AUSTRALIAN ACANTHOCEPHALA
No. 5

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Hypoechinorhynchus alaiopis Yamaguti 1939
(Fig. 1-9)

Parasites of this species were found in the fish *Callionymus calauropomus*, caught in St. Vincent Gulf, South Australia. Five of six fish examined contained this parasite, and in four of them they were abundant. The intestines of all these fish contained crustacean material, especially amphipods and cyprids. The collections examined contained both males and females, the latter being slightly longer and broader than the males. In all the specimens examined the proboscis was protruded, but in no case was the copulatory bursa of the male everted.

The length of the male is 1·3 to 2·7 mm., and the female 1·6 to 2·8 mm. The maximum width of the male is 0·45 to 0·70 mm., and the female 0·50 to 0·91 mm. The body in both sexes is curved ventrally and devoid of spines. The proboscis is globular to spherical in shape and is attached to the trunk ventroterminally (fig. 1). The proboscis of the male is 0·10 to 0·14 mm. long and 0·10 to 0·15 mm. in its widest part. The corresponding measurements in the female are 0·12 to 0·16 mm. The neck portion of the proboscis is very short. The proboscis is armed with 25 hooks arranged in ten longitudinal rows, consisting of five rows each of three hooks alternating with five rows each of two hooks (fig. 4, 5). The lengths of the hooks, measured along the curve from the point of extrusion to the tip of the hook, are shown in the following table:—

Male	Anterior	Middle	Posterior
Row of three	78–101 μ	30–36 μ	21–28 μ
Row of two	71–89 μ		25–32 μ
Female	**Anterior**	**Middle**	**Posterior**
Row of three	83–110 μ	38–42 μ	28–32 μ
Row of two	74–90 μ		29–35 μ

The proboscis sheath is bulb-like and in the male measures 0·12 to 0·22 mm. long and 0·11 to 0·14 mm. in its widest part. The corresponding measurements of the female are 0·12 to 0·20 mm. and 0·11 to 0·16 mm. The sheath, which is inserted at the base of the proboscis, is double-walled. The maximum thickness of each layer in both sexes is 10 to 15 μ. A spindle-shaped ganglion is situated at the posterior end of the sheath, and the retinacula arise from the side walls at about this level. A strongly developed retractor is present in both sexes. The lemnisci are short, stout and cylindrical, and contain a well-developed lacunar system. The hypodermis is thick and the lacunae of the body wall anastomose freely.

Male system—There are two spherical to oval-shaped testes placed one behind the other but usually pressed close together. They lie in the anterior part of the worm. The anterior testis is slightly larger than the posterior, the dimensions of the former being 0·21 to 0·38 mm. long and 0·20 to 0·26 mm. wide; and of the posterior 0·20 to 0·32 mm. long and 0·18 to 0·25 mm. wide. Two vasa efferentia unite near the anterior end of the Saefftigen's pouch to form a common duct, which in most specimens is swollen at its base to form a seminal vesicle. This terminates in a penis which projects into the atrium of the bursa

and which is enclosed in a capsule or genital papilla. There are six cement glands which are elliptical to pyriform. In most cases they lie pressed closely together. The ducts of the six glands unite to form two lateral ducts, which join at their bases to form a U-shaped cement reservoir. Two well-developed diverticula project anteriorly from the bursa. The genital pore is terminal.

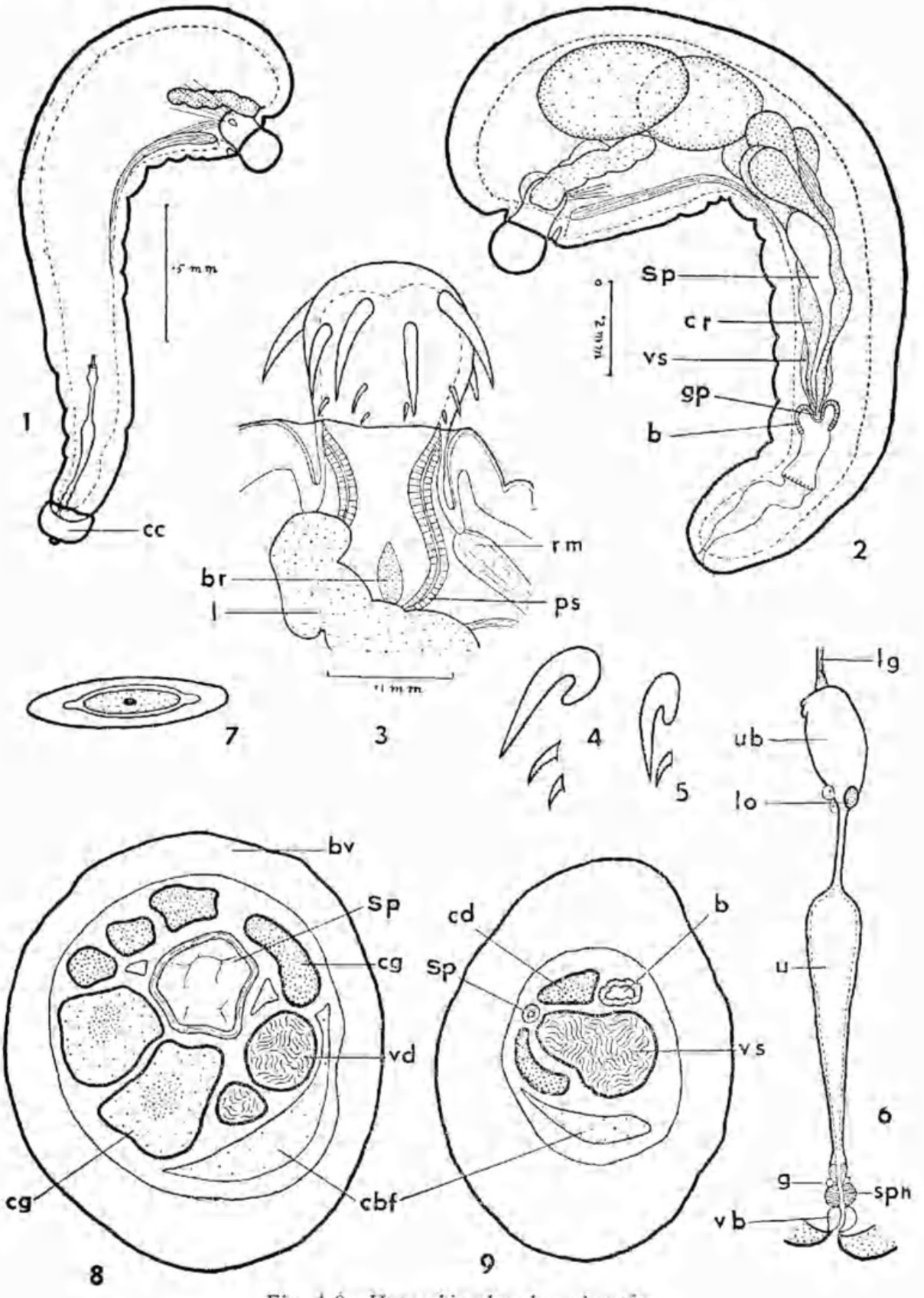

Fig. 1-9—*Hypocolinorhynchus alacopis*:

Female system—The general anatomy of the female system is shown in fig. 6. In a typical specimen the uterine bell is 0·15 mm. long and is separated from the uterus by a narrow constriction, 0·12 mm. in length. The uterus in the same specimen is 0·35 mm. long and 0·07 mm. wide at the anterior end. Some of the female specimens contain floating ovaries, while the others have both ovaries and eggs. Mature eggs, when mounted in methyl salicylate, measure 50 to 54 μ long and 13 to 16 μ wide. The polar extrusions of the middle shell are well developed. A number of females bear a copulatory cap at their posterior extremity.

Systematic position—We consider that this parasite belongs to the species *Hypocchinorhynchus alacopis*, described by Yamaguti (1939, 325), from a Japanese fish. Our measurements agree very closely with those given by him. The hooks of our specimens, however, seem slightly longer, and the testes somewhat smaller than in his material. We regard *Hypocchinorhynchus* as a valid genus of the family Echinorhynchidae. The form of the proboscis, as well as the shape, number and arrangement of its hooks, are suggestive of those of *Neocchinorhynchus*, but the characters of the cement glands are quite different.

Although the parasites described by Yamaguti were taken from *Alacops plinthus*, he stated that a single immature female specimen was collected from *Callionymus altivelis*.

Pararhadinorhynchus mugilis n. gen., n. sp.

(Fig. 10-22)

This species occurs in the mullet, *Mugil cephalus*. Five of six fish examined from Port Wilunga in March, 1939, were parasitised, in one case heavily. The intestine of all the fish contained much plant debris with occasional molluscs and small crustaceans. Two other fish taken at American River, Kangaroo Island, by Mr. H. M. Cooper in January, 1945, also contained the same species of parasite in considerable numbers. In the stomach of these fish were gastropods and numerous crustaceans (prawns, amphipods and copepods). Both male and female specimens were collected. The worms are long and cylindrical, the female being longer and slightly broader than the male. Both sexes are devoid of body spines. The length of the male ranges from 3·1 to 11·4 mm., and the minimum width from 0·23 to 0·61 mm. The females are from 3·9 to 19·2 mm. long and from 0·22 to 0·69 mm. wide. The posterior half or third of the female is twisted in most cases into two or three spiral-like convolutions (fig. 19). This may be due to the fixing processes. All measurements were made on animals cleared in methyl salicylate.

Although the collection consists of a considerable number of both sexes, in only two is the proboscis fully extended. It is therefore difficult to give a range of values for the length and breadth of that organ. The proboscis in most adult specimens is about 0·9 mm. long and 0·2 mm. wide in the broadest part. It appears to taper slightly towards the base. It bears 18 longitudinal rows of hooks, most of which are firmly attached by rooting processes to the cuticle. Each row consists of 16 to 17 hooks. The form of the proboscis is shown in fig. 10, and

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DESCRIPTION OF FIG. 1-9

1, male; 2, female; 3, proboscis; 4, 5, rows of hooks; 6 female organs; 7, egg; 8, T.S. male, through cement glands; 9, T.S. male, through cement ducts.

b, bursa; br, brain; bw, body wall; cc, copulatory cap; cd, cement duct; ci, coagulated body fluid; cg, cement gland; cr, cement reservoir; ej, ejaculatory duct; g, ganglion; go, genital opening; gp, genital papilla; l, lemniscus; la, lacuna; lg, ligament; lm, longitudinal muscle; lo, lateral opening of uterine bell; n, nucleus; pr, proboscis; ps, proboscis sheath; rm, retractor muscle; Sp, Saefftigen's pouch; sph, sphincter; t, testis; u, uterus; ub, uterine bell; vb, vaginal bulb; vd, vas deferens; vs, vesicula seminalis.

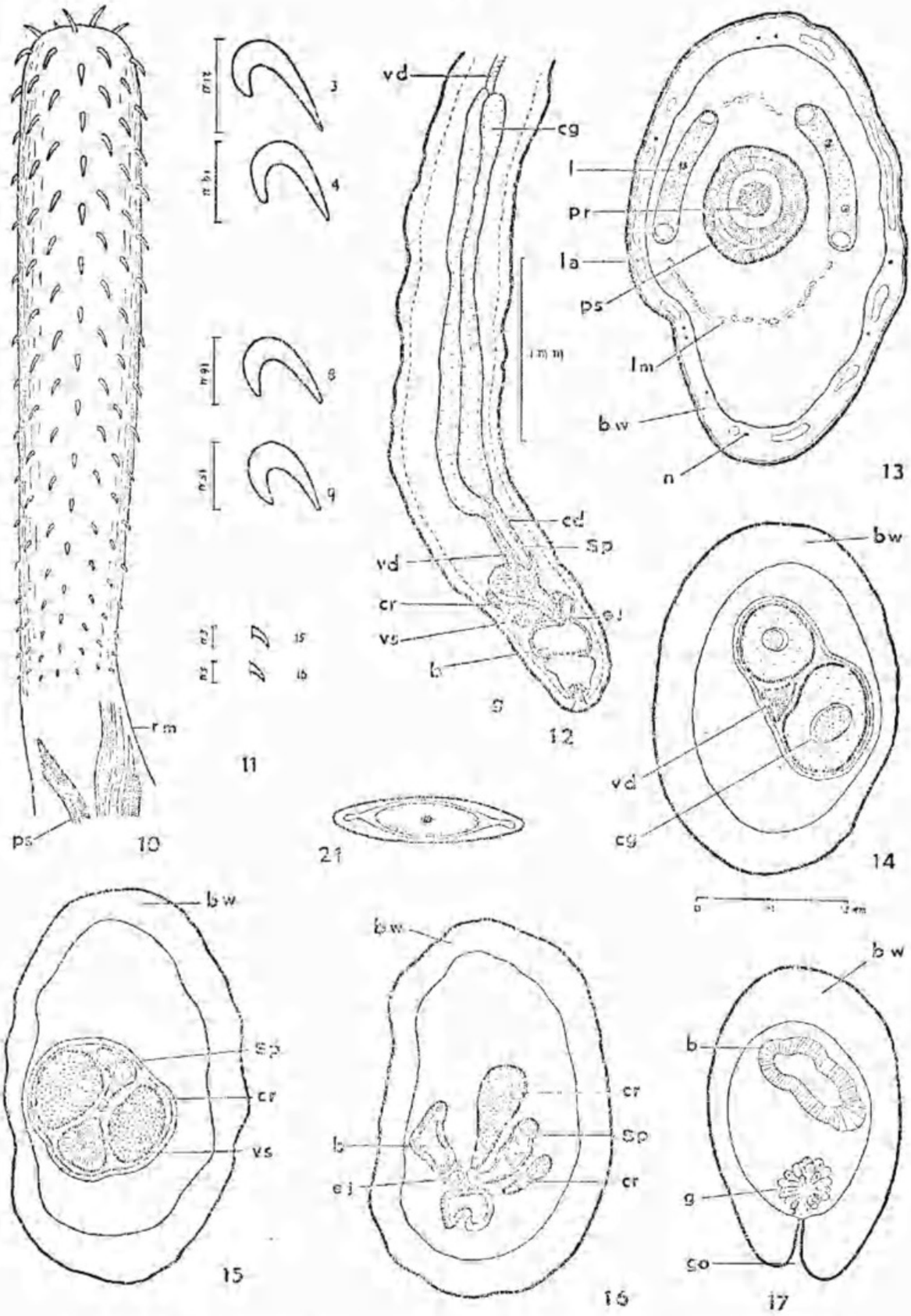

Fig. 10-17—*Paraschistorhynchus nagpurensis*: 10, proboscis of male; 11, hooks from anterior, middle and posterior regions of proboscis; 12 posterior end of male; 13, T.S. anterior end of male; 14, T.S. through region of cement glands; 15, T.S. through cement ducts; 16, T.S. through region of ejaculatory duct; 17, T.S. region of ganglion of male.

the size and form of the hooks in fig. 11. There is a slight neck region. The proboscis sheath is double-walled and measures from 0·61 to 1·3 mm. long, and from 0·12 to 0·20 mm. wide. The thickness of each wall is about 0·02 mm. A brain is situated towards the base of the proboscis sheath.

The lacunar system of the body wall shows two well-developed longitudinal lacunae, from which anastomosing channels arise (fig. 22). Numerous small nuclei are found in the body wall.

The lemnisci are about 0·8 mm. long and extend usually as far as the posterior portion of the proboscis sheath. Transverse sections of the lemnisci show that they are flat and that two lateral canals and a number of large nuclei are also present in these structures (fig. 13).

Male system—There are two elongate testes which lie close together, one behind the other, in the posterior half or third of the animal. The anterior testis measures from 0·28 to 1·1 mm long and from 0·08 to 0·24 mm. wide, and the posterior 0·27 to 1·1 mm. long and 0·08 to 0·23 mm. wide. There are two long, narrow cement glands which range in length from 0·45 to 2·5 mm., and in most specimens they are swollen posteriorly. The ducts from these glands form two long cement reservoirs which usually are constricted in one or two places towards their posterior extremities. A long Saefftigen's pouch lies between the two cement ducts and reaches forward as far as the distal ends of the cement glands. The vas deferens swells slightly towards its posterior part to form a seminal vesicle. There is an ejaculatory duct and a well-developed bursa which bears rays. In none of the specimens examined was the bursa everted. The male aperture is terminal and is surrounded by numerous cells probably constituting a ganglion.

Female system—The structure and arrangement of the female system is shown in fig. 20. The uterine bell is about 0·20 mm. long. The uterus proper in mature specimens ranges from 1·1 to 1·4 mm. in length. The genital opening is terminal and the ganglionic complex which surrounds it is about 0·15 mm. long.

Mature eggs, measured in 70% alcohol, range from 56 to 62 μ long and 14 to 18 μ wide and bear polar prolongations of the middle shell.

Systematic position—This species does not fit very well into Van Cleave's conception (1923; 1940) of the Rhadinorhynchidae, but it resembles most of the members of that family in the form of the proboscis, the shape of the hooks, the double-walled proboscis sheath, the long, tubular cement glands, and the fact that its host is a fish. It differs from the known genera of the family in the lack of body spines, though one such genus, *Leptorhynchoides*, has already been admitted. We propose for the reception of this species a new genus, *Pararhadinorhynchus*, with the following characters:—Rhadinorhynchidae; body elongate, cylindrical; proboscis long, with numerous hooks; proboscis sheath double-walled with proboscis ganglion towards the posterior end; body devoid of spines; cement glands two, long, tubular, swollen slightly towards the posterior end; numerous small nuclei in body wall; genital ganglion well developed. In fish. Type, *Pararhadinorhynchus mugilis*. Types have been deposited in the South Australian Museum, Adelaide.

Rhadinorhynchus pristis (Rudolphi 1802)

(Fig. 23-25)

One immature female of this species was found in the intestine of the southern tunny, *Thunnus maccoyi*, caught off the Semaphore in St. Vincent Gulf, South Australia. The worm was long and tubular, its length being 17·1 mm. and its maximum breadth 0·60 mm. The proboscis, which was fully retracted, was 1·9 mm. long and bore many hooks. The proboscis sheath was double-walled

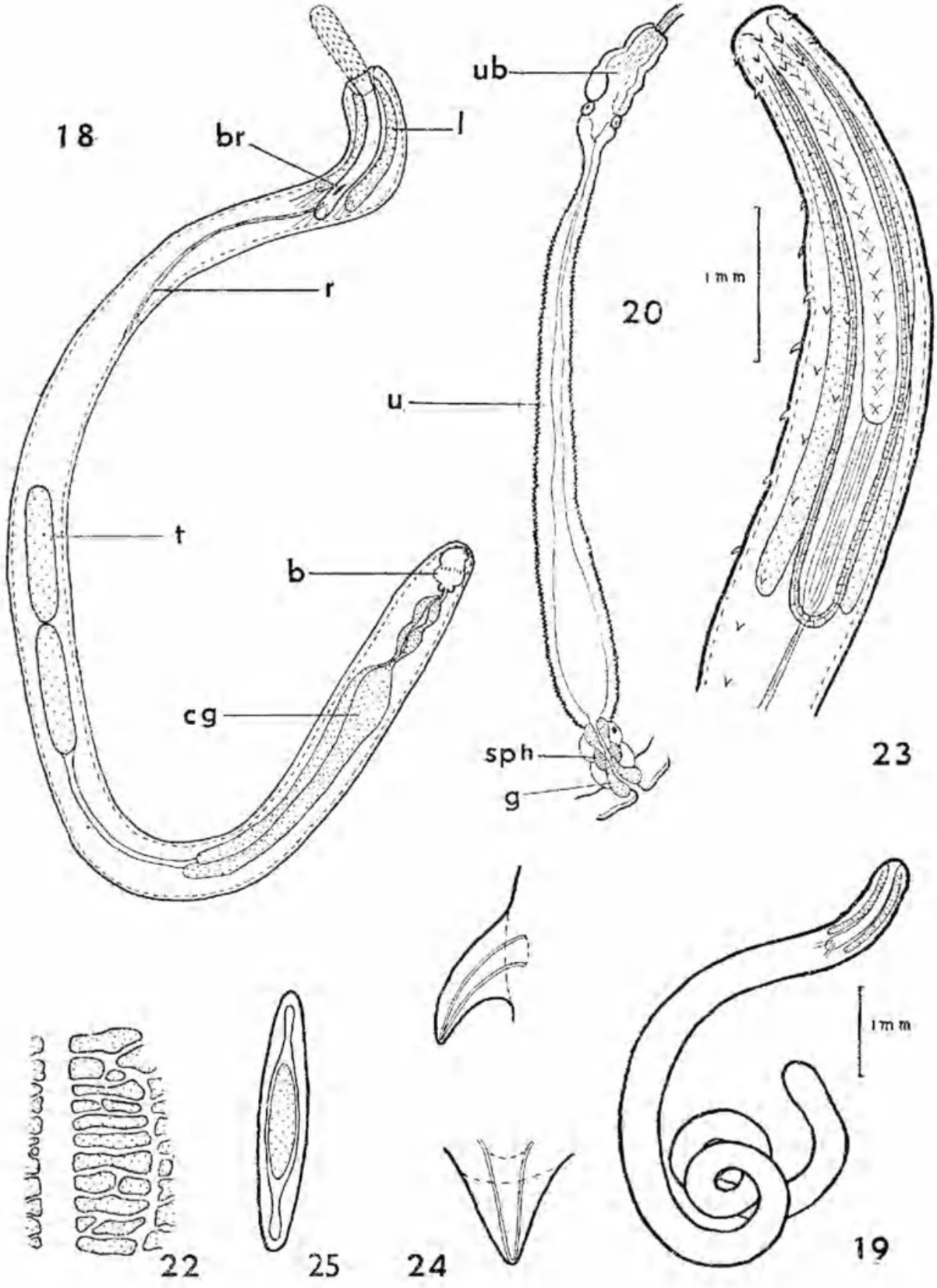

Fig. 18-22—*Pararhadinorhynchus mugilis:* 18, male; 19, female; 20, female organs; 21, egg; 22, part of lacunar system.

Fig. 23-25—*Rhadinorhynchus pristis:* 23, anterior end of female; 24, body hooks; 25, egg.

and 2·8 mm. long. Two lemnisci extended back as far as the posterior part of the proboscis sheath. The extreme anterior part of the body bore two sets of hooks, one group surrounding that part of the body adjacent to the proboscis, and the other group lying on the ventral side of the worm. The shape of the hooks is shown in fig. 24. The specimen was filled with unripe eggs which prevented the examination of the female complex. The largest of the eggs were 0·062 mm. long and 0·012 mm. broad. Three shells were seen, the middle bearing well-developed polar prolongations (fig. 25).

The specimen agreed in all essential details with the figures published by Lühe (1911, 44-46, fig. 58-63) and Meyer (1932, 47-48, fig. 23-25). The latter mentioned several kinds of fish as hosts of the parasite. The species is now recorded for the first time from Australasian waters.

References to Literature

Lühe, M. 1911 Acanthocephalen. Die Süsswasserfauna Deutschlands. Heft 16

Meyer, A. 1932 Acanthocephala. Bronn's Klassen und Ordnungen des Tierreichs, Bd. 4, 2 Abt., 2 Buch, 40-62

Van Cleave, H. J. 1923 Key to Genera of Acanthocephala. Trans. Amer. Micro. Soc., **40**, 184-191

Van Cleave, H. J. 1940 A Reconsideration of the Family Rhadinorhynchidae. Jour. Parasitol., (1), 75-84

Yamaguti, S. 1939 Studies of the Helminth Fauna of Japan, part 29, Acanthocephala ii. Jap. Jour. Zool., **8**, (3), 317-351