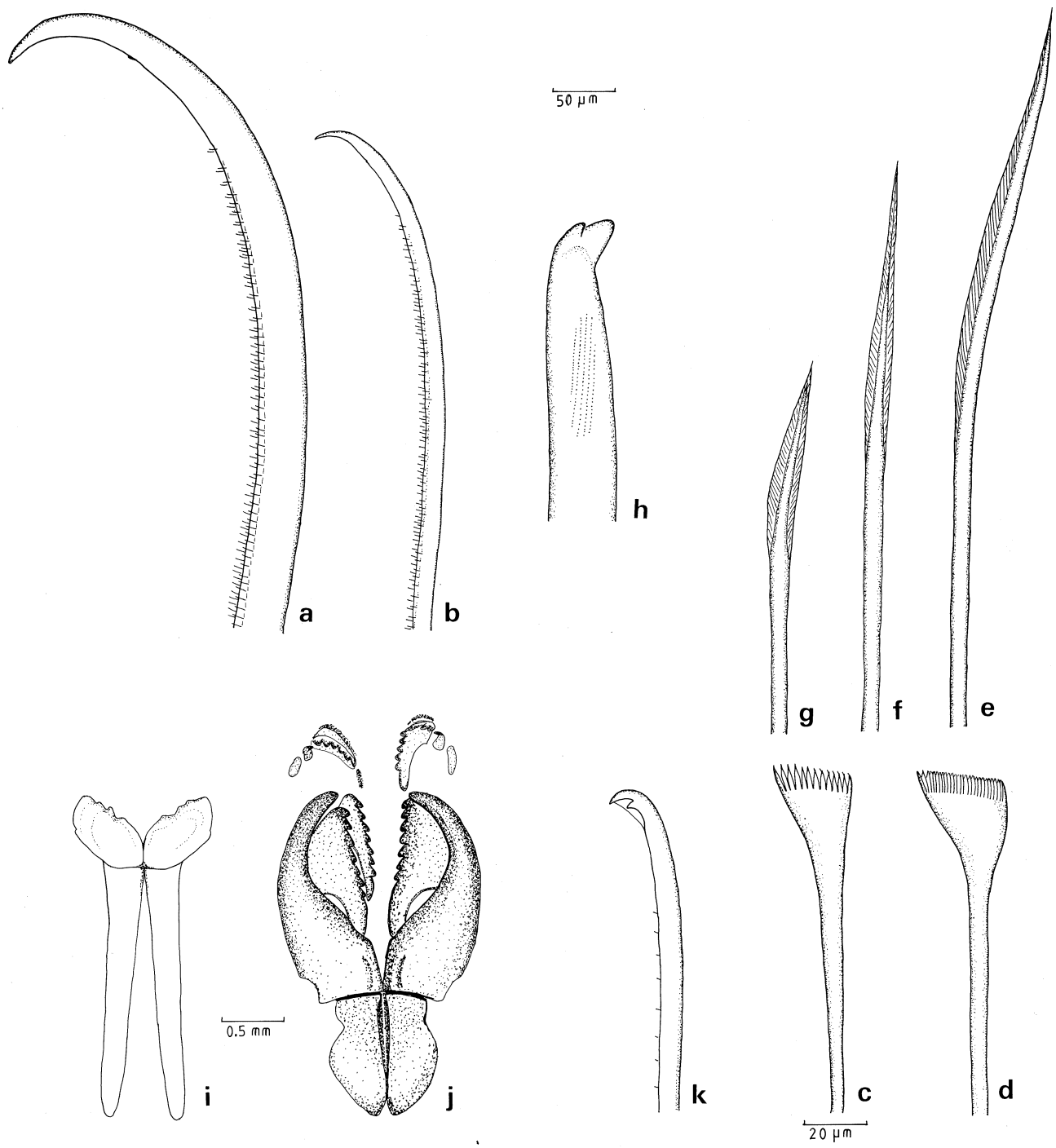

Fig. 5. *Longibrachium longipes* (a,b,h: holotype AM W.198973; d–g: paratype 1 USNM 98882; c, i–k: paratype AM W.198974): **a,** large spiny hook from setiger 2; **b,** small spiny hook from same; **c,** pectinate seta from setiger 5; **d,** pectinate seta from setiger 28; **e,** upper unilimbate seta from setiger 26; **f,** median bilimbate seta from setiger 26; **g,** lower spine-like limbate seta from setiger 26; **h,** subacicular hook from setiger 44; **i,** mandibles; **j,** maxillae; **k,** bidentate spiny hook from regenerating parapodium 2.

Modified parapodia greatly prolonged, with short postsetal lobes. Following parapodia short; digitiform postsetal lobes, absent from setiger 15–16. Dorsal cirri with basal swelling, ventral cirri on 5 anterior parapodia. Single branchial filaments from setiger 8, bifid from 13, maximum of 5 filaments on setigers 20–22, decreasing thereafter.

Hooks of modified parapodia with small, closely spaced spines, distal portion spineless; setal sacs of hooks from parapodia 1–3 to setiger 20, parapodia 4 to setiger 12. Limbate and pectinate setae (comb with 20 teeth) from setiger 5. Hooded bidentate subacicular hooks from setiger 16.

Jaws 'typical for the family' (Kucheruk, 1979).

Remarks. The single specimen on which the original description was based was not available for examination.

Distribution. Western North Pacific Ocean: Gulf of Tonkin; in 157 m.

Genus *Rhamphobrachium* Ehlers

Rhamphobrachium Ehlers, 1887: 70. Type species: *Rhamphobrachium Agassizii* Ehlers, 1887: 70, by subsequent designation of Hartman, 1944: 47. Gender: neuter.

Paranorthia Moore, 1903: 448. Type species: *Paranorthia brevicornuta* Moore, 1903: 448, by monotypy and subsequent designation of Hartman, 1959: 306.

Diagnosis. Anterior 3 pairs of parapodia prolonged, with 3 distally recurved hooks each; hooks with 2 rows of moveable spines, setal sacs extending to setiger 30–60.

Remarks. For a full definition of the genus see Paxton (1986).

Two species of *Rhamphobrachium, R. agassizii* Ehlers, 1887 (type species) and *R. chuni* Ehlers, 1908, differ in a number of characters from the remaining species. These differences are here considered to be of sufficient status to warrant the division of the genus into two subgenera.

Rhamphobrachium agassizii and *R. chuni* are referred to the nominal subgenus which is characterized by: all limbate setae simple; subacicular hooks reaching a maximum number of 3–6 per parapodium on setigers 15–30; maxilla VI present. The remaining species are referred to the new subgenus, *Rhamphobrachium (Spinigerium)* (type species *R. longisetosum* Berkeley & Berkeley, 1938) which is characterized as follows: lower limbate setae pseudocompound to compound; number of subacicular hooks per parapodium not exceeding 2; maxilla VI absent.

Prior to the present study, five species were described based on specimens with only two pairs of modified parapodia. The elucidation of *Rhamphobrachium* development (Paxton, 1986) has shown that specimens with two pairs of modified parapodia are juveniles. For one of these, *R. averincevi* Kucheruk, 1979, the availability of a large size range of specimens from near the type locality, spanning from juveniles to adults, made it possible to emend the definition of the species to its adult features.

Rhamphobrachium golikovi Averincev, 1972 and *R.* sp. Averincev, 1972 are considered as juveniles of *R.(S.) ehlersi* and are here referred to this species.

Rhamphobrachium (S.) bipes Monro, 1937, *R.(S.) brevicornutum* (Moore, 1903), and *R.(S.) cristobalensis* Fauchald, 1968 are juveniles that cannot be aligned with any known species at the present time and are treated as *incertae sedis.*

Key to Species of *Rhamphobrachium*

1. Tentacular cirri inserted far apart (Fig. 7a); lower limbate setae pseudocompound (Fig. 7d,e) to compound (= spinigers) (Fig. 12g–i); maximum of 2 subacicular hooks per parapodium; Mx VI absent (Fig. 8h). ..... *R. (Spinigerium)*...3

——Tentacular cirri inserted close together (Fig. 6a); all limbate setae simple; maximum of 3–6 subacicular hooks on setigers 15–30 (Fig. 6d); Mx VI present (Fig. 6f). ..... *R. (Rhamphobrachium)*...2

2. Branchiae from setiger 16–17; early unmodified parapodia with well developed, subulate postsetal lobes; recurved hooks weakly pseudocompound. ..... *R.(R.) agassizii*

——Branchiae from setiger 12–14; early unmodified parapodia with short postsetal lobes (Fig. 6c); recurved hooks simple. ..... *R.(R.) chuni*

3. Lower limbate setae compound; falcigers (Fig. 9d) present or absent on setigers 4 and 5. 9

——Lower limbate setae pseudocompound (Fig. 7d,e); falcigers absent. 4

4. Branchiae with maximally 1 or 2 filaments. 5

——Branchiae with 4 or more filaments. 7

5. Branchiae with 1 filament only; subacicular hooks from setiger 10–11. ..... *R.(S.) pettiboneae*

——Branchiae with maximally 2 filaments; subacicular hooks from setiger 12–16. 6

6. Branchiae from setiger 14; posterior antennae with 4–5 rings, reaching to setiger 3–6. ..... *R.(S.) pyriforme*

——Branchiae from setiger 10–12; posterior antennae with 2–3 rings, reaching to setiger 1–2. ..... *R.(S.) ehlersi*

7. Branchiae from setiger 11–14. ..... *R.(S.) verngreni*

——Branchiae from setiger 6–9. 8

8. Branchiae from setiger 6–8, maximally 4 filaments; subacicular hooks from setiger 16–18. ..... *R.(S.) averincevi*

——Branchiae from setiger 8–9, maximally 8–10 filaments; subacicular hooks from setiger 12–14. ..... *R.(S.) longisetosum*

9. Branchiae from setiger 10, maximally 8 filaments. ..... *R.(S.) diversosetosum*

——Branchiae from setiger 11–13, maximally 4–6 filaments. 10

10. Antennae on anterior part of prostomium (Fig. 13a); postsetal lobes of modified parapodia short and rounded (Fig. 13c). ..... *R.(S.) noeli*

——Antennae on median part of prostomium (Fig. 12a); postsetal lobes of modified parapodia longer and subulate (Fig. 12b). 11

11. Falcigers (Fig. 12f) on setigers 4 and 5. ..... *R.(S.) hutchingsae*

——Falcigers on setiger 4 only, or absent. ..... *R.(S.) brevibrachiatum*

Subgenus *Rhamphobrachium*

Diagnosis. All limbate setae simple.

Definition. Posterior antennae on median part of prostomium (Fig. 6a). Labial palps with distinct anterior median section (Fig. 6b). Nuchal grooves with small middorsal separation. Tentacular cirri subulate, inserted distally on peristomium, very long, to near distal end of frontal palps; inserted close together, lying between median and posterior lateral antennae. Branchiae from setiger 12–16, pectinate filaments. Recurved hooks simple to weakly pseudocompound. Lower limbate setae simple; falcigers absent; 1–2 subacicular hooks per parapodium from setiger 13–15, maximum of 3–6 from 15–30 (Fig. 6d), thereafter 2. Maxilla VI present.

Size. Large; length to 19+ cm (190+ setigers), width to 7 mm.

Distribution. North Atlantic, Indian and Pacific Oceans; ?64 to 2165 m.

Rhamphobrachium (Rhamphobrachium) agassizii Ehlers

Rhamphobrachium Agassizii Ehlers, 1887: 70, pl. 17 figs 1–5, pl. 18 figs 1–9 (in part) (Carysfort Reef, Florida, U.S.A., 642 m).—Fauvel, 1914: 126 (Azores and Morocco); Treadwell, 1939: 258, fig. 76 (Puerto Rico); [?] Intes & Le Loeuff, 1975: 312 (Ivory Coast); Paxton, 1986: 44, fig. 27 (definition of genus).

Material examined. U.S.A.: Florida: *Blake*, off Carysfort Reef, 642 m, 23 Mar. 1869—LECTOTYPE designated herein (MCZ 789). **Puerto Rico:** Johnson-Smithsonian Expedition sta. 67-354E, 18°32′18″N, 65°46′12″W, 549–599 m, 23 Feb. 1933—3 (USNM 20070).

Diagnosis. Early unmodified parapodia with well developed triangular postsetal lobes; branchiae from setiger 16–17. Recurved hooks weakly pseudocompound.

Description. Length 22+ (to 37+) mm, setigers 29+ (to 49+), width 4 (to 4) mm. Prostomium anteriorly rounded (Paxton, 1986: fig. 27a,b). Ceratophores of antennae with 2–3 proximal rings and longer distal ring; anterior lateral styles to setiger 1, posterior laterals to 4 (3), median to 3 (2).

Each of parapodia 1–3 with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Paxton, 1986: fig. 27c) low presetal and triangular postsetal lobes, latter decreasing in size and absent from setiger 10. Dorsal cirri digitiform, long on anterior 3 setigers, shorter on 4 and 5, remaining constant from 6 onwards. Single branchial filaments from setiger 17(16–17), bifid from 18–21, reaching maximum of 5 filaments by setiger 30.

Modified parapodia with weakly pseudocompound, long, recurved hooks (Paxton, 1986: fig. 27d,e), setal

sacs to setiger 55. Pectinate setae (comb with 12–25 teeth) and limbate setae from setiger 4; latter longest (Paxton, 1986: fig. 27f) in upper position, shorter in median, and short spine-like in lower position. One to 2 subacicular hooks per parapodium from setiger 15(14–15), maximum of 3–5 from 16(15–20) (Paxton, 1986: fig. 27i,j), 2 from 20(20–21) to presumably end of body.

Jaws (Paxton, 1986: fig. 27k,l) strongly calcified; mandibular shafts slender, cutting plates distally serrated. Maxillae weakly sclerotized, light brown; maxillary formula: Mx I = 1 + 1; Mx II = 8 + 8 (8–9); Mx III = 7 (6–7) + 0; Mx IV = 6 + 8 (7–9); Mx V = 1 + 1; Mx VI toothless plate. Tubes with parchment-like inner layer and outer layer of mud and sand.

Remarks. Ehlers (1887) described *R. agassizii* on the basis of five specimens collected in four different stations; all were taken by the U.S. Coast Survey Steamer *Blake* in the Caribbean, at depths exceeding 600 m. The five syntypes were examined in the present study, and only one (MCZ 789), the largest specimen, agreed with the description and illustrations, while the other four specimens were found to belong to another species, *R.(S.) brevibrachiatum* (see 'Remarks' for *R. brevibrachiatum).* Thus the only type specimen of *R.(R.) agassizii* (MCZ 789) that matches Ehlers' description is herewith designated the lectotype.

The lectotype consists of 29 setigers, not 20 as stated by Ehlers. Although it is not in the best condition (it was dried up at some stage and some of the setae have crystalline deposits), it can be clearly identified with Ehlers' drawings.

The three specimens from Puerto Rico (USNM 20070) are smaller, measuring from 2.6–3.0 mm in width. The setae of these specimens vary in two aspects from those of the lectotype: (1) the comb of the pectinate setae has 12–20 teeth in the lectotype and 18–25 in the specimens from Puerto Rico; and (2) the maximum number of subacicular hooks is 3 (Paxton, 1986: fig. 27i) in the former and 4–5 (Paxton, 1986: fig. 27j) in the latter. Since there is agreement in all other aspects, the specimens from Puerto Rico are considered members of *R.(R.) agassizii* and the variation may be ascribed to their smaller size.

Ehlers described the tubes as consisting of an inner parchment layer, covered on the outside with foraminiferans and other fragments. However, these tubes belong to the specimens of *R.(S.) brevibrachiatum.* The tube of the lectotype of *R. (R.) agassizii* consists of an inner parchment-like layer covered on its outside with a mud and sand layer. The specimens from Puerto Rico have similar tubes, but a thicker outer layer.

Biology. The lectotype is a male specimen, containing sperm morulae and free sperm.

Distribution. Eastern North Atlantic: U.S.A. (Florida) and Puerto Rico; western North Atlantic: Azores, Morocco and Ivory Coast; ?40–2165 m.

Rhamphobrachium (Rhamphobrachium) chuni Ehlers
Fig. 6a–f

Rhamphobrachium chuni Ehlers, 1908: 76, pl.9 figs 6–15 (Nias Canal, Indonesia, 677 m and East Africa, 1362 m).—Fauvel, 1932: 150 (Indian Ocean); 1953: 261, fig. 132a,b (same record); [?] Day, 1967: 420 (Natal); [?] Knox & Hicks, 1973: 293, figs 44,45 (New Zealand); [?] Stull, 1979: 32 (New Zealand).

Rhamphobrachium pacifica Hoagland, 1920: 618, pl. 49 figs 15–23 (Basa Island, Philippines, 703 m).

Material examined. Indonesia: *Valdivia* sta. 198, Nias Canal, c. 0°16′N, 98°07′E, 677 m—SYNTYPE (ZMH PE-759). **East Africa:** *Valdivia* sta. 258, c. 2°58′N, 46°50′E, 1362 m, 28 Mar. 1899—SYNTYPE (ZMB 4446). **Philippines:** *Albatross* sta. 5656, Olang Point, Basa Island, 703 m, 19 Dec. 1909—HOLOTYPE of *R. pacificum* (USNM 18959); *Albatross* sta. 5348, Point Tabonan, Palawan Passage, 686 m, 27 Dec. 1908—1 (USNM 18999).

Diagnosis. Early unmodified parapodia with short postsetal lobes; branchiae from setiger 12–14. Recurved hooks simple.

Description. Length 19+ (to 42+) cm, setigers 190+ (to 87+), width 4.5 (to 7.0) mm. Prostomium anteriorly rounded (Fig. 6a,b). Ceratophores of antennae with 2–4 proximal rings and longer distal ring; anterior lateral styles to setiger 1, posterior laterals to 3, median to 2.

Each of parapodia 1–3 with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Fig. 6c), low presetal and short postsetal lobes, latter absent from setiger 10. Dorsal cirri subulate, long on anterior 3 pairs of parapodia, shorter on setiger 4 and 5, remaining constant from 6. Single branchial filaments from setiger 12–14, bifid from 15–16, maximum of 6 filaments from setiger 30–40, thereafter decreasing and absent from setiger 145.

Modified parapodia with simple long recurved hooks, setal sacs to setiger 55. Pectinate setae (comb with 15–20 teeth) and limbate setae from setiger 4; latter weakly uni- to bilimbate, longest in upper, shortest in lower position. One to 2 subacicular hooks per parapodium from setiger 16(13–15), maximum of 5–6 (Fig. 6d) from 17(16–20), 3–4 from 20(18–30), 2 from 23(25–30) to end of body (variation with size of animal).

Jaws strongly calcified, mandibular shafts slender, cutting plates distally smooth (Fig. 6e). Maxillae weakly sclerotized, light brown; maxillary formula: Mx I = 1 + 1; Mx II = 7 (10) + 9 (9); Mx III = 8 (6) + 0; Mx IV = 6 (7) + 8 (7); Mx V = 1 + 1; Mx VI toothless plate (Fig. 6f). Tubes with parchment-like inner layer and thick outer layer of black mud (Ehlers, 1908).

Remarks. Ehlers (1908) stated that the setal bundle contained two or three subacicular hooks. He overlooked the number of subacicular hooks in more anterior segments which reaches a maximum of five or six.

Hoagland (1920) described *R. pacificum* from the Philippines. Apparently she was not aware of *R. chuni,* since she compared her specimens to *R. agassizii* but

not *R. chuni*. The holotype of *R. pacificum* was examined and found to agree with *R. chuni;* thus the former name is a junior synonym of the latter.

The branchiae do not start on the eleventh parapodium as stated by Hoagland, but on setiger 13 (USNM 18959) and setiger 14 (USNM 18999). Although the branchial filaments are infrequently subdivided, I have not found another parapodium where the dorsal cirrus is bifid as shown by Hoagland (1920: pl.49 fig. 19) and consider it as abnormal growth.

Distribution. Indo-Pacific: East Africa, India, Indonesia, Philippines, ?New Zealand; ?64 to 1362 m.

Rhamphobrachium (Rhamphobrachium) sp.

Material examined. Australia: Victoria: *Esso-Gipps* sta. 19, Bass Strait, c. 39°S, 148°30′E, 126 m, 7–9 May 1969—2 (AM W.198964); *Esso-Gipps* sta. 20, 110 km S of Lakes Entrance, c. 39°S, 148°24′50″E, 95 m, May 1969, C. Phipps, collector—4 (AM W.198965). New South Wales: Palm Beach, Sydney, 33°35′03″S, 151°21′30″E, 31 m, 10 Dec. 1977, F. Talbot *et al.*, collectors—16 (AM W.198966); same locality and collectors, 17 Mar. 1978—7 (AM W.198967).

Remarks. The samples consist of young juveniles, lacking frontal palps, tentacular cirri and branchiae [see Paxton (1986) for description]. The absence of pseudocompound or compound limbate setae marks them as members of the subgenus *Rhamphobrachium,* but specific identification is not possible.

Distribution. Pacific Ocean: southeast Australia; 31–126 m.

Spinigerium n. subgen.

Type species: *Rhamphobrachium longisetosum* Berkeley & Berkeley, 1938: 428. Gender: neuter.

Diagnosis. Lower limbate setae pseudocompound to compound (= spinigers).

Definition. Posterior antennae on anterior (Fig. 13a) to median part of prostomium (Fig. 12a). Labial palps with indistinct anterior median section (Fig. 7b). Nuchal grooves with large middorsal separation. Tentacular cirri subulate, inserted distally to subdistally on peristomium, moderately long to long, rarely reaching frontal palps; inserted far apart, lying between anterior and posterior lateral antennae. Branchiae from setiger 6–13, single or pectinate filaments. Recurved hooks pseudocompound (Fig. 14d). Lower limbate setae pseudocompound (Fig. 7d,e) to compound (= spinigers) (Fig. 12g–i); falcigers (Fig. 9d) sometimes present; subacicular hooks (Fig. 8g) from setiger 10–16, maximum of 2 per parapodium. Maxilla VI absent.

Size. Small to moderately large; length to 57+ mm for 73+ setigers; width to 5 mm.

Etymology. The name refers to the presence of spinigers in the early unmodified parapodia.

Distribution. World-wide; intertidal to 1470 m.

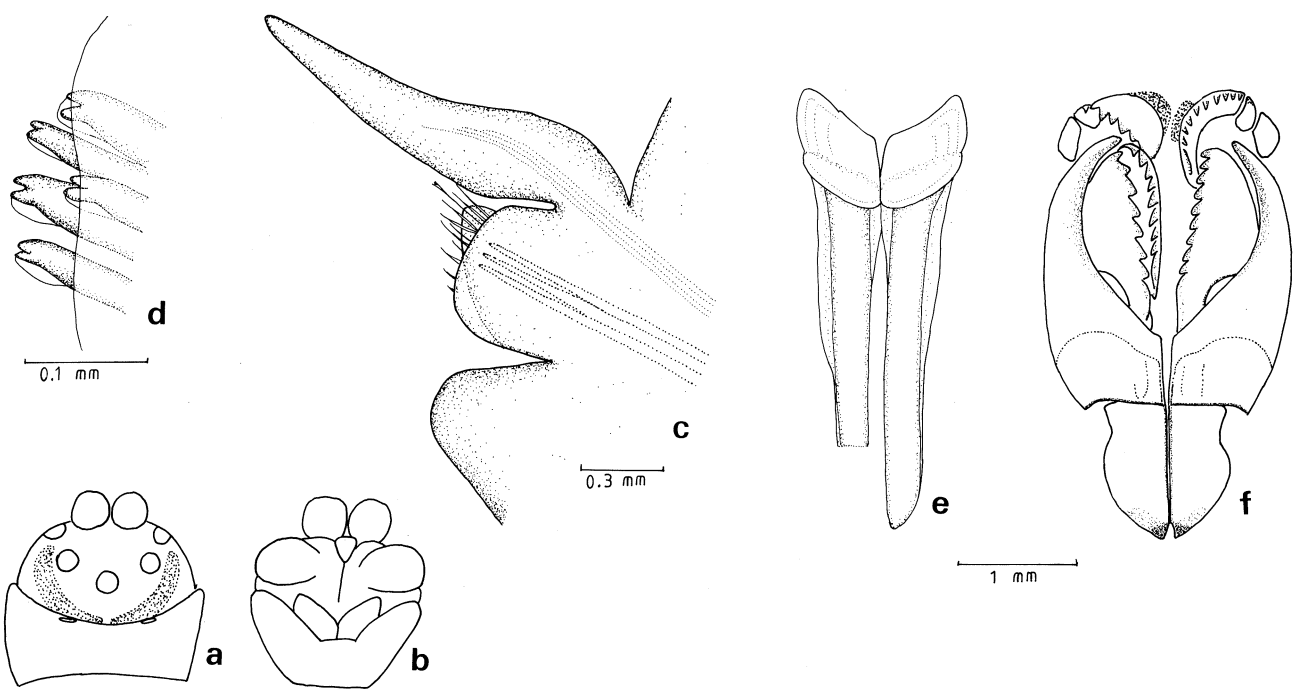

Fig. 6. *R. (Rhamphobrachium) chuni* (c,d: syntype ZMB 4446; e,f: syntype ZMH PE-759): **a,** stylized diagram of prostomium and peristomium, dorsal view; **b,** same, ventral view; **c,** parapodium 4, anterior view; **d,** subacicular hooks from setiger 17; **e,** mandibles; **f,** maxillae.

Rhamphobrachium (Spinigerium) longisetosum
Berkeley & Berkeley
Fig. 7a–g

Rhamphobrachium longisetosum Berkeley & Berkeley, 1938: 428, figs 1–8 (Southern California, U.S.A., 31 m).—Hartman, 1944: 48, pl. 1 figs 1–8 (Southern California, Mexico, Galapagos Islands); 1968: 705, figs 1–5 (same records); Pettibone, 1967: 8 (list of Berkeley types); Fauchald, 1968: 46 (Mexico).

Material examined. U.S.A.: California: off mouth of Santa Ana River, 31 m, G.E. MacGinitie, collector—SYNTYPE (USNM 32865); off Balboa, 60 m, 19 May 1933, G.E. MacGinitie, collector—SYNTYPE (USNM 32866); *Velero* sta. 890-38, 908-39, 1012-39, 1018-39, 1023-39, 1125-40, 1130-40, 1131-40, 1149-40, southern California, 45–275 m (for detailed station data see Hartman, 1944)—15 (AHF).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 8–9, reaching maximum of 8–10 filaments by setiger 35; setigers 1–4 with moderately long postsetal lobes; one subacicular hook from setiger 12–14, 2 from 15–17.

Description. Length 8+ (to 34+) mm, setigers 9+ (to 47+), width 5 (to 5) mm. Pigmentation, often bleached by preservatives, consisting of longitudinal pale brown band on prostomium and spots on ceratophores and dorsal surface of anterior segments. Posterior antennae on median part of prostomium (Fig. 7a,b). Ceratophores of antennae with 4 (3–6) proximal rings and longer distal ring; styles subulate, anterior lateral styles to setiger 2(1–2), posterior laterals to 5(3–5), median to 4(4). Small eyespots between lateral antennae (bleached out in most specimens examined). Tentacular cirri long, almost reaching frontal palps.

Each of parapodia 1–3 with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Fig. 7c), low presetal and moderately long subulate postsetal lobes, latter reduced from setiger 5 and absent from 15–20. Dorsal cirri subulate. Single branchial filaments from setiger 8–9, bifid from 15–17, maximum of 8–10 filaments by setiger 35.

Modified parapodia with long recurved hooks, setal sacs to about setiger 50. From setiger 4, pectinate (comb with 12–20 teeth) and simple long upper limbate setae projecting from dorsal pocket. Lower bundle with pseudocompound median and lower limbate setae (Fig. 7d), becoming gradually shorter, cultriform (Fig. 7e) and spine-like bilimbate (Fig. 7f) in following parapodia. One bidentate hooded subacicular hook from setiger 12–14, 2 from 15–17.

Calcified cutting plates of mandibles (Fig. 7g) with tooth-like projection near point of fusion. Maxillary formula: Mx I = 1 + 1; Mx II = 6–7 + 7; Mx III = 7–8 + 0; Mx IV = 7–8 + 9–11; Mx V = 1 + 1 (large plate). Tubes with tough parchment-like inner layer and outer sandy layer.

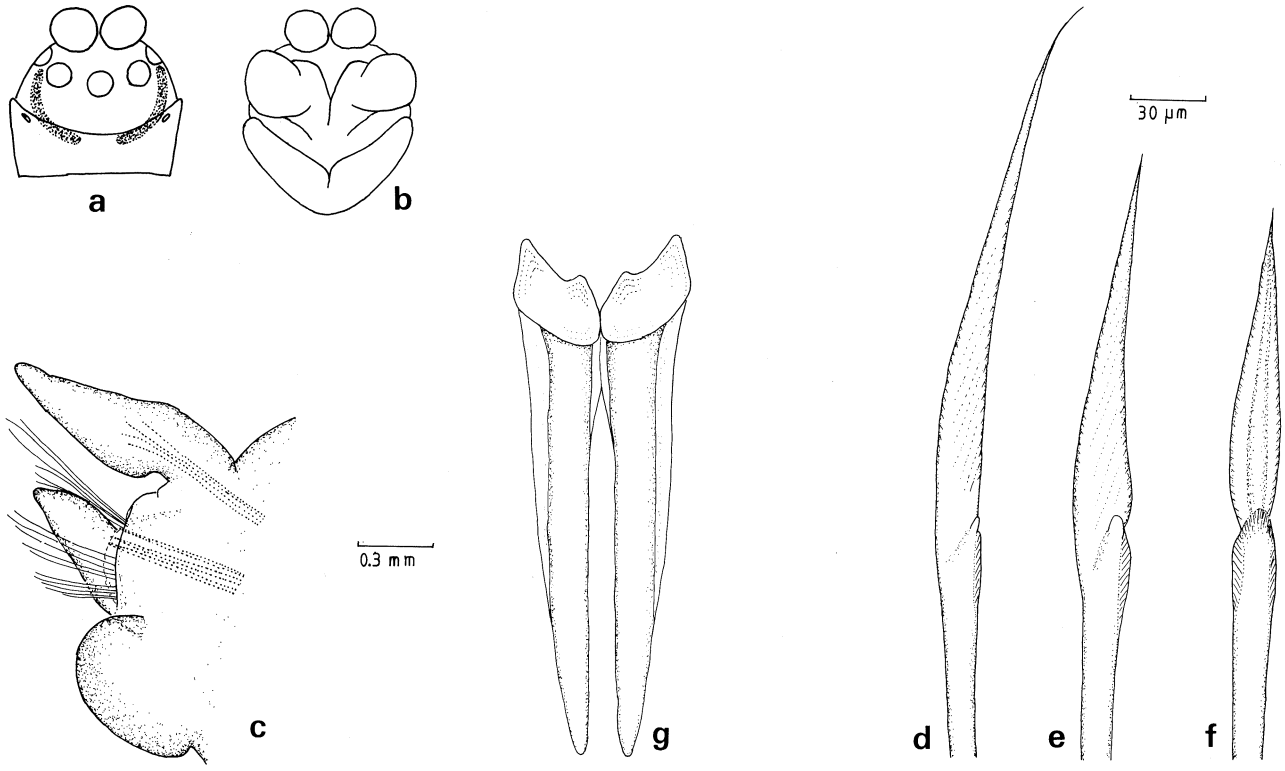

Fig. 7. *R. (Spinigerium) longisetosum* (c–f: AHF *Velero* sta. 1131-40; g: AHF *Velero* sta. 890-38): **a,** stylized diagram of prostomium and peristomium, dorsal view; **b,** same, ventral view; **c,** parapodium 4, anterior view; **d,** pseudocompound lower limbate seta from setiger 4; **e,** pseudocompound cultriform limbate seta from setiger 19; **f,** pseudocompound spine-like limbate seta from same; **g,** mandibles.

Distribution. Pacific Ocean: U.S.A. (Southern California to Mexico); Galapagos Islands; 20–730 m.

Rhamphobrachium (Spinigerium) averincevi Kucheruk
Fig. 8a–h

Rhamphobrachium chuni (not Ehlers, 1908).—Knox, 1960: 126 (Chathams, S of New Zealand).
Rhamphobrachium averincevi Kucheruk, 1979b: 120, figs 1–10 (S of New Zealand, 1200–1400 m).

Material examined. New Zealand: sta. MU68-29, Karitane Canyon, 580 m, S. Rainer, collector—1 (PML); sta. MU73-186, Papanui Canyon, c. 45°52′S, 171°01′E, 480 m, sandy mud, 24 Aug. 1973, P.K. Probert, collector—1 (PML); sta. MU74-92, Papanui Canyon, c. 45°51′S, 171°01′E, 420–320 m, muddy sandy gravel, 24 Mar. 1974, P.K. Probert, collector—1 (PML); sta. Q723, off South Island west coast, c. 41°58.5′S, 170°28.1′E, 507 m, muddy sand, 4 Mar. 1982, P.K. Probert, collector—1 (NZOI); sta. Q727, off South Island west coast, c. 40°58.5′S, 171°40.9′E, 134 m, muddy sand, 5 Mar. 1982, P.K. Probert, collector—3 (NZOI); sta. Q729, off South Island west coast, c. 40°51.8′S, 171°28.0′E, 195 m, sand 6 Mar. 1983, P.K. Probert, collector—3 (NZOI); *Eltanin* sta. 1989, c. 53°29′ to 53°30′S, 169°48′ to 169°45′E, 589-594, 1 Jan. 1968—1 (USNM).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 6–8, maximum of 3–6 filaments by setiger 35–40; setigers 1–4 with moderately long postsetal lobes; one subacicular hook from setiger 15–18, 2 from 17–20.

Description. Length to 25+ mm, number of setigers to 42+, width to 4 mm. Prostomium and anterior parapodia with light brown patches of pigment. Posterior antennae on median part of prostomium. Ceratophores of lateral antennae with 3–4, median antenna with 2–3 proximal rings and long distal ring. Styles subulate; anterior laterals to setiger 1–2, posterior laterals to 3–5, median to 2–4. Small eyespots between anterior and posterior lateral antennae. Tentacular cirri subulate, longer than ceratophores, reaching to bases of frontal palps.

Each of parapodia 1–3 (Fig. 8a) with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Fig. 8b), low presetal and moderately long subulate postsetal lobes, latter reduced from setiger 5 and absent from 20–25. Dorsal cirri subulate, ventral cirri subulate on setigers 1–3, oval on setiger 4. Single branchial filaments from setiger 6–8, bifid from 16–19, reaching maximum of 3–6 filaments by setiger 35–40 (Fig. 8c).

Modified parapodia with long recurved hooks, setal sacs to about setiger 60. From setiger 4, pectinate (comb with 10–20 teeth) and simple long upper limbate setae projecting from dorsal pocket. Lower bundle with weakly pseudocompound median and lower (Fig. 8d) limbate setae, becoming shorter, cultriform (Fig. 8e) and bilimbate spine-like (Fig. 8f) in following setigers. One subacicular hook (Fig. 8g) from setiger 15–18, 2 from 17–20.

Calcified cutting plates of mandibles partly dissolved. Maxillae (Fig. 8h) weakly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7 + 9; Mx III = 7 + 0; Mx IV = 5 + 9; Mx V = 1 + 1 (large plate). Tubes with parchment-like inner layer and outer layer of foreign particles.

Remarks. *Rhamphobrachium (S.) averincevi* was described by Kucheruk (1979b) on the basis of two specimens, collected south of New Zealand in 1200–1400 m. He characterized the species as having 2 pairs of modified parapodia with recurved hooks, parapodia 3 with compound limbate setae and falcigers, and single branchial filaments from setiger 13–27. The presence of only two pairs of modified parapodia marks the type specimens as juveniles.

The specimens examined during the present study were of a wide size range, ranging in width from 0.5–4.0 mm and belonging to stages 1, 2, 4 and adults [as defined for *R.(S.) ehlersi,* see Paxton (1986)]. Single branchial filaments are present from setiger 10–13 in juveniles, 8–10 in young adults, and 6–8 in adults. Since the juvenile specimens agree with the description of *R.(S.) averincevi* and are from the vicinity of the type locality, it appears certain that the specimens are conspecific. The original description of *R. (S.) averincevi* is here emended to the adult features of the species.

Knox (1960) reported *R. chuni* from the Chatham Islands. He stated that the branchiae commenced on the 6th setiger. Since *R.(S.) averincevi* is the only species with branchiae from setiger 6 in adults, and occurs near the collecting area, the record is here referred to *R.(S.) averincevi.*

Distribution. South Pacific Ocean: South of New Zealand; 134–1400 m.

Rhamphobrachium (Spinigerium) brevibrachiatum (Ehlers)
Fig. 9a–g

Diopatra brevibrachiata Ehlers, 1875: 49, pl. 3 figs 11–21 (W of English Channel, 1247 m).
Rhamphobrachium brevibrachiatum.—Ehlers, 1887: 72 (new combination); Bellan, 1964: 89, figs 5–7 (Mediterranean); Amoureux, 1972: 75 (Spain); 1974: 136 (Portugal); 1977: 398 (English Channel).
Rhamphobrachium agassizii (not Ehlers, 1887).—Ehlers, 1887: 70 (in part) (Florida); [?] Hartman, 1965: 113 (NE South America).
Onuphis (Diopatra) brevibrachiata.—McIntosh, 1903: 133, pl. 10 figs 5–10 (Strait of Gibraltar; E of Cape de Gatte).
Onuphis brevibrachiata.—McIntosh, 1910: 407, pl. 63 figs 8,8a,10,10a; pl. 75 figs 6,6a; pl. 84 figs 4–4c (previous records); Fauvel, 1923: 417, fig. 165a–e (previous records).

Material examined. Spain: *Porcupine*, E of Strait of Gibraltar, probably 35°39′ to 37°25′N, 1°56′ to 1°10′W, 655 m, 1870—1 (BMNH ZK 1921.5.1.1695). **U.S.A.:** Virginia: *Iselin* sta. A3, 39°16.5′N, 72°29.7′W, 136 m, 3 Nov. 1975—2

Fig. 8. *R. (Spinigerium) averincevi* (PML MU 68-29): **a,** parapodium 1, anterior view; **b,** parapodium 4, same view; **c,** parapodium 38, same view; **d,** pseudocompound lower limbate seta from setiger 6; **e,** pseudocompound cultriform limbate seta from setiger 19; **f,** pseudocompound spine-like seta from same; **g,** subacicular hook from setiger 38; **h,** maxillae.

(USNM 57040-1). South Carolina: *Pierce*, 32°30′N, 78°29′W, 218 m, 15 Feb. 1977—1 (USNM 060969) and 22 Aug. 1977—1 (USNM 060970). Florida: *Blake*, off Carysfort Reef, cast no. 4, 639 m, 31 Mar. 1869—1 (MCZ 779); *Blake* sta. 44, 25°33′N, 84°35′W, 986 m, 1878-79—2 (MCZ 754); *Columbus Iselin* sta. 2958, 25°40′N, 83°50′W, 120 m, Nov. 1977—1 (USNM 56142).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 11–13, maximum of 5–6 filaments by setiger 30; falcigers present or absent on setiger 4; one subacicular hook from setiger 12–16, 2 from 17–18.

Description. Length to 38 + mm, number of setigers to 65 +, width to 3 mm. Posterior antennae on median part of prostomium. Ceratophores of antennae with 2–4 proximal rings and long distal ring, styles subulate with threadlike ends, median style to setiger 2–4, posterior laterals to 3–5. No eyespots visible. Tentacular cirri subulate. Each of parapodia 1–3 (Fig. 9a) with 3 short papilliform lobes and one longer postsetal lobe. From setiger 4 (Fig. 9b), low presetal and short rounded postsetal lobes, latter absent from about setiger 12. Dorsal cirri subulate. Single branchial filaments from setiger 11–13, bifid from 16–18, reaching maximum of 5–6 filaments by setiger 30.

Modified parapodia with long recurved hooks (Fig. 9c), setal sacs to about setiger 50. From setiger 4, upper bundle of pectinate (comb with 12–15 long teeth) and simple limbate setae projecting from dorsal pocket. Lower bundle of compound limbate setae; compound falcigers (Fig. 9d) present or absent. From setiger 5, only compound limbate setae in lower bundle, consisting of median (Fig. 9e) and cultriform (Fig. 9f) limbate setae, latter changing to weakly bilimbate spine-like (Fig. 9g) in following setigers. One bidentate subacicular hook from setiger 12–16, 2 from 17–18.

Mandibles calcified, shafts slender, cutting plates

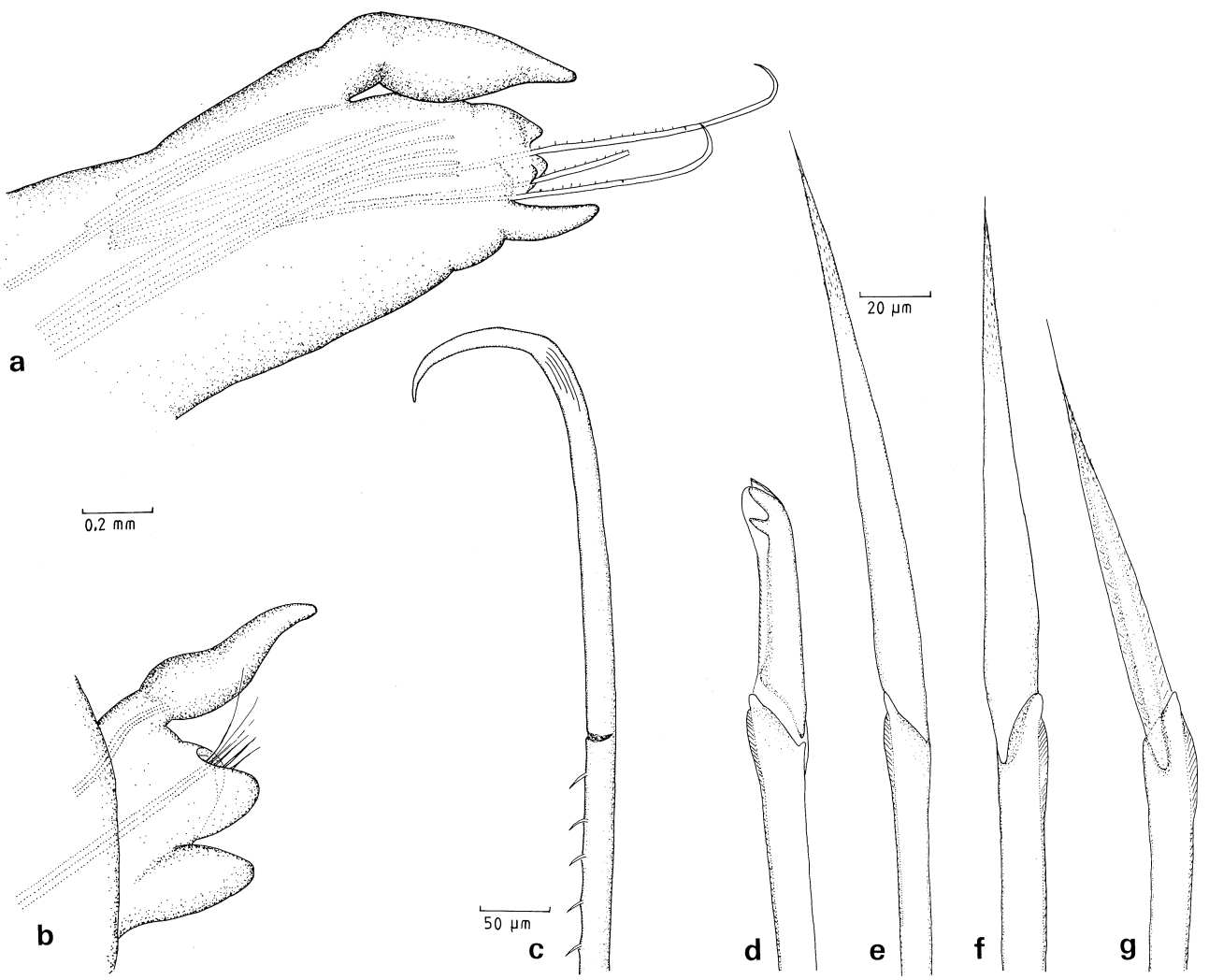

Fig. 9. *R. (Spinigerium) brevibrachiatum* (a,c,f,g: USNM 57040; b: MCZ 754; e,d: BMNH ZK 1921.5.1.1695): **a**, parapodium 2, posterior view; **b**, parapodium 4, same view; **c**, recurved seta from setiger 2; **d**, compound falciger from setiger 4; **e**, compound median limbate seta from same; **f**, compound cultriform limbate seta from setiger 16; **g**, compound spine-like limbate seta from same.

distally serrated. Maxillae very weakly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7–8 + 8; Mx III = 7–8 + 0; Mx IV = 5 + 8; Mx V = 1 + 1 (large plate). Inner layer of tubes parchment-like, covered on outside with foraminiferans and sand.

Remarks. The two syntypes of *Diopatra brevibrachiata* could not be located. Another specimen dredged by the *Porcupine,* 'probably between stations 46 and 47' (E of Strait of Gibraltar) according to McIntosh (1903), was examined. This specimen agreed in most respects with Ehlers' description and illustrations, and was considered as representative.

Ehlers (1875: figs 11–13) illustrated the ceratophores of the antennae as being totally ringed, thus representing 8 equal rings. This drawing is apparently incorrect since all species of *Rhamphobrachium* examined have a larger distal ring. In the specimens of *R.(S.) brevibrachiatum* examined, the distal ring made up more than half the length of the ceratophore. Ehlers stated that the filaments of the branchiae appeared to be arrranged spirally. Although they are pectinate as stated by McIntosh (1903), they appear spiralled in some specimens due to constrictions of the main branchial stem.

Four specimens (MCZ 754, 779, 788) collected by the U.S. Coast Steamer *Blake* were included as syntypes of *R. agassizii* by Ehlers (1887). He remarked on their smaller size and considered them as juveniles. Ehlers considered long anterior modified parapodia as characteristic of *R. agassizii* and short ones of *R. brevibrachiatum* since he was not aware of the degree to which they can be extended or retracted. He apparently did not check the setae of the unmodified segments which, in these specimens, do not have simple limbate setae like *R. (R.) agassizii,* but compound limbate setae like *R.(S.) brevibrachiatum.*

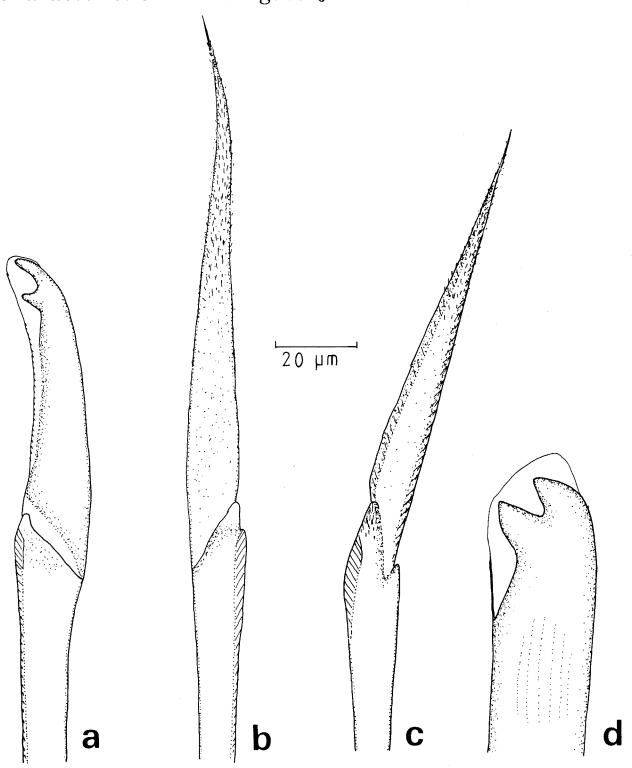

Fig. 10. *R. (Spinigerium) diversosetosum* (syntype BMNH ZK 1937.9.2.380): **a,** compound falciger from setiger 4; **b,** compound cultriform limbate seta from setiger 5; **c,** compound spine-like limbate seta from setiger 13; **d,** subacicular hook from setiger 14.

An interesting characteristic of *R.(S.) brevibrachiatum* is the fact that falcigers may be present or absent in setiger 4. The presence in one and absence in another, otherwise identical specimen from the same station has shown that the presence of falcigers is an unstable character in this species. Presumably they are present in all juveniles and are partially or completely replaced with spinigers in adults.

Rhamphobrachium (S.) brevibrachiatum is here newly reported from the western North Atlantic.

Biology. Several specimens contained sperm morulae and free spermatozoans. One specimen (USNM 57040) contained oocytes measuring 330 µm in diameter.

Distribution. Eastern North Atlantic: English Channel to Mediterranean; western North Atlantic: U.S.A. (off Virginia, South Carolina and Florida), ?NE South America; 120–1470 m.

Rhamphobrachium (Spinigerium) diversosetosum Monro

Fig. 10a–d

Rhamphobrachium diversosetosum Monro, 1937: 295, text-fig. 17a–l (Maldives, 183–274 m).—Fauvel, 1953: 262, fig. 132c–h (same record).

Material examined. Maldives: *John Murray* sta. 164, 8°15′24″N, 73°01′30″E, 183 m—SYNTYPE (BMNH ZK 1937.9.2.380).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 10, maximum of 8 filaments by setiger 30; falcigers on setiger 4; one subacicular hook from setiger 13, 2 from 14–15.

Description. Length to 30+ mm, number of setigers to 52+, width to 2.8 mm. Posterior antennae on median part of prostomium. Ceratophores of antennae with 3–4 proximal rings and long distal ring; styles slender, posterior styles to setiger 3–4. Small eyespots between bases of posterior and anterior lateral antennae. Tentacular cirri subulate.

Each of parapodia 1–3 with 3 short papilliform lobes and one longer postsetal lobe. On setiger 4, low presetal and short rounded postsetal lobes, latter absent from about setiger 12. Dorsal cirri subulate. Single branchial filaments from setiger 10, bifid from 14, maximum of 8 filaments by setiger 30.

Modified parapodia with long recurved hooks, setal sacs to about setiger 50. From setiger 4, upper bundle of simple limbate and pectinate setae (comb with 10–15 teeth); lower bundle of parapodia 4 with 2 compound limbate setae and about 15 compound falcigers (Fig. 10a). From setiger 5, only compound limbate setae in lower bundle, changing from cultriform (Fig. 10b) to bilimbate spine-like setae (Fig. 10c). One subacicular

hook (Fig. 10d) from setiger 13, 2 from 14–15.

Mandibles calcified, shafts slender, cutting plates distally weakly serrated. Maxillae weakly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7 + 9; Mx III = 8 + 0; Mx IV = 7 + 7; Mx V = 1 + 1 (large plate). Tube unknown.

Remarks. *Rhamphobrachium (S.) diversosetosum* closely resembles *R.(S.) brevibrachiatum*. Both species have falcigers on setiger 4 and similar compound limbate setae. The two species can be distinguished in that: (1) falcigers in setiger 4 are more numerous; (2) subacicular hooks replace lower limbate setae earlier; and (3) branchiae start earlier and have more filaments in *R.(S.) diversosetosum* than in *R.(S.) brevibrachiatum* of a comparable size.

Distribution. Indian Ocean: Maldives; 183–274 m.

Rhamphobrachium (Spinigerium) ehlersi Monro

Fig. 11a–f

Rhamphobrachium ehlersi Monro, 1930: 126, fig. 46a–i (South Shetlands, Antarctica, 525 m); 1936: 148, fig. 27a–c (South Georgia).—Hartman, 1964: 117, pl. 36 figs 3–7 (previous records); Averincev, 1972: 182 (South Shetlands, South Orkneys).

Rhamphobrachium cf. *ehlersi*.—Hartman, 1967: 98 (South Shetlands, South Orkneys).

Rhamphobrachium golikovi Averincev, 1972: 183, pl. 36 fig. 1 (South Orkneys, 225 m).

Rhamphobrachium sp. Averincev, 1972: 184, pl. 36 fig. 2 (South Georgia).

Material examined. Antarctica: *Discovery* sta. 172, off Deception Island, South Shetlands, 62°59′S, 60°28′W, 525 m, 26 Feb. 1927—SYNTYPE (BMNH ZK 1930.10.8.1898/99); *Eltanin* sta. 410, South Shetlands, c. 61°18′ to 61°20′S, 56°09′ to 56°10′W, 220–240 m, 31 Dec. 1962—81 (USNM 58394); *Eltanin* sta. 1079, South Orkneys, c. 61°26′ to 61°24′S, 41°55′W, 593–598 m, 13 Apr. 1964—1 (USNM 58395); *Eltanin* sta. 2198, Chathams, c. 43°48′ to 43°48′S, 174°24′ to 174°26′W, 881–909 m, 12 May 1968—1 (USNM).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 10–12, maximum of 2 filaments by setiger 20; setiger 4 with short subulate postsetal lobes; one subacicular hook from setiger 15–16, 2 from 18–21.

Description. Length 26+ (to 45+) mm, setigers 35+ (to 72+), width 2.5 (to 3.5) mm. Flesh-coloured with traces of reddish brown pigment on prostomium and anterior parapodia. Posterior antennae on median part of prostomium. Ceratophores of antennae with 1–2 proximal rings and longer distal ring; styles short and subulate, posterior styles to setiger 2(1–2). Tentacular cirri subulate, slightly longer than posterior ceratophores.

Each of parapodia 1–3 with 3 short papilliform lobes and one slightly longer postsetal lobe. On setiger 4 (Fig. 11a), low presetal and short subulate postsetal lobes, latter reduced by setiger 8 and absent from 12. Dorsal cirri subulate. Single branchial filaments from setiger 10(10–12), maximum of 2 filaments from 19(about 20), both filaments long, reaching further than dorsal midline, single again from about setiger 40.

Modified parapodia with long recurved hooks, setal sacs to about setiger 40. Pectinate (comb with 10–20 teeth) and simple long upper limbate setae from setiger 4. Lower bundle of weakly pseudocompound median and pseudocompound cultriform (Fig. 11b) limbate setae becoming gradually simple and shorter (Fig. 11c), and spine-like bilimbate (Fig. 11d) in following parapodia. One bidentate hooded subacicular hook (Fig. 11e) from setiger 15–16, 2 from 18–21.

Mandibles and maxillae greatly calcified, mandible strongly serrated at cutting edge (Fig. 11f), with slender shaft. Maxillary formula: Mx I = 1 + 1, Mx II = 7–9 + 7–9, Mx III = 5–9 + 0, Mx IV = 6–7 + 6–10, Mx V = 1 + 1 (large plate). Tubes with inner parchment-like layer and outer agglutinated sandgrains.

Remarks. Monro (1930: fig. 46a) illustrated setiger 4 and showed a presetal papilla. This papilla as such is not present in the syntype nor the other specimens examined. However, the presetal lobe is inflated, and the tip appears like an additional lobe when flattened on a slide (Fig. 11a). The inferior limbate setae (Fig. 11b) of setiger 4, described by Monro as compound, should be referred to as pseudocompound since there is no clear fracture.

Averincev (1972) described *R. golikovi* from the South Orkneys. He distinguished the new species from *R. ehlersi* in that the only specimen of the former lacked setae on setigers 1 and 2, and that the hooks of setiger 3 formed a loop at the base of the parapodium (Averincev, 1972: pl. 36 fig. 1). The absence of setae is probably due to parapodial regeneration or a case of abnormal development. Infrequently, looped hooks were also observed in the present study. They appear to occur when the hooks are withdrawn from the parapodium but the setal sac fails to retract sufficiently in the body cavity. *Rhamphobrachium golikovi,* which was collected in the same station as a specimen of *R.(S.) ehlersi* is considered a junior synonym of the latter.

Rhamphobrachium sp. was reported by Averincev (1972) from South Georgia. Although the 3 anterior parapodia contained hooks, only setigers 1 and 2 were enlarged and directed anteriorly (Averincev, 1972: pl. 36 fig. 2). Tentacular cirri were very small, branchiae occurred as single filaments from setigers 12–28. These features are in agreement with those of juveniles stage 4 of *R.(S.) ehlersi* (Paxton, 1986).

A poorly preserved specimen (*Eltanin* sta. 2198) is hesitantly referred to *R.(S.) ehlersi*. It agrees with all diagnostic characters of this species and also possesses the reddish pigment. However, it has slightly longer antennae with the proximal ceratophoral rings numbering 3–4 instead of 1–2. The specimen in question was collected near the Chatham Islands in the Pacific Ocean while all other specimens are from the Atlantic Ocean.

Biology. The *Eltanin* station 410 yielded 81 specimens ranging from 12 mm in length to adults. This material

made it possible to determine the sequence of ontogenetic changes the animals undergo from juvenile to adult morphology. The juvenile sequence has been divided into 4 stages (Paxton, 1986).

Many small specimens contained sperm morulae and free sperm. Oocytes (diameter 600 μm) were only found in one adult. The presence of sperm in juveniles suggests that *R. ehlersi* is a protandric hermaphrodite.

Distribution. South Atlantic Ocean: South Shetlands, South Orkneys, South Georgia, Antarctica; ?South Pacific Ocean: Chathams; 199–935 m.

***Rhamphobrachium (Spinigerium) hutchingsae* n. sp.**
Fig. 12a–l

Material examined. Solomons: Malaita Island: NW coast, 1.2 km off Laulasi Village, S of Aoki, c. 400 m, bottom olive-gray sandy mud with coarse pebbles, 27 Aug. 1973, P.H. Colman, collector—HOLOTYPE (AM W.198968). **Australia:** Queensland: *Kimbla,* off Moreton Bay, 27°22′S, 153°37′E, 112–116 m, 29 Mar. 1969—PARATYPE (AM W.198969); *Kimbla* sta. 21, E of North Reef, 23°8.6′S, 152°16.6′E, 155 m, dead shell and fine sand and mud, 14 Dec. 1977—PARATYPE (USNM 98881); *Kimbla* sta. 22, Capricorn Channel, E of North West Island, 23°15.2′S, 152°24.1′E, 284 m, 14 Dec. 1977—PARATYPE (AM W. 17730). New South

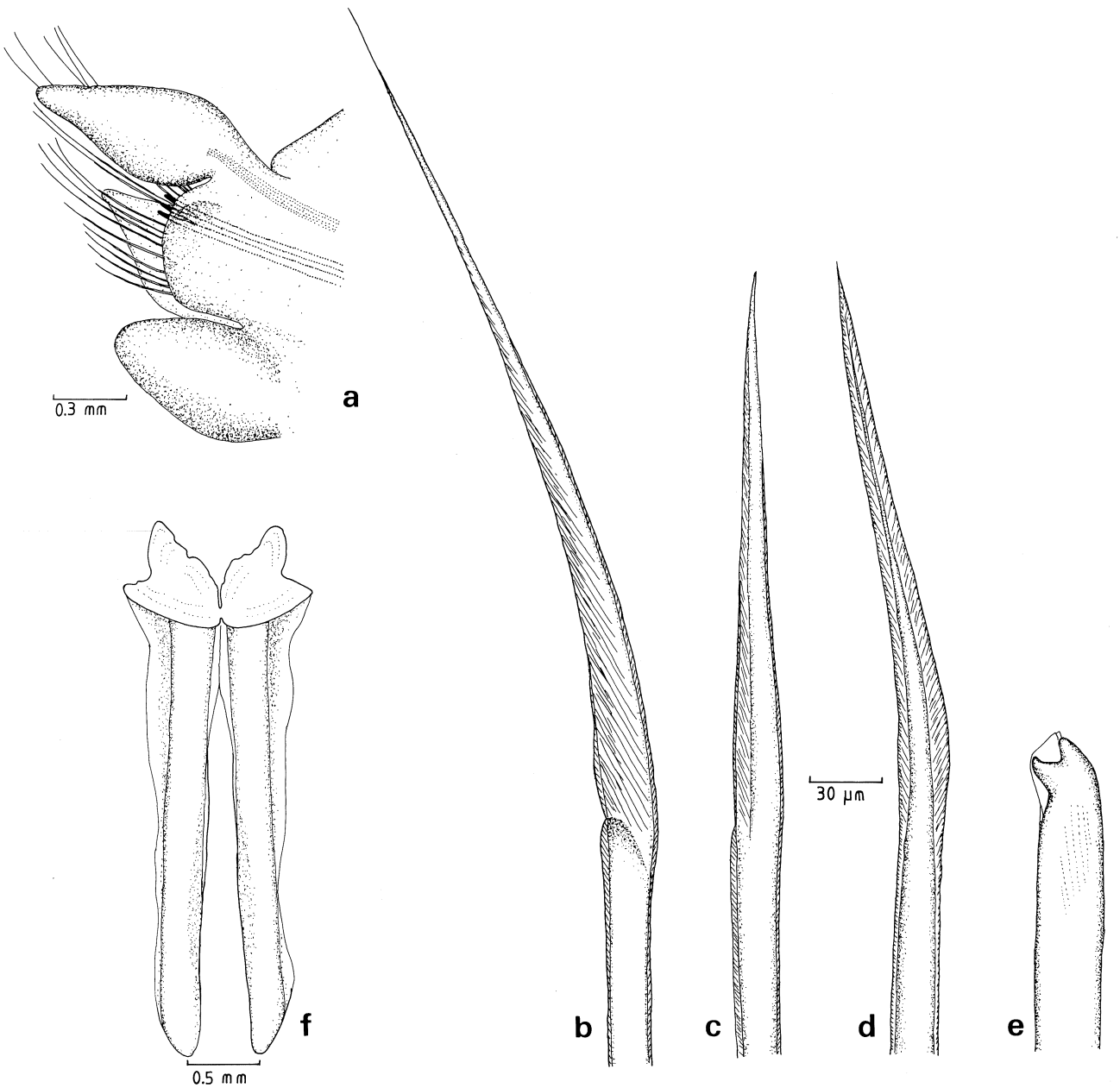

Fig. 11. *R. (Spinigerium) ehlersi* (USNM 58394): **a,** parapodium 4, anterior view; **b,** pseudocompound lower limbate seta from setiger 4; **c,** simple lower limbate seta from setiger 20; **d,** simple spine-like limbate seta from same; **e,** subacicular hook from setiger 27; **f,** mandibles.

Wales: Shelf Benthic Survey sta. 44, off Sydney, 33°58′54″S, 151°33′38″E, 187 m, 9 Aug. 1973—PARATYPE (AM W.6851).

Diagnosis. Posterior antennae on median part of prostomium; falcigers on setigers 4 and 5.

Description. Length 21 + (13 + –26 +) mm, number of setigers 44 + (29 + –70 +), width 2.0(2.0–2.8) mm. Holotype with brown pigmentation on prostomium (Fig. 12a) and anterior setigers, absent in paratypes. Posterior antennae on median part of prostomium. Ceratophores of antennae with 2(2–4) proximal rings and long distal ring. Styles subulate, posterior laterals to setiger 3(2–3), median to 2(1–2), anterior laterals to 1. Small eyespots between anterior and posterior lateral antennae. Tentacular cirri subulate, about as long as the ceratophores, inserted slightly subdistally on peristomium.

Each of parapodia 1–3 (Fig. 12b) with 3 short papilliform and one slightly longer subulate postsetal lobe. On setiger 4 (Fig. 12c), low presetal and short rounded postsetal lobes, latter absent from about setiger 20. Dorsal cirri subulate. Single branchial filaments from setiger 12(12–13), bifid from 17(19–23), reaching maximum of 4(2–5) filaments by about setiger 40.

Modified parapodia with long recurved hooks, setal sacs to about setiger 50. Acicula internal in modified

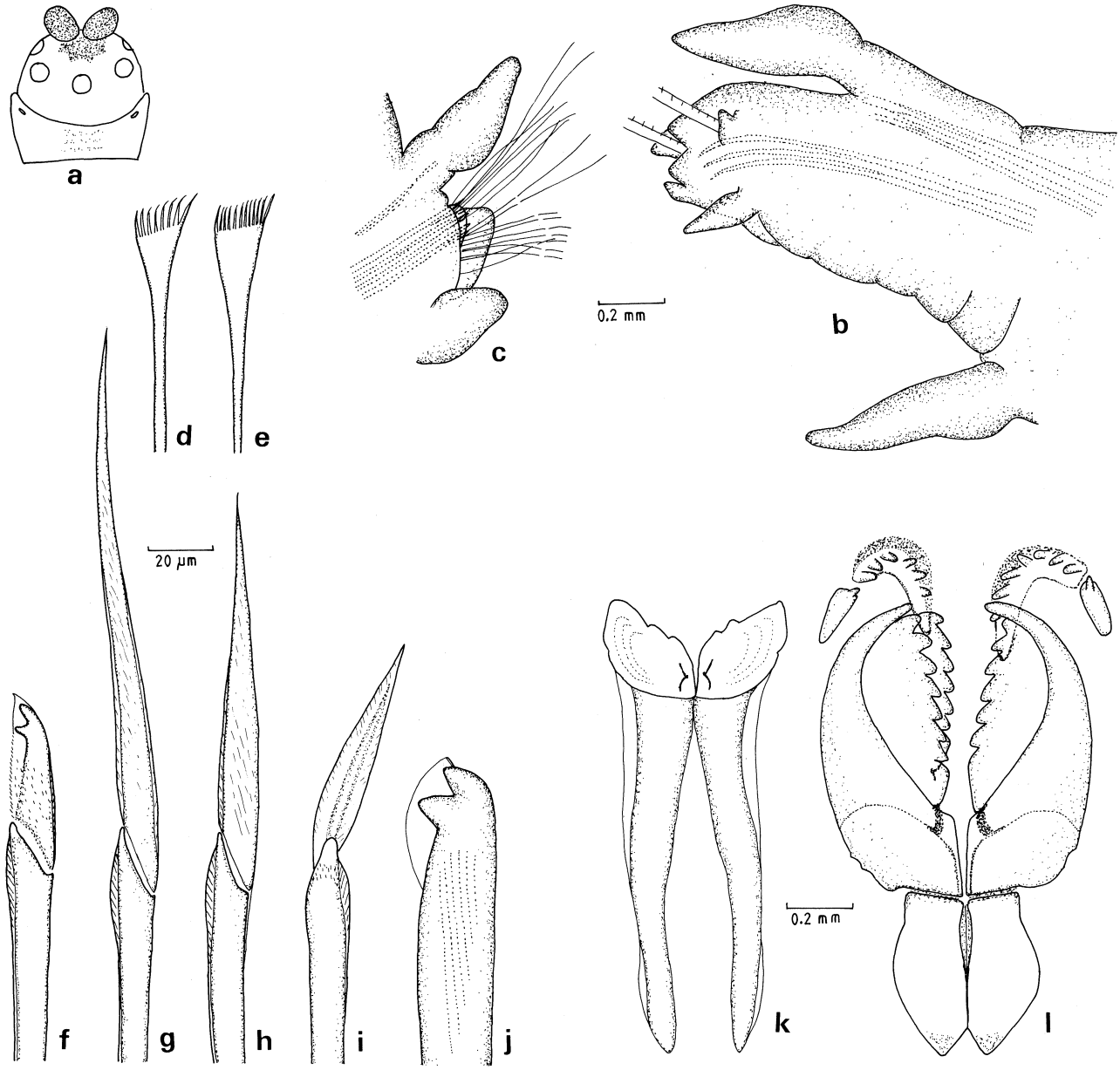

Fig. 12. *R. (Spinigerium) hutchingsae* (a,f–l: holotype AM W. 198968; b–e: paratype AM W. 6851): **a**, stylized diagram of prostomium and peristomium, showing pigmentation pattern, dorsal view; **b**, parapodium 2, posterior view; **c**, parapodium 4, anterior view; **d**, pectinate seta with 8 teeth from setiger 5; **e**, pectinate seta with 12 teeth from same; **f**, compound falciger from setiger 5; **g**, compound median limbate seta from setiger 6; **h**, compound cultriform limbate seta from same; **i**, compound spine-like limbate seta from setiger 13; **j**, subacicular hook from setiger 33; **k**, mandibles; **l**, maxillae.

parapodia, from setiger 4 with projecting rounded tip, numbering (3–4). From setiger 4, upper bundle of 1–3 pectinate setae (oblique comb with 8–12 long teeth) (Fig. 12d,e) and 6–8 simple long limbate setae projecting from dorsal pocket. Lower bundle of setiger 4 with 2 compound limbate and 10–12 compound falcigers (Fig. 12f); lower bundle of setiger 5 with limbate setae and 3–5 falcigers. From setiger 6, only compound limbate setae in lower bundle, consisting of compound median (Fig. 12g) and cultriform (Fig. 12h) limbate, becoming shorter and bilimbate spine-like (Fig. 12i) in following setigers. One subacicular hook (Fig. 12j) from setiger 12(13), 2 from 14(15–17).

Mandibles (Fig. 12k) with distally serrated cutting plates. Maxillae (Fig. 12l) weakly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7 + 6; Mx III = 6 + 0; Mx IV = 6 + 7; Mx V = 1 + 1 (large plate). Tube unknown.

Etymology. The species is named in honour of Dr Pat Hutchings for her generous loans of specimens and other help during this study.

Remarks. *Rhamphobrachium (S.) hutchingsae* shares the possession of compound lower limbate setae and falcigers with *R.(S.) brevibrachiatum* and *R.(S.) diversosetosum*. However, it differs from both species in having falcigers on setigers 4 and 5, instead of only on setiger 4.

Biology. The holotype contains eggs (largest about 150 μm diameter).

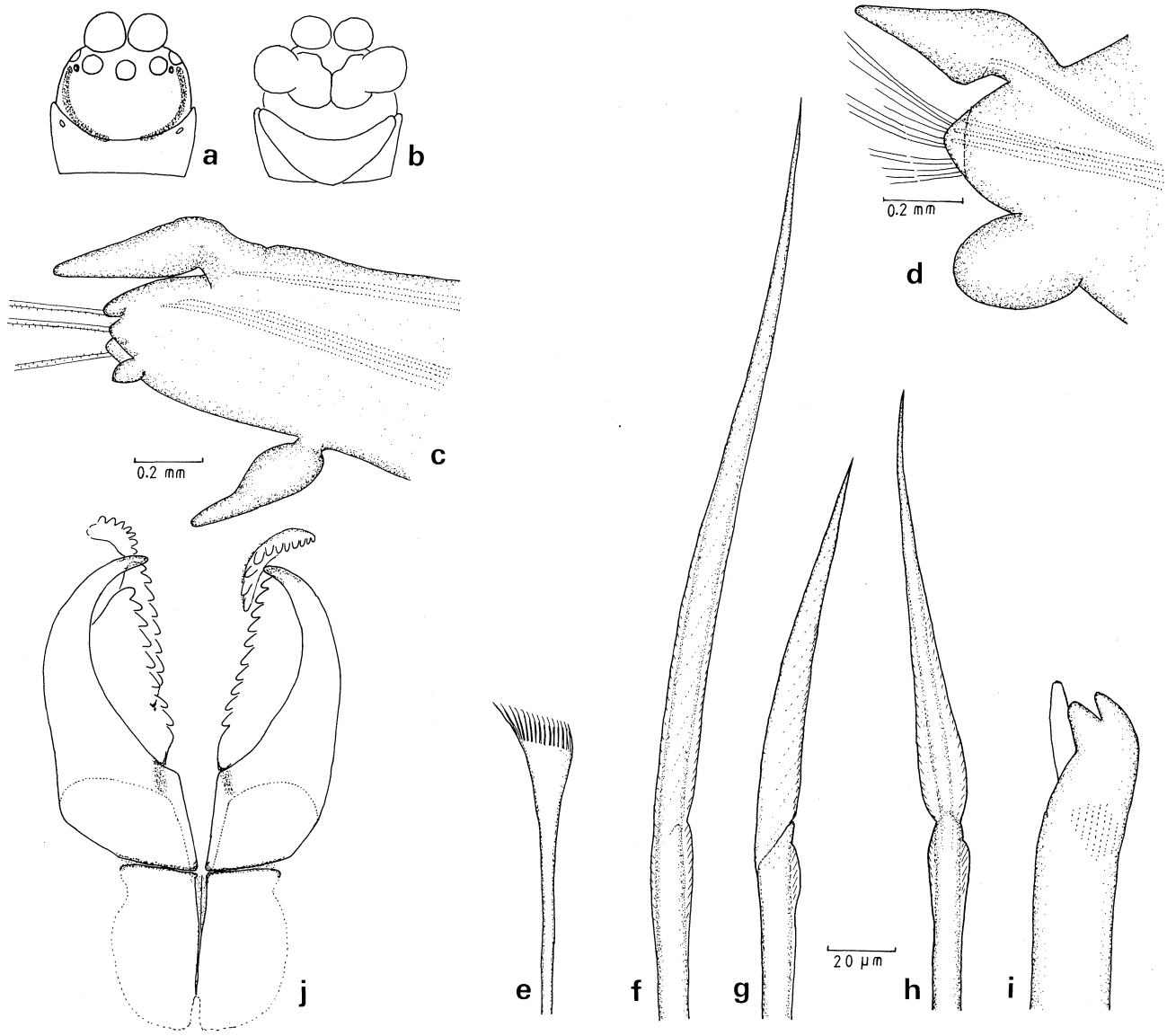

Fig. 13. *R. (Spinigerium) noeli* (c,e,i: paratype QM G10424; d,f–h: holotype QM G10436; j: paratype QM H569): **a,** stylized diagram of prostomium and peristomium, dorsal view; **b,** same, ventral view; **c,** parapodium 1, posterior view; **d,** parapodium 4, posterior view; **e,** pectinate seta from setiger 15; **f,** pseudocompound median limbate seta from setiger 4; **g,** compound cultriform limbate seta from same; **h,** compound spine-like limbate seta from setiger 5; **i,** subacicular hook from setiger 53; **j,** maxillae.

Distribution. South Pacific Ocean: Solomon Islands, Australia (Queensland and New South Wales).

Rhamphobrachium (Spinigerium) noeli n. sp.
Fig. 13a–j

Rhamphobranchium sp.—Stephenson *et al.*, 1974: 113 (Moreton Bay, Queensland, Australia).
Rhamphobrachium sp.—Day & Hutchings, 1979: 119 (same record).

Material examined. Australia: Queensland: Peel Island, Moreton Bay, 7.62 m, Sep. 1970, S. Cook, collector—HOLOTYPE (QM G10436); same locality and collector, 9.5 m, Jun. 1970—1 PARATYPE (QM G10424); same locality and collector, 6.4 m, Sep. 1970—2 PARATYPES (QM G10456 and G10483); Middle Banks, Moreton Bay, Dec. 1973, Dept. of Zoology, University of Queensland, collectors—1 PARATYPE (QM H571); same locality and collectors, Jun. 1974—1 PARATYPE (QM H569).

Diagnosis. Posterior antennae on anterior part of prostomium; branchiae from setiger 12–13, maximum of 4–5 filaments by setiger 30.

Description. Length 48(9+–29+) mm, number of setigers 155 (30+–63+), width 2.4(1.5–2.2) mm. Brown pigmentation on prostomium, antennae, palps and modified parapodia; pale in holotype, absent in some paratypes. Antennae positioned far anteriorly, leaving greater part of prostomium (Fig. 13a,b) exposed. Ceratophores of antennae with 2–3(2–4) proximal rings and long distal ring. Styles subulate; posterior styles to setiger 3(2–3), anterior laterals to 1. Eyes present between anterior and posterior lateral antennae; best developed in one paratype (QM G10424) where clear lenses are visible. Tentacular cirri subulate, slightly longer than ceratophores, inserted slightly subdistally on peristomium.

Each of parapodia 1–3 (Fig. 13c) with 3 short papilliform lobes and one rounded postsetal lobe of equal length. From setiger 4 (Fig. 13d), low presetal and short, rounded postsetal lobes, latter absent from about setiger 15. Dorsal and ventral cirri subulate, latter oval on setiger 4. Branchiae from setiger 12(12–13) as single filaments, bifid from setiger 22(18–19), maximum of 5(3–5) filaments by setiger 30(25–33), reduced to one by setiger 90, absent from last 50 setigers.

Modified parapodia with long, recurved hooks, setal sacs to about setiger 45. Acicula internal in modified parapodia, from setiger 4 with projecting rounded tip, numbering 3(3–4). From setiger 4, 1–3 distally oblique pectinate (comb with 10–15 long teeth) (Fig. 13e) and 5–7 long simple upper limbate setae. Lower bundle with 4–6 pseudocompound median (Fig. 13f) and 6–8 pseudocompound cultriform (Fig. 13g) limbate setae, becoming shorter and bilimbate spine-like (Fig. 13h) in following setigers. One bidentate hooded subacicular hook (Fig. 13i) from setiger 12(10–13), 2 from 16(15).

Pygidium with dorsal anus, and 2 dorsal (about as long as last 5 setigers) and 2 (half as long) ventral anal cirri. Calcified parts of mandibles dissolved; maxillae (QMH569) very weakly sclerotized (Fig. 13j). Maxillary formula: Mx I = 1 + 1; Mx II = 8 + 10; Mx III = 7 + 0; Mx IV = 7 + 10; Mx V not observed. Tube with mucous inner layer and outer thin layer of pieces of shells and rubble.

Etymology. The new species is named in honour of Dr Noel N. Tait, supervisor and friend.

Remarks. *Rhamphobrachium (S.) noeli* approaches *R.(S.) verngreni,* another shallow water species, in its setal and branchial distribution. The two species can be easily distinguished by: (1) antennae positioned very far forward on the prostomium, and postsetal lobes of setiger 4 rounded (Fig. 13d) in the former; and (2) antennae positioned more medially, and postsetal lobes subulate (Fig. 16a) in the latter.

The new species is the only species of *Rhamphobrachium* encountered in the present study that has eyes with obvious lenses, and constructs tubes with a mucous rather than parchment-like lining.

Biology. In two specimens (QMG10424 and 10456) the body cavity was filled with eggs (largest 350 μm in diameter) from about setiger 40.

Distribution. South Pacific Ocean: Australia (southern Queensland).

Rhamphobrachium (Spinigerium) pettiboneae n. sp.
Fig. 14a–k

Material examined. U.S.A.: Georgia: *Pierce* sta. 4G, c. 31°19′N, 79°28′W, 495 m, 23 Feb. 1977—HOLOTYPE (USNM 61025) and 2 PARATYPES (USNM 98879-80).

Diagnosis. Posterior antennae on anterior part of prostomium; branchiae from setiger 10–13, single filaments only.

Description. Length 27 (16+–17+) mm, number of setigers 61(38+–40+), width 1.3(1.2–1.9) mm. Colour markings consisting only of light brown pigment patches on palps, antennae, tentacular cirri and modified parapodia. Antennae positioned far anteriorly, leaving greater part of prostomium (Fig. 14a) exposed. Ceratophores of antennae with 1–3 irregular proximal rings and very long distal ring. Styles subulate; posterior laterals longest, to setiger 2–3, median to 1–2, anterior laterals to 1. No eyes visible. Tentacular cirri subulate, shorter than ceratophores, inserted subdistally on peristomium.

Each of parapodia 1–3 (Fig. 14b) with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Fig. 14c), low presetal and short, rounded postsetal lobes, latter absent from about setiger 10–12. Dorsal cirri subulate, ventral cirri subulate on setigers 1–3, rounded on setiger 4. Branchiae from setiger 12 (10–13), single filaments only; by setiger 20 about 3 times as long as dorsal cirrus, more posteriorly shorter, absent from about setiger 40.

Modified parapodia with long recurved hooks (Fig. 14d), setal sacs to about setiger 40. Acicula internal in modified parapodia, from setiger 4 with projecting rounded tip, numbering 2–3, becoming very thick after

setiger 10 (Fig. 14e). From setiger 4, 4–7 pectinate (comb with 15–20 teeth) (Fig. 14f) and 6–8 long simple upper limbate setae. Lower bundle with 4–5 weakly pseudocompound median and 5–6 pseudocompound cultriform (Fig. 14g) limbate setae, becoming spine-like (Fig. 14h) in following parapodia. One bidentate hooded subacicular hook (Fig. 14i) from setiger 10(10–11), 2 from 11(13–14).

Pygidium with dorsal anus, and 2 long dorsal (about as long as last 7 setigers) and 2 very short ventral anal cirri (Fig. 14j). Mandibles with slender shaft, calcified cutting plates dissolved; maxillae (smaller paratype)

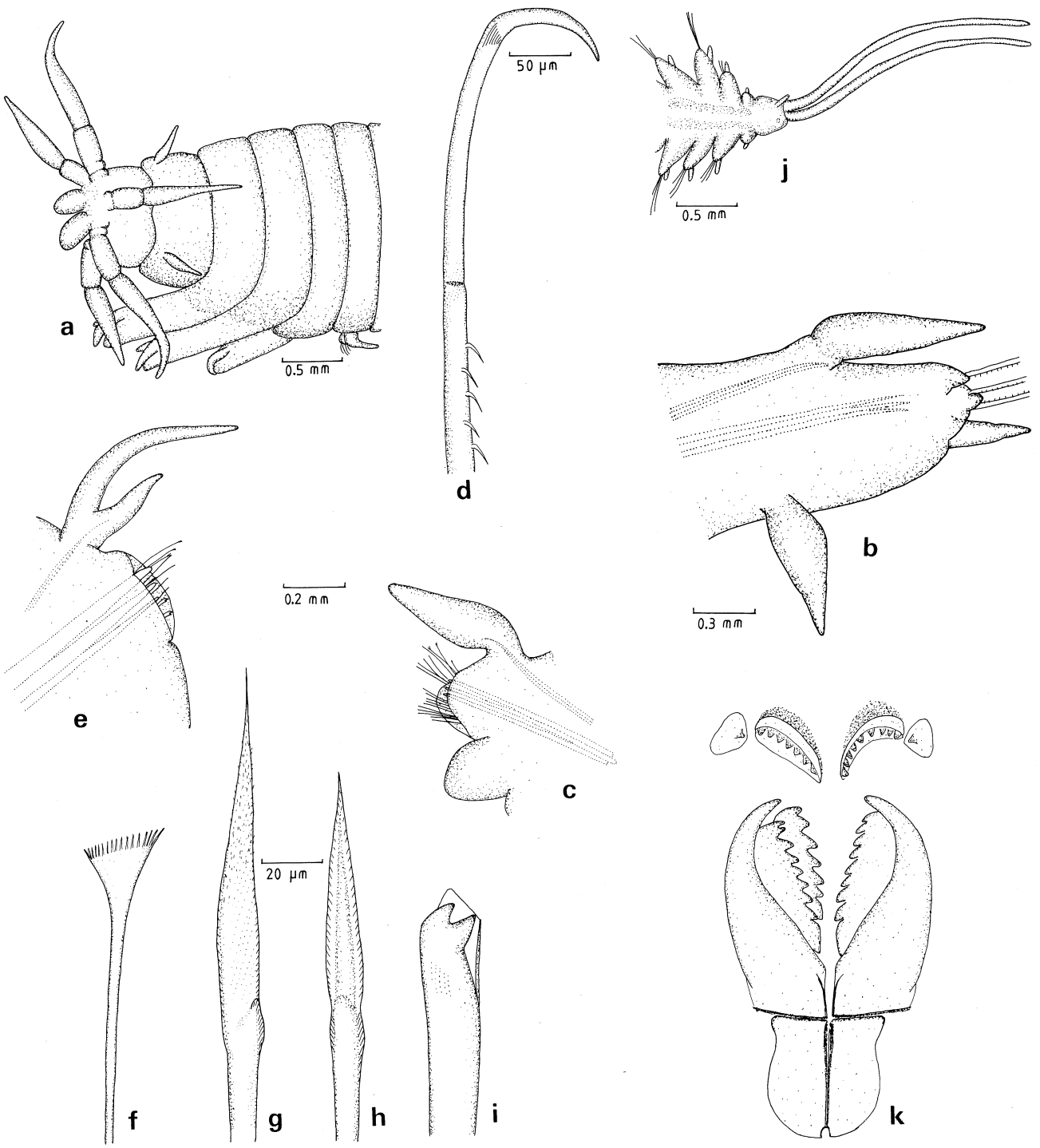

Fig. 14. *R. (Spinigerium) pettiboneae* (a,i,j: holotype USNM 61025; b,f,h,k: paratype USNM 98879; c-e,g: paratype USNM 98880): **a**, anterior end, dorsolateral view; **b**, parapodium 1, anterior view; **c**, parapodium 4, same view; **d**, recurved hook from setiger 1; **e**, parapodium 14, anterior view; **f**, pectinate seta from setiger 14; **g**, pseudocompound cultriform limbate seta from setiger 4; **h**, pseudocompound spine-like limbate seta from setiger 10; **i**, subacicular hook from setiger 12; **j**, posterior end, in ventral view; **k**, maxillae (Mx IV to Mx V not in natural position).

weakly sclerotized (Fig. 14k). Maxillary formula: Mx I = 1 + 1; Mx II = 8 + 8; Mx III = 6 + 0; Mx IV = 7 + 9; Mx V = 1 + 1 (large plate). Tube unknown.

Etymology. It gives me pleasure to name the new species in honour of Dr Marian H. Pettibone, whose help and advice I greatly appreciate.

Remarks. Although the types of *R.(S.) pettiboneae* are relatively small, they are adult specimens (see 'Biology' below). The new species shares the possession of pseudocompound lower limbate setae with *R.(S.) longisetosum, R.(S.) averincevi, R.(S.) verngreni, R.(S.) noeli, R.(S.) ehlersi* and *R.(S.) pyriforme. Rhamphobrachium (S.) pettiboneae* is distinguished from these species by being a very small species with such neotenic characteristics as ceratophores with few rings, single branchial filaments and early origin of subacicular hooks.

The occurrence of *R.(S.) pettiboneae* overlaps with the distribution of *R.(S.) brevibrachiatum*. The former differs mainly from the latter in that its lower limbate setae are pseudocompound instead of compound and its branchiae have only single filaments instead of 5–6.

Biology. Both paratypes contained free sperm and the holotype appeared to have spawned and retained some eggs, the largest of which had a diameter of 170 μm. This evidence is taken as an indication that the specimens represent adults of a small species, rather than being juveniles.

Distribution. North Atlantic Ocean: U.S.A. (off Georgia); 495 m.

Rhamphobrachium (Spinigerium) pyriforme n. sp.

Fig. 15a–i

Material examined. Australia: New South Wales: *Kapala* sta. K78-27-04, 34°50′S, 151°15′E, c. 800 m, 12 Dec. 1978—HOLOTYPE (AM W.198978) and PARATYPE (AMS W.198979).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 14, maximum of 2 filaments by setiger 20; setiger 4 with short subulate postsetal lobes; one subacicular hook from setiger 12–14, 2 from 15–16.

Description. Length 57+(17+) mm, number of setigers 73+(35+), width 4.0(2.2) mm. Reddish-brown pigment concentrated on palps, antennae, tentacular cirri, anterior parapodia, and as diffuse dorsal and ventral segmental bands. Posterior antennae on median part of prostomium. Ceratophores of antennae with closely spaced proximal rings and longer distal ring, lateral antennae with 3–4, median antenna with 2–3 proximal rings; styles of holotype cirriform, styles of paratype longer, with filiform ends; anterior lateral styles to setiger 1, posterior laterals to 3–4(6), median to 3(4). No eyes visible. Tentacular cirri subulate to pyriform, about as long as ceratophores.

Each of parapodia 1–3 (Fig. 15a) with 3 short papilliform lobes and one longer subulate postsetal lobe. On setiger 4 (Fig. 15b), low presetal and short subulate postsetal lobes, latter absent from about setiger 15. Anterior dorsal cirri of holotype pyriform, becoming gradually less inflated, subulate from setiger 10; in paratype subulate throughout. Ventral cirri pyriform to subulate on setigers 1–3, rounded on setiger 4. Branchiae from setiger 14 as single filaments; bifid from 21(16–17), single again from about setiger 50; posterior single filaments long, to middle of dorsum.

Modified parapodia with long recurved hooks, setal sacs to about setiger 40. Acicula internal in modified parapodia; from setiger 4, 4 projecting acicula: dorsalmost and presumably newest replacement aciculum with needle-like distal extension, broken off in older acicula, leaving rounded tips (Fig. 15c). In median and posterior region acicula large, reduced to 2 per parapodium (Fig. 15d). From setiger 4, 2–4 distally oblique pectinate (comb with 14–18 teeth) (Fig. 15e) and 8–10 long simple upper limbate setae. Lower bundle with 8–10 weakly pseudocompound median (Fig. 15f), and 8–10 weakly pseudocompound cultriform limbate setae (Fig. 15g), becoming shorter and almost simple bilimbate spine-like (Fig. 15h) in following parapodia. One bidentate hooded subacicular hook (Fig. 15i) from setiger 14(12), 2 from 16(15).

Calcified cutting plates of mandibles with tooth-like projections near point of fusion. Maxillae (paratype) weakly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7 + 7; Mx III = ? + 0; Mx IV = 6 + 8; Mx V = 1 + 1 (large plate). Tubes with tough parchment-like inner layer and outer thin layer of sand grains and foraminiferans.

Etymology. The name of the new species is derived from its characteristic pyriform cirri.

Remarks. *Rhamphobrachium (S.) pyriforme* is unique in that its tentacular cirri and anterior dorsal and ventral cirri are pyriform, a character that is more pronounced in the mature holotype than in the smaller paratype. The new species resembles *R.(S.) ehlersi* most closely in having some reddish-brown pigmentation and branchiae with only two but long filaments. The two species can be distinguished by: branchiae starting on setiger 14 in *R.(S.) pyriforme* and on setiger 10–12 in *R.(S.) ehlersi;* and antennae in the former being longer and having more rings than in the latter.

Biology. The holotype is ovigerous; the largest eggs measure 330 μm in diameter.

Distribution. Pacific Ocean: eastern Australia; c. 800m.

Rhamphobrachium (Spinigerium) verngreni (Kinberg)

Fig. 16a–e

Onuphis Verngreni Kinberg, 1865: 560 (16 miles SE of Rio de Janeiro, Brazil, 106 m); 1910: 39, pl. 14 fig. 8 (same record).

Rhamphobrachium verngreni.—Augener, 1931: 295, fig. 4

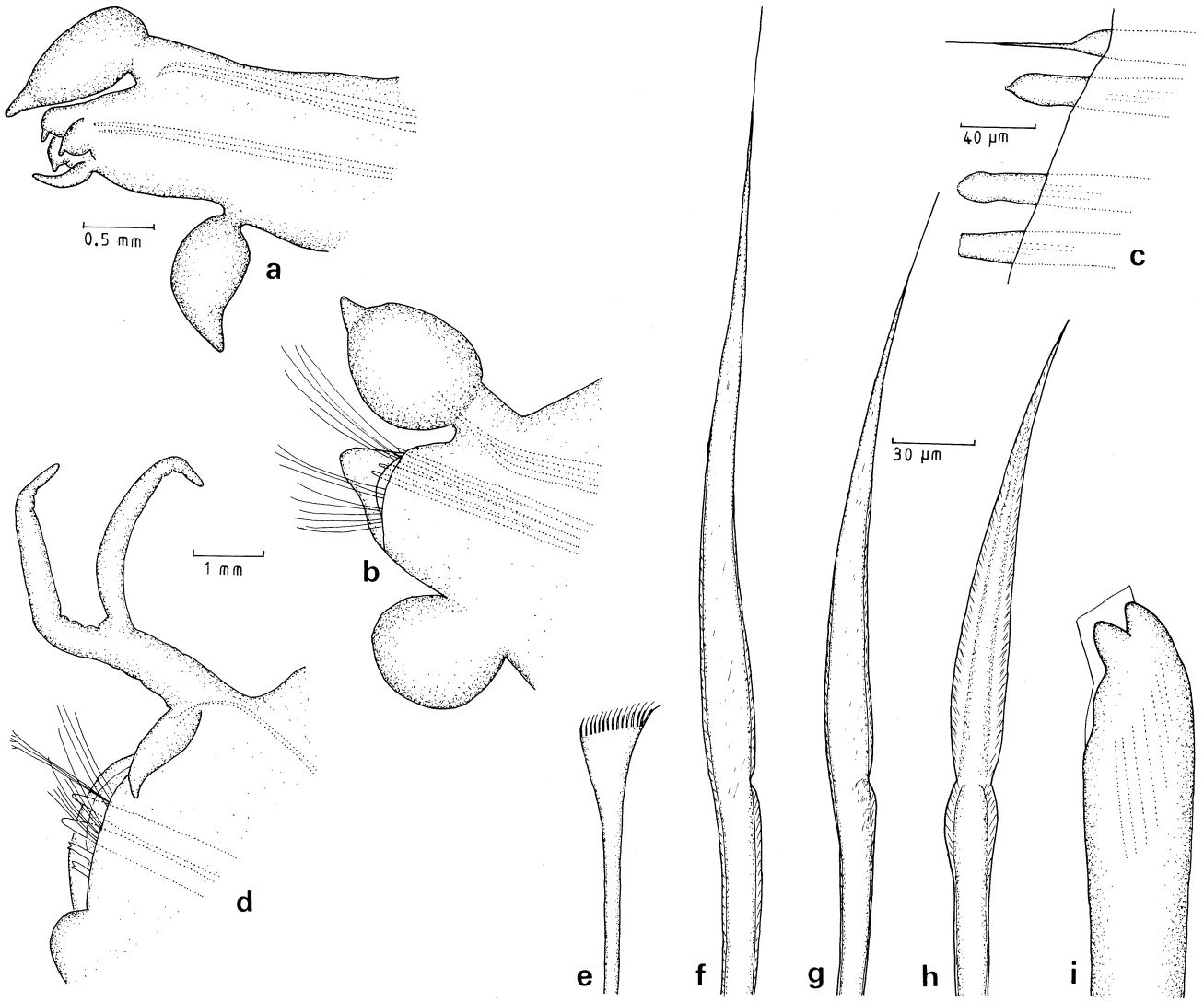

Fig. 15. *R. (Spinigerium) pyriforme* (holotype AM W.198978): **a**, parapodium 1, posterior view (pfl = papilliform lobes; psl = postsetal lobe); **b**, parapodium 4, anterior view; **c**, acicula from setiger 4; **d**, parapodium 33, anterior view; **e**, pectinate seta from setiger 33; **f**, pseudocompound median limbate seta from setiger 4; **g**, pseudocompound cultriform limbate seta from same; **h**, pseudocompound spine-like limbate seta from setiger 14; **i**, subacicular hook from setiger 33.

(examination of types); Orensanz, 1974: 109, pl. 11 figs 1–13 (Uruguay); Rullier & Amoureux, 1979: 176 (Brazil).

[?] *Rhamphobrachium* sp. Orensanz, 1974: 112, pl. 12 figs 1–3 (Uruguay).

Material examined. Brazil: *Calypso* sta. 104, c. 23°08′S, 42°30′W, 103 m, 2 Dec. 1961—2 (MNHP AS278).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 11–14, maximum of 4–7 filaments by setiger 35; setiger 4 with short subulate postsetal lobes; one subacicular hook from setiger 13–14, 2 from 17–18.

Description. Length to 34+ mm, setigers to 67+, width to 3 mm. No obvious pigmentation. Posterior antennae on median part of prostomium. Ceratophores of antennae with 2–3 proximal rings and longer distal ring; styles subulate, anterior lateral styles to setiger 1, posterior styles to setiger 2–3. Tentacular cirri about as long as ceratophores.

Each of parapodia 1–3 with 3 short papilliform lobes and one slightly longer postsetal lobe. On setiger 4 (Fig. 16a), low presetal and short, subulate postsetal lobes, latter becoming reduced in following parapodia and absent from setiger 12–14. Dorsal cirri subulate. Single branchial filaments from setiger 11–14, bifid from 17–18, maximum of 4–7 filaments by setiger 35.

Modified parapodia with long recurved hooks, setal sacs to about setiger 55. From setiger 4, pectinate (comb with 10–15 teeth) and simple long upper limbate setae projecting from dorsal pocket. Lower bundle with weakly pseudocompound median and cultriform (Fig. 16b) limbate setae, becoming gradually shorter (Fig. 16c) and spine-like bilimbate (Fig. 16d) in following parapodia. One bidentate hooded subacicular hook from setiger 13–14, 2 from 17–18.

Calcified cutting plates of mandibles (Fig. 16e) with tooth-like projection at point of fusion. Maxillae hardly sclerotized, maxillary formula: Mx I = 1 + 1; Mx II = 7 + 6-8; Mx III = 5-6 + 0; Mx IV = 6 + 6-7; Mx V = 1 + 1 (large plate). Tubes with tough parchment-like inner layer and outer layer of mud, sand and shells.

Remarks. *Rhamphobrachium* sp. was reported by Orensanz (1974) from Uruguay in depths of 72-86 m. The presence of only 2 modified anterior pairs of parapodia, compound limbate setae and bidentate falcigers in parapodia 3 (Orensanz, 1974: pl. 12) characterize the specimens as juveniles of *R. (Spinigerium)*. Since *R.(S.) verngreni* is the only known species of the genus to occur in the area, it is probable that the specimens belong to this species.

Distribution. South Atlantic Ocean: Brazil, Uruguay; in 72-115 m.

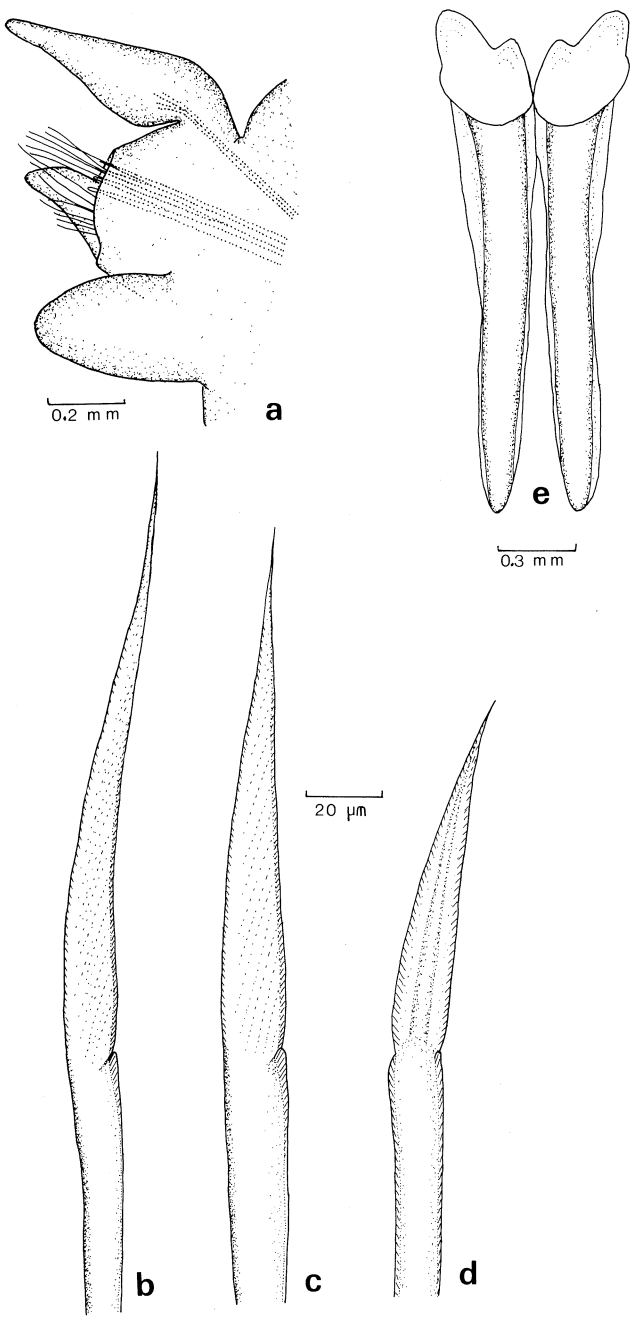

Fig. 16. *R. (Spinigerium) verngreni* (MNHN AS278): **a**, parapodium 4, anterior view; **b**, pseudocompound lower limbate seta from setiger 4; **c**, pseudocompound cultriform limbate seta from setiger 12; **d**, pseudocompound spine-like seta from same; **e**, mandibles.

INCERTAE SEDIS

?Rhamphobrachium (Spinigerium) bipes Monro

Fig. 17a-d

Rhamphobrachium bipes Monro, 1937: 293, text-fig. 16a-h (Gulf of Aden, 91 m).

Paranorthia bipes.—Imajima & Hartman, 1964: 247 (new combination).

Material examined. Gulf of Aden: *John Murray* sta. 178, 12°00′36″N, 50°40′06″E, 91 m—HOLOTYPE (BMNH ZK 1937.9.2.378).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 7, maximum of 5 filaments by setiger 40; falcigers on setiger 3; one subacicular hook from setiger 13, 2 from 14.

Description. Length 16+ mm, number of setigers 49+, width 1.5 mm. Ceratophores of antennae with 2-3 proximal rings and long distal ring; styles slender, posterior styles to setiger 2. Small eyespots between bases of posterior and anterior lateral antennae. Tentacular cirri subulate.

Each of parapodia 1-2 with 3 short papilliform lobes and one longer postsetal lobe. On setiger 3, low presetal and short rounded postsetal lobes, latter absent from about setiger 10. Dorsal cirri subulate. Single branchial filaments from setiger 7, bifid from 10, maximum of 5 filaments by setiger 40.

Two pairs of modified parapodia with long recurved hooks, setal sacs to about setiger 55. From setiger 3, upper bundle of simple limbate and pectinate setae (comb with 12 teeth). Lower bundle of parapodia 3 with compound falcigers (Fig. 17a); from setiger 4, compound cultriform limbate setae (Fig. 17b) in lower bundle changing gradually to bilimbate spine-like setae (Fig. 17c). One subacicular hook (Fig. 17d) from setiger 13, 2 from 14.

Mandibles and maxillae delicate, calcified, hardly sclerotized; maxillary formula: Mx I = 1 + 1; Mx II = 7 + 8; Mx III = 7 + 0; Mx IV = 7 + 8; Mx V = 1 + 1 (large plate). Tube unknown.

Remarks. The holotype of *R.(S.) bipes* displays the juvenile characteristics of only 2 modified pairs of parapodia and compound falcigers on setiger 3. It most closely resembles *R.(S.) diversosetosum* which possesses falcigers, compound limbate setae and well developed branchiae. It is possible that the holotype of *R.(S.) bipes* is a young *R.(S.) diversosetosum*. Although the material was collected on the same cruise of the *John Murray*, the stations are widely separated. Since *R.(S.) bipes*

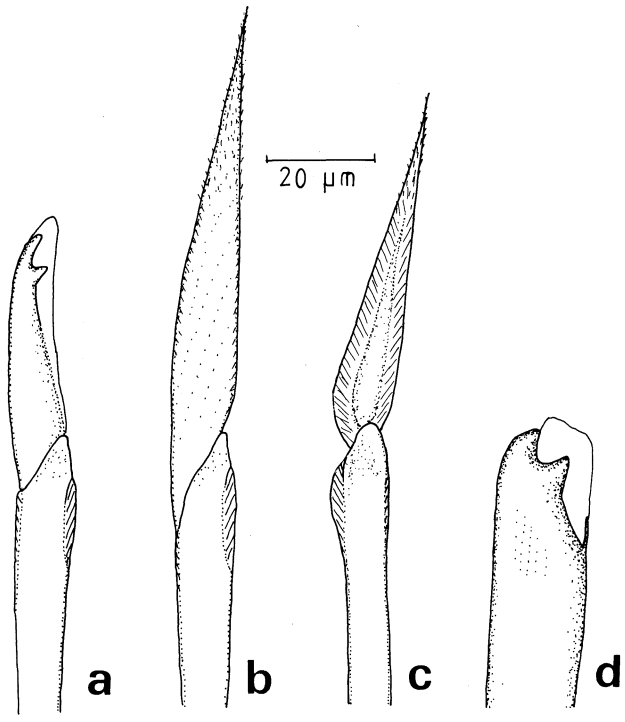

Fig. 17. *R. (Spinigerium) bipes* (holotype BMNH ZK 1937.9.2.378): **a**, compound falciger from setiger 3; **b**, compound cultriform limbate seta from setiger 5; **c**, compound spine-like limbate seta from setiger 9; **d**, subacicular hook from setiger 14.

cannot be positively identified with a known adult species, it is retained as a doubtful species.

Distribution. Indian Ocean: Gulf of Aden; 91 m.

Rhamphobrachium (Spinigerium) brevicornutum (Moore)

Fig. 18a,b

Paranorthia brevicornuta Moore, 1903: 448, pl. 25 figs 52–56 (Suruga Bay, Japan, 82–88 m).—Izuka, 1912: 108 (same record); Imajima & Hartman, 1964: 247 (same record).
Rhamphobrachium brevicornuta.—Kucheruk, 1979b: 119 (new combination).

Material examined. Japan: *Albatross* sta. 3713, Suruga Bay, off Honshu Island, 82–88 m, 11 May 1900—HOLOTYPE (USNM 15712).

Diagnosis. Posterior antennae on median part of prostomium; branchiae from setiger 9, maximum of 2 filaments by setiger 23; falcigers on setiger 3; subacicular hooks from setiger 12–13.

Description. Length 13+ mm, number of setigers 44+, width 1.0 mm. Posterior antennae on median part of prostomium. Ceratophores of antennae with 1–2 proximal rings and long distal ring; styles subulate, to setiger 1. No eyes visible. Tentacular cirri subulate, shorter than ceratophores.

Each of parapodia 1–2 with 3 short papilliform lobes and one about equally long postsetal lobe. On setiger 3 (Fig. 18a), low presetal and short rounded postsetal lobes, latter absent from about setiger 7–8. Dorsal cirri subulate. Single branchial filaments from sestiger 9, bifid from 23.

Two pairs of modified parapodia with long spiny hooks (Fig. 18b). From setiger 3, upper bundle of 5 simple limbate setae. Lower bundle of parapodia 3 with 3 pseudocompound median limbate setae, 1 compound cultriform limbate seta and 6 compound falcigers; from setiger 4, only pseudocompound median, compound cultriform and spine-like limbate setae. Most anterior pectinate setae (comb with 15–20 long teeth) observed on setiger 7. Subacicular hooks from setiger 12–13.

Jaws not examined. Tube unknown.

Remarks. Although the distal parts of the long recurved hooks are broken off in the only type specimen, the long internal shafts bear the moveable spines, characteristic of *Rhamphobrachium,* clarifying its generic status (Paxton, 1986). The presence of only two modified pairs of parapodia marks the holotype of *R.(S.) brevicornutum* a juvenile. Since the type locality is widely separated from any other known species of *Rhamphobrachium, R.(S.) brevicornutum* remains an incompletely known species until more material becomes available.

Distribution. Eastern North Pacific: Japan; 82–88 m.

?Rhamphobrachium (Spinigerium) cristobalensis Fauchald

Rhamphobrachium cristobalensis Fauchald, 1968: 44, pl. 12 figs b–i (San Cristobel Bay, Baja California, 75 m).

Diagnosis. Antennae on anterior part of prostomium; branchiae from setiger 4, maximum of 2 filaments by setiger 18; falcigers on setiger 3; subacicular hooks from setiger 8.

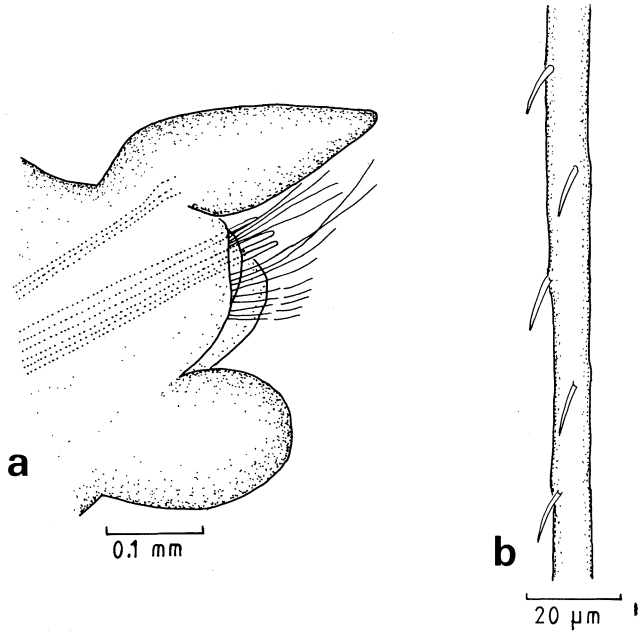

Fig. 18. *R. (Spinigerium) brevicornutum* (holotype USNM 15712): **a**, parapodium 3, anterior view; **b**, internal shaft of long spiny hook.

Description. Length 7 mm, number of setigers 63, width 1.2 mm with setae. Antennae on anterior part of prostomium. Ceratophores of antennae with 2–3 irregular rings; short styles, posterior styles to about setiger 3. Small anterior eyespots near frontal palps. Tentacular cirri longer than ceratophores, digitiform.

Each of parapodia 1–2 with 3 short papilliform lobes and one longer digitiform postsetal lobe. On setiger 3, low presetal and short rounded postsetal lobes. Dorsal cirri digitiform. Single branchial filaments from setiger 4, bifid from 18, single again from 33, absent from setiger 43.

Two pairs of modified parapodia with long recurved hooks, setal sacs to at least setiger 35. From setiger 3, upper bundle of simple limbate and lower bundle of compound limbate setae; compound falcigers in lower bundle of parapodia 3. Subacicular hooks from setiger 8. Pectinate setae in median and posterior region.

Maxillary formula: Mx I = 1 + 1; Mx II = 9 + 0; Mx III = 5 + 0; Mx IV = 0 + 5; MxV = 0 + 0. Tube unknown.

Remarks. *Rhamphobrachium (S.) cristobalensis* is known only from two syntypes, both of which are juveniles. The specimens were collected within the geograpic and depth distribution of *R.(S.) longisetosum* and may represent juveniles of that species. However, the con-specificity cannot be proven until a larger size range of juveniles becomes available.

Distribution. Pacific Ocean: Baja California; 75 m.

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