PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Aspects of Polychaete Ecology with Particular Reference to Commensalism

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Aspects of polychaete ecology with particular reference to commensalism

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[Plates 69 and 70]

Introduction

In his monograph of the Polychaeta in the *Fauna of India* series, Fauvel (1953) records about 450 species that are to be found in the waters around India but he believed that this number represented only about one-half of the total. Day's recent work (Day 1967) dealing with the polychaete fauna of Southern Africa has listed about 750 species from this region. It seems probable that a similarly large number of polychaete species will be recorded eventually from the central West Pacific region since a large proportion of the species recorded from Southern Africa and around India are known to be distributed throughout the Indo-West Pacific area, extending from the Red Sea to Japan and Eastern Australia. In many of these species a circumtropical distribution is apparent.

In view of the fact that the polychaete fauna of the central West Pacific region is still very incompletely known, the Royal Society Expedition to the Solomon Islands in 1965 offered a unique opportunity for obtaining material from this area. The bulk of the material collected by the author comes from the littoral zone of the coral reefs as well as from the sediments of the more sheltered shores. However, in conjunction with Dr D. R. Stoddart's physiographic survey of the Marovo Lagoon complex in the eastern part of New Georgia, the author carried out a dredging survey, comprising about 40 stations in depths of less than 35 m, and many interesting shallow-water invertebrates were obtained.

The polychaete fauna of the Solomon Islands appears to be rich and so far only a relatively small number of the species have been identified. Most of these species have proved to be well-known Indo-Pacific forms but some have posed some interesting problems from the taxonomic and biogeographical viewpoints. A systematic account of the polychaete fauna of the Solomon Islands is planned for publication in the future.

This paper is a preliminary report on some aspects of the work that was carried out in the Solomon Islands. The first section is a description of the polychaete faunas of some littoral habitats. The second section presents some observations on those polychaetes that were discovered living as commensals on the surface of, or in the burrows of, other animals. It has proved necessary to incorporate taxonomic notes on these commensal species in order to clarify certain points where confusion exists.

The nomenclature used in this paper is that of Hartman (1959, 1965), but Day (1967) has been followed where taxonomic revisions have been made.

The polychaete faunas of some littoral habitats

The following descriptions are based on field observations and ecological collections, and, although it was attempted to collect complete assemblages of the polychaetes in different habitats, undoubtedly many of the smaller species, particularly the syllids, have been overlooked. The coral reefs and the sandy or muddy shores of the Solomon Islands presented a wide variety of habitats, but at present the systematic work is not sufficiently advanced to be able to present a complete report. This preliminary account is a brief description of the polychaete faunas of the following: (i) beachrock, (ii) *Phyllochaetopterus* and *Amphiroa* colonies, and (iii) the silty-sand deposits of a '*Thalassia*' flat.

(i) *Beachrock*

A well-developed reef of beachrock was discovered on Lauvie Island in Marau Sound which has been described by Dr D. R. Stoddart elsewhere in this Discussion (Stoddart 1969). This beachrock was heavily populated by boring sipunculids (chiefly *Aspidosiphon*) as can be seen from figure 135, plate 69. The polychaete fauna in the lower eulittoral zones was similar to that found in coral rock at other localities. A total of 19 polychaete species was recovered from the beachrock, living either in burrows or in crevices (see table 24).

Table 24. List of the polychaete species inhabiting the beachrock formation at Lauvie Is., Marau Sound

The following scale of their relative abundance is used: + = rare, ++ = occasional, +++ = common. Crevice-dwelling species are indicated by C, boring species by B.

habit	species	relative abundance
C	*Harmothoë nigricans*	+
C	*Eurythoë complanata*	+
C	*Phyllodoce (Anaitides) madeirensis*	++
C	*Phyllodoce quadraticeps*	+
C	*Phyllodoce fristedti*	+
C	Syllid sp.	+
B	*Nereis unifasciata*	+
B	*Perinereis cultrifera*	+
B	*P. nigropunctata*	+++
B	*Pseudonereis variegata*	++
B	*Eunice afra*	+
B	*Eunice (Palola) siciliensis*	+
B	*Lysidice collaris*	+
C	*Cirriformia filigera*	++
C	*Hyboscolex longiseta*	++
C	*Loimia medusa*	+++
B?	*Hypsicomus phaeotaenia*	+++
C	*Sabella fusca*	++

The boring species are almost exclusively represented by the two families Nereidae and Eunicidae, the members of which possess hard pharyngeal structures that can be used to abrade the rock. *Perinereis nigropunctata*, a species which usually excavates a simple vertical burrow, was particularly abundant at this locality. While the sabellid *Hypsicomus phaeotaenia* does not possess any structures that could be used for mechanical abrasion, it does appear to penetrate beachrock (and coral) and presumably it does so by chemical action.

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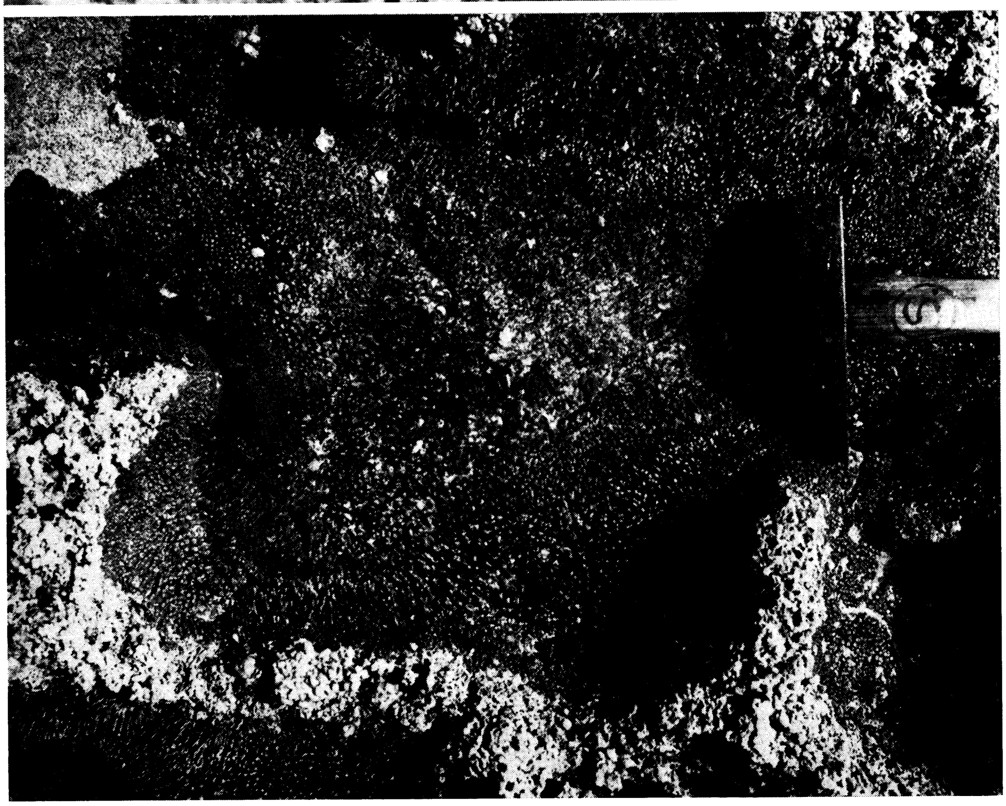

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FIGURE 135. Cross-section of a piece of the beachrock at Lauvie Is., Marau Sound, showing the burrows of boring sipunculids (chiefly *Aspidosiphon*) and polychaete worms.

FIGURE 136. Dense colonies of the chaetopterid *Phyllochaetopterus socialis* exposed towards low water mark on the outer shore of Matiu Is., Marovo Lagoon.

(*Facing p.* 444)

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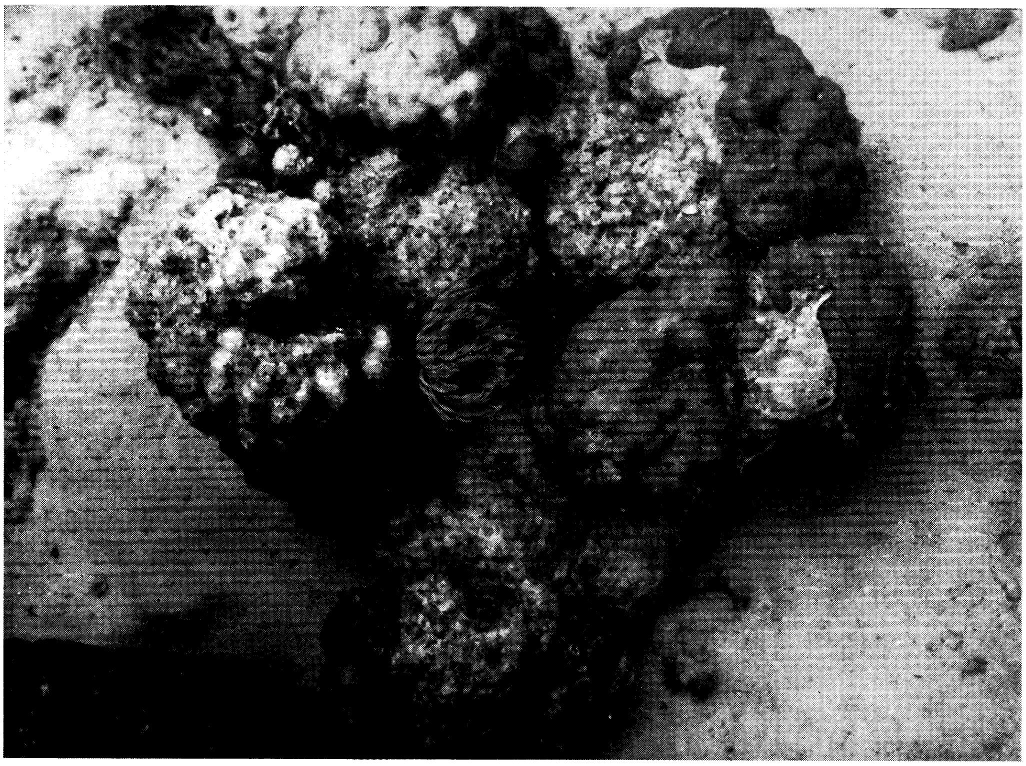

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FIGURE 137. The sabellid *Sabellastarte sanctijosephi* inhabiting a crevice in a *Porites* boulder at Paleki Is., Marovo Lagoon.

FIGURE 138. An underwater photograph showing the branchial crowns of numerous individuals of the serpulid *Spirobranchus giganteus* embedded in a *Porites* boulder at Paleki Is., Marovo Lagoon.

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It may be mentioned that Gardiner (1903) considered that the polychaetes were to be regarded as the most important and the most effective agents in the destruction of coral rock. This is probably true for beachrock also, but the importance of sipunculids in the destruction of coralline and other calcareous rocks should not be overlooked.

(ii) Phyllochaetopterus *and* Amphiroa *colonies*

The majority of polychaetes inhabiting the coral reef platform are to be found living over the lower half of the intertidal zone where they are able to avoid the desiccating effect of the high temperatures prevailing during the period of exposure by living in burrows or crevices. However, colonies of the chaetopterid *Phyllochaetopterus socialis* are often found exposed on the surface of coral rock towards low water mark, usually in tide-pool depressions (figure 136, plate 69). The horny tube secreted by *Phyllochaetopterus* has a small diameter—less than 1 mm—so that apparently the rate of evaporation is minimized and sufficient water is retained within the tube for the worm to survive until immersed by the incoming tide.

On exposed shores the colonies of *Phyllochaetopterus* provide the necessary cover for quite a number of other polychaetes and collections of these species were made at two localities, namely, on the moderately exposed outer shore of Matiu Island in Marovo Lagoon and on a very exposed shoreline at Wickham Island to the south-east of New Georgia. As a comparison, a further collection of the species utilizing the cover provided by the calcareous alga *Amphiroa* was made on a very exposed shore at Gizo Island. The species taken in these three microhabitats are given in table 25. The dominance of the errant species is striking, with 19 out of the total of 21 species that were taken. The family Nereidae is well represented with six species, the most abundant of which was *Pseudonereis anomala*.

As can be seen from table 25, a greater number of species were recovered from the chaetopterid colonies growing under the more exposed conditions, while the *Amphiroa* cover yielded fewer species than the chaetopterid colonies, possibly because the alga provides less shelter from the effects of wave-action. It should be stressed, however, that further work on a quantitative basis is required to confirm these qualitative differences.

(iii) *Silty-sand deposits of a* Thalassia *flat*

The shores within Marau Sound are sheltered from heavy wave-action by a barrier reef and consequently the intertidal zone is often wide with the development of extensive sand flats. At Graham Point a thick layer of sediment, chiefly silty-sand (but with patches of coarser material composed of shell fragments and dead *Halimeda* disks), has accumulated on the reef platform. These deposits are blackened below a depth of about 2 cm, due to the formation of hydrogen sulphide under anaerobic conditions, and support a rich growth of the marine angiosperm *Thalassia*.

The *Thalassia* flat at Graham Point was an area that was extensively investigated since it was found to contain a rich and varied fauna that included many invertebrate species that were not encountered elsewhere in the Solomon Islands. Nineteen species of polychaetes were discovered within the *Thalassia* zone (table 26) some of which were abundant, in particular the glycerid *Glycera gigantea* and two capitellids—*Dasybranchus caducus* and

TABLE 25. COMPARISON OF THE RELATIVE ABUNDANCE (SEE TABLE 24 FOR SCALE) OF THE POLYCHAETE SPECIES INHABITING *PHYLLOCHAETOPTERUS SOCIALIS* COLONIES ON A MODERATELY EXPOSED SHORE (MATIU IS.) AND AN EXPOSED SHORE (WICKHAM IS.) AND ALSO THOSE SPECIES INHABITING THE 'ALGAL MAT' FORMED BY *AMPHIROA* SP. ON AN EXPOSED SHORE (GIZO IS.)

	relative abundance		
	Phyllochaetopterus socialis colonies		*Amphiroa* sp.
species	Matiu Is.	Wickham Is.	Gizo Is.
Thormora jukesii	.	+++	++
Paleanotus debilis	+	+	.
Bhawania goodei	+	.	.
Eurythoë complanata	+++	+++	+
Euphrosine myrtosa	.	+	.
Phyllodoce pruvoti	.	+	.
Eulalia (Steggoa) magalhaensis	++	+	+
Synelmis rigida	.	++	.
Syllid spp.	++	+++	.
Perinereis nigropunctata	.	++	.
Ceratonereis costae	.	+	.
Platynereis insolita	+	.	++
Pseudonereis anomala	.	+++	+++
P. variegata	.	.	+
P. masalacensis	.	++	++
Eunice afra	.	++	.
Lysidice collaris	+	+	.
Nematonereis unicornis	.	++	.
Arabella mutans	.	++	.
Terebella ehrenbergi	+	.	.
Hydroides monoceros	+	.	.

TABLE 26. THE RELATIVE ABUNDANCE OF THE POLYCHAETE SPECIES (SEE TABLE 24 FOR SCALE) INHABITING THE SILTY-SAND DEPOSITS OF THE '*THALASSIA*' ZONE ON THE REEF PLATFORM AT GRAHAM PT. GUADALCANAL IS., AT MARAU SOUND

species	relative abundance
Lepidasthenia microlepis	++
L. mossambica	++
L. stylolepis	++
Polyodontes maxillosus	+
Psammolyce zeylanica	++
Sthenelais zeylanica	++
Amphinome nigrobranchiata	+
Eurythoë complanata	++
Pseudeurythoë paucibranchiata	+
Leocrates claparedii	+
Glycera gigantea	+++
G. lancadivae	++
Eunice (Palola) siciliensis	+
Poecilochaetus tropicus	+
Mesochaetopterus minutus	+
Dasybranchus caducus	+++
Mastobranchus trinchesii	+++
Maldanid sp.	+
Pista typha	+

Mastobranchus trinchesii. Of the rarer species, one of the more interesting is the trochochaetid *Poecilochaetus tropicus* which does not appear to have been recorded outside of the Palau Islands. The majority of the polychaetes from this *Thalassia* flat are errant species, with six aphroditid (s.l.) and three amphinomid species. Included in the former group are three *Lepidasthenia* species, all of which were discovered as commensals for the first time, living in the burrows of sipunculids and an enteropneust (see below).

Observations on commensal polychaetes

Many species of animals are to be found living in close association, often to their mutual benefit, but where this association is clearly advantageous to one of the members, which lives apparently without harming the other, the relationship is referred to as commensalism (Dales 1957). This term embraces a wide variety of phenomena since it is usually difficult to determine the type of benefit that the commensal or 'guest' species derives from its association with the host animal (Clark 1956). In this paper the term is used in a fairly narrow sense and the examples of commensalism will be limited to those cases where polychaetes were discovered living in close association with other animals. The division between those associations that might be considered commensalism and those that may be considered little more than ecologically fortuitous has been drawn in an arbitrary fashion. This is necessary because, on the coral reef, numerous polychaetes utilize corals for shelter, or as a substrate, for example *Sabellastarte sanctijosephi* lives within the shelter of crevices in corals (figure 137, plate 70) and *Spirobranchus giganteus* is nearly always found embedded in the skeleton of coral colonies (figure 138, plate 70); boring species such as *Lysidice collaris* are often to be found living within burrows excavated in various corals and sponges.

In the Solomon Islands a total of twelve polychaete species were discovered to have the commensal habit, living with a wide variety of invertebrate hosts. As with any list of commensal polychaetes, one group—the polynoids—constitutes the majority, with nine species out of the twelve.

Family APHRODITIDAE

Subfamily Polynoinae

Gastrolepidia clavigera Schmarda

Gastrolepidia clavigera Schmarda 1861, p. 159, pl. 36, fig. 316.
Gastrolepidia clavigera Schmarda: Fauvel 1953, p. 51, fig. 22.

Occurrence. On *Stichopus chloronotus*—Maraunibina Is., Marau Sound; Kalota Is., Auki, Malaita. On *Holothuria atra*—Maraunibina Is., Marau Sound; Kalota Is., and Auki Harbour, Malaita. On *Thelenota ananas*—Maraunibina Is., Marau Sound. On *Bohadschia argus*—Maraunibina Is., Marau Sound; Kalota Is., Auki, Malaita. On *Bohadschia graffei*—Maraunibina Is., Marau Sound.

Remarks. *Gastrolepidia clavigera* occurs throughout the Indo-Pacific region and is apparently always found living on the surface of holothurians. Unfortunately, only in a few

TABLE 27. SUMMARY OF THE HOSTS DISCOVERED IN THE SOLOMON ISLANDS AND THOSE THAT HAVE BEEN RECORDED PREVIOUSLY FOR THE COMMENSAL POLYCHAETES DISCUSSED IN THE TEXT

Abbreviations: Po, Polychaeta; Si, Sipunculoidea; Ga, Gastropoda; Ast, Asteroidea; Oph, Ophiuroidea; Ech, Echinoidea; Ho, Holothuroidea; Cr Crinoidea.

commensal	hosts discovered in Solomon Islands	hosts previously recorded	reference
Gastrolepidia clavigera	*Stichopus chloronotus* (Ho)	*Holothuria atra* (Ho)	Potts 1910; Day 1962
	Holothuria atra (Ho)	*H. maculata* (Ho)	Potts 1910
	Thelenota ananas (Ho)	*H. gyrifer* (Ho)	Hartman 1954
	Bohadschia argus (Ho)	*Stichopus horrens* (Ho)	Hartman 1954
	B. graffei (Ho)	*Actinopyga* sp. (Ho)	Potts 1910
Hololepidella minuta	*Ophiocoma brevipes* (Oph)	*Comanthus annulatum* (Cr)	Potts 1915 (as *Polynoë minuta*)
	O. insularia (Oph)	*Ophiocoma anaglyptica* (Oph)	Devaney 1967 (as *H. nigropunctata*)
	Ophiarthrum elegans (Oph)	*O. brevipes* (Oph)	Devaney 1967 (as *H. nigropunctata*)
		O. erinaceus (Oph)	Devaney 1967 (as *H. nigropunctata*)
		O. dentata (Oph)	Devaney 1967 (as *H. nigropunctata*)
		Acanthaster planci (Ast)	Devaney 1967 (as *H. nigropunctata*)
		Macrophiothrix hirsuta (Oph)	Macnae & Kalk 1962 (as *H. nigropunctata*)
Hololepidella commensalis	*Macrophiothrix koehleri* (Oph)	*Clypeaster humilis* (Ech)	Willey 1905
	Ophiarthrum pictum (Oph)	*Peronella lesueuri* (Ech)	Augener 1922
Scalisetosus longicirra	*Himerometra robustipinna* (Cr)	*Tropiometra carinata* (Cr)	Day 1962, 1967
		Lamprometra klinzingeri (Cr)	Day 1967
		Astropecten sp. (Ast)	Fauvel 1953
Lepidasthenia elegans	*Mesochaetopterus minutus* (Po)	Terebellid sp. (Po)	Day 1967
L. maculata	Chaetopterid sp. (Po)	*Phyllochaetopterus* sp. (Po)	Fauvel 1932
		Dasybranchus caducus (Po)	Day 1957, 1967
L. microlepis	*Siphonosoma vastus* (Si)		
	Paraspidosiphon cumingi (Si)		
L. mossambica	Enteropneust	Enteropneust	Macnae & Kalk 1962
L. stylolepis	*Siphonosoma vastus* (Si)		
Bhawania goodei	*Aspidosiphon elegans* (Si)		
	Cleosiphon aspergillum (Si)		
	Phascolosoma albolineatum (Si)		
Bhawania sp.	*Eurythoë complanata* (Po)		
Eunice sp.	*Cerithium vertagus* (Ga)		

instances has the identity of the host species been determined and mainly these have been species of *Holothuria* and *Stichopus* (see table 27).

In the Islands *G. clavigera* was found as a commensal on five different species of holothurians. A maximum of three individuals of this polynoid was taken from any one host—normally from the undersurface. Although a few exceptions were found, perhaps as a result of the polynoid changing its host, these worms were nearly always camouflaged according to the host coloration. *Stichopus chloronotus* is a uniform black colour and its commensals are usually black. The background colour of *Holothuria atra* is also black but white coralline sand grains adhere to its surface, imparting a stippled appearance and individuals of *G. clavigera* from this holothurian are correspondingly dark in colour, the white sand grains on the host being effectively imitated by small white tubercles developed on the elytra, as was noted by Potts (1910). *G. clavigera* from *Thelenota ananas* are light brown and the host is yellow to brown in colour. However, the two species of *Bohadschia* are irregularly patterned with various colours, chiefly shades of brown and black. *G. clavigera* taken from these two holothurians are usually only lightly pigmented and it appears that the colour pattern of the host is partially transmitted through the elytra, thus camouflaging the presence of the commensal to some extent.

At the time of collection during the low-tide period, *G. clavigera* was usually only to be found clinging to the undersurface of holothurians but it seems probable that during the period of high water it moves on to the upper surface while feeding, when a cryptic coloration would be advantageous in preventing detection by likely predators.

G. clavigera must prevent itself from being dislodged from the host's surface through the action of water currents or the movements of the host, and in this respect the significance of a unique structural feature possessed by this polynoid can be noted. This feature is the serially arranged scute-like processes that are developed laterally on the ventral side of each segment (figure 130). These processes considerably increase the area of the ventral surface and also the area of contact with the host. Removal of this polynoid from the host is sometimes difficult because the worm appears to be able to clamp itself down on to the host. It may be that by closely applying the lateral processes to the host's surface and then arching the body, the worm is able to create a slight suction and in this way prevent dislodgement.

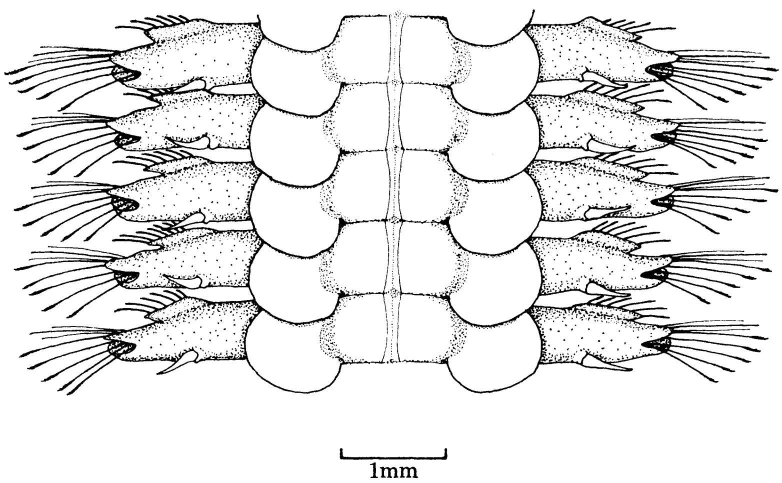

FIGURE 130. Ventral surface of *Gastrolepidia clavigera* showing the lateral processes developed on the ventrum.

Hololepidella minuta (Potts)

Polynoë minuta Potts 1910, p. 337, pl. 19, fig. 12, pl. 20, fig. 31, pl. 21, figs. 42, 43.
Polynoë minuta var. *oculata* Potts 1915, p. 91, fig. 7.
Lagisca minuta: Horst 1915, p. 15; 1917, p. 97.
Harmothoë minuta: Fauvel 1953, p. 45, fig. 17.
Hololepidella nigropunctata (Horst): Day 1957, p. 65, fig. 1; Devaney 1967, p. 288, figs. 1–5.

Occurrence. On *Ophiocoma brevipes*—eight examples. On *Ophiocoma insularia*—one example. On *Ophiarthrum elegans*—seven examples. All discovered at Graham Point, Marau Sound.

Remarks. All of the specimens are under 10 mm in length, and were found on the oral surface of the ophiuroid's disk. In each case only one individual was discovered on each of the ophiuroid hosts.

It is almost certain that *H. nigropunctata*, which has been found living on four different ophiuroids and an asteroid in Hawaiian waters, is synonymous with *H. minuta* (see below). If this is correct, the host specificity of *H. minuta* is poorly developed because this polynoid will have been recorded as a commensal with at least five different ophiuroids as well as an asteroid and a crinoid (see table 27).

Taxonomic notes. *Hololepidella minuta* was first described by Potts (1910) (as *Polynoë minuta*) from two incomplete specimens collected in the Maldive Islands. However, this description was incomplete, as Potts himself admits when he later described (Potts 1915) a new variety *Polynoë minuta* var. *oculata* that he discovered on the crinoid *Comanthus annulatum* in the Torres Straits. Apart from minor differences in the shape of the lateral tentacles and palps, *P. minuta* only differs from *P. minuta* var. *oculata* in not possessing distinct eyes (perhaps a result of poor preservation). Subsequently *P. minuta* was transferred to the genus *Lagisca* by Horst (1915, 1917) and to *Harmothoë* by Fauvel (1953). Thus the taxonomy of this little-known species is very confused.

Examination of the specimens found living on ophiuroids in the Solomon Islands has shown them to correspond in detail with Potts's later description (1915) of *P. minuta*. However, Potts makes no mention of the segmental arrangement of the elytra, which in the Solomon Islands specimens are located on segments 2, 4, 5, 7,..., 23, 26, 29, 31, 34, 36 and on alternate posterior segments. This sequence is diagnostic of the genus *Hololepidella* Willey (Devaney 1967) and thus it is clear that *P. minuta* can be referred to *Hololepidella*.

Recently, Devaney (1967) has fully described the polynoid commensal of Hawaiian ophiuroids and he has referred it to *Hololepidella nigropunctata* (Horst). His description corresponds, particularly in terms of the succession of setae in the neuropodium, to that of *P. minuta*. Through the kindness of Dr Devaney, the author has been able to compare specimens from Hawaii with those from the Solomon Islands. They differ only in minor detail, namely in the Hawaiian specimens the spinules on the slender superior neuropodial setae are more developed, but this is probably due to the difference in the size of the specimens, those from Hawaii being larger than those from the Solomon Islands.

H. nigropunctata was described by Horst (1915, 1917) as *Polynoë nigropunctata*; Day (1957), in describing specimens from Mozambique, transferred the species to *Hololepidella*. The distinctive pigmentation of the head region of this species (Horst 1917, pl. 21, fig. 15) is identical to that of the Solomon Islands specimens (figure 131). Unfortunately both Horst and Day omit any mention of the segmental arrangement of the elytra and the succession of the neuropodial setae so that *H. nigropunctata* cannot be referred to *H. minuta* with certainty but such characters as have been described fit those of *H. minuta* and it is very likely that the two species are synonymous. It must be noted, however, that recently Day (1967) has transferred *H. nigropunctata* to the genus *Polyeunoa* McIntosh.

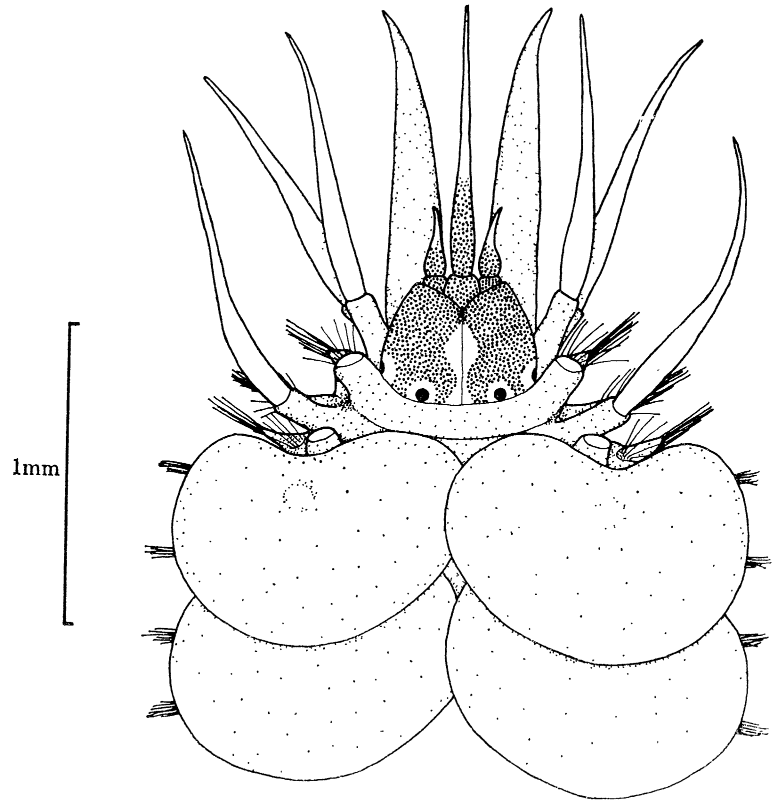

FIGURE 131. Dorsal view of the anterior region of *Hololepidella minuta* showing the typical pigmentation of the head.

Hololepidella commensalis Willey

Hololepidella commensalis Willey 1905, p. 251, pl. 1, figs. 17–20.

OCCURRENCE. On *Macrophiothrix koehleri*—four examples—Graham Point, Marau Sound. On *Ophiarthrum pictum*—one example—Kalota Is., Auki, Malaita.

REMARKS. *H. commensalis* is similar to *H. minuta* in its commensal habits, with solitary individuals living on the oral surface of the ophiuroid disk. It is interesting to note that the pigmentation of the dorsal surface in the specimens from the two hosts differs. The black bands on *H. commensalis* taken from *M. koehleri* are essentially longitudinal while the bands on the specimen from *O. pictum* are transverse (figure 132). Presumably these patterns of banding impart a cryptic coloration.

Records of *H. commensalis* are few and only two have been traced. In both cases this species was discovered living on the surface of clypeastroid echinoids (table 27). The fact that *H. commensalis* has now been recorded from ophiuroids as well as echinoids suggests that this species may have a wide range of hosts, similar to *H. minuta*.

TAXONOMIC NOTES. There is some doubt as to whether these specimens should be assigned to *H. commensalis* because Willey's (1905) description of the species is rather vague and poorly illustrated. In comparing the Solomon Island specimens with that described by Willey from Ceylon, the serrations on the dorsal setae are less distinct and these setae are more numerous, but other details are in agreement.

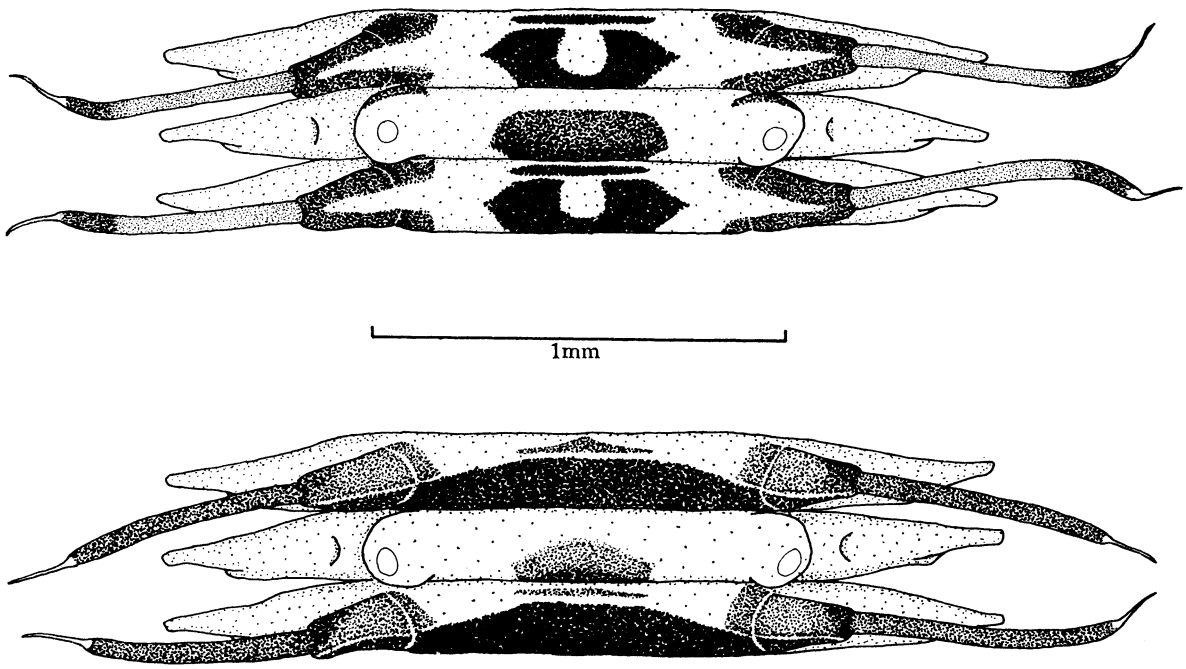

FIGURE 132. Pigmentation of the dorsal surface of *Hololepidella commensalis* from *Macrophiothrix hirsuta* (above) and *Ophiarthrum pictum* (below).

Scalisetosus longicirra (Schmarda)

Polynoë (*L.*) *longicirra* Schmarda 1861, p. 152, pl. 36, fig. 309.
Scalisetosus longicirra: Fauvel 1953, p. 50, fig. 22.

OCCURRENCE. On *Himerometra robustipinna*—five individuals from two hosts—Marauni-bina Is., Marau Sound.

REMARKS. *S. longicirra* is quite a well-known commensal of crinoids, with records from the Red Sea, Indian Ocean and Japan. It inhabits the ambulacral grooves of the crinoid where it is presumably able to scavenge food particles being transported along the ciliary tracts. Unfortunately the specific identities of host crinoids have been neglected on the whole, although two species of crinoids and an asteroid are known (table 27). In the Solomon Islands a further crinoid species was discovered, namely *Himerometra robustipinna*, and it is probable that a number of other crinoids that were not examined also harbour this polynoid.

TAXONOMIC NOTE. The type specimens of *Polynoë crinoidicola* Potts (1910) in the British Museum (Natural History) agree in detail with *S. longicirra* (Schmarda).

Lepidasthenia elegans (Grube)

Lepidasthenia elegans: Fauvel 1923, p. 88, fig. 23.

OCCURRENCE. A single specimen in a tube of *Mesochaetopterus minutus*—Tetel Is., Florida Group.

REMARKS. Day (1967) records that occasional specimens of *L. elegans* are found in the tubes of Terebellidae on the coast of Madagascar.

Lepidasthenia maculata Potts

Lepidasthenia maculata Potts 1910, p. 344, pl. 20, fig. 33, pl. 21, fig. 51.

Occurrence. A single specimen in a chaetopterid tube—Tetel Is., Florida Group.

Remarks. Unfortunately the host is in a poor state of preservation and cannot be identified with certainty. Fauvel (1953) describes a variety of this species, *L. maculata* var. *striata* taken from *Phyllochaetopterus* tubes in the Mergui Archipelago and several specimens have been found as commensals in the burrows of *Dasybranchus caducus* on the coast of Mozambique (Day 1967).

Lepidasthenia microlepis Potts

Lepidasthenia microlepis Potts 1910, p. 343, pl. 19, fig. 17, pl. 21, fig. 52.

Occurrence. Two examples in the burrows of *Siphonosoma vastus* and one example in the burrow of *Paraspidosiphon cumingi*—all at Graham Point, Marau Sound.

Remarks. There are relatively few records for the occurrence of *L. microlepis*, although it appears to be distributed throughout the Indo-West Pacific region. It has not been recorded previously as a commensal.

Lepidasthenia mossambica Day

Lepidasthenia mossambica Day 1962, p. 632, fig. 2.

Occurrence. Four examples from the burrows of a large enteropneust—all at Graham Point, Marau Sound.

Remarks. The enteropneust host of *L. mossambica* is, as yet, unnamed but is probably *Balanoglossus carnosus*. Similar associations of *Lepidasthenia* species with enteropneusts have been described by Gravier (1905) and Macnae & Kalk (1962).

Taxonomic notes. The specimens from Marau Sound differ only in minor details from the type specimens collected at Inhaca Island, Mozambique. The neuropodial setae have fewer rows of spinules (7 compared to 10) and become stouter in the posterior region. In all of the specimens the fourth pair of elytra is heavily coloured with purple pigment, but the other elytra are translucent white in colour, whereas the type specimens have a dark transverse bar or central spot on each elytron. Such colour variations are however common amongst commensal polynoids. Apart from these differences, Day's description fits the Solomon Islands specimens in detail.

Day (1962, 1967) does not record *L. mossambica* as a commensal, but Macnae & Kalk (1962) mention that a species of *Lepidasthenia* is found in the burrows of large enteropneusts on the sand flats at Inhaca Island and presumably this is a reference to *L. mossambica*.

Lepidasthenia stylolepis Willey

Lepidasthenia stylolepis Willey in Lloyd, 1907, p. 260, figs. 1–4.

Occurrence. Three examples in the burrows of *Siphonosoma vastus*—Graham Point, Marau Sound.

Remarks. It appears that *L. stylolepis* is known only from one specimen, namely the holotype that was dredged in the Persian Gulf by Lloyd (1907). However, two other species are probably synonymous with *L. stylolepis* and they are *L. sibogae* Horst (1917) from the East Indies and *Perolepis regularis* Ehlers (1908) taken off the East African coast. All three species are known only from material dredged in shallow water, so that it is not surprising no previous observations of commensalism have been made.

One interesting feature of *L. stylolepis* is that the modified elytra are apparently luminescent organs (Lloyd 1907).

Taxonomic notes. As noted above, it is quite probable that *L. sibogae* and *P. regularis* are synonyms of *L. stylolepis*. Both of these species possess the modified elytra that are carried on long elytrophores and the strongly bidentate neuropodial setae of *L. stylolepis*. The first pair of elytra are large and cover the head region in *P. regularis*, as in *L. stylolepis*, but are not shown in Horst's illustration (pl. 16, fig. 1) of *L. sibogae* and may have been lost.

Family PALMYRIDAE

Bhawania goodei Webster

Bhawania goodei Webster 1884, p. 308, pl. 7, figs. 10–15.
Bhawania cryptocephala Gravier 1901, p. 263, pl. 10, figs. 152–156.
Bhawania goodei: Day 1953, p. 407 (synonymy).

Occurrence. In burrows of *Aspidosiphon elegans*—three examples—Matiu Is., Marovo Lagoon. In a burrow of *Cleosiphon aspergillum*—one example—Gizo Is. In burrows of *Phascolosoma albolineatum*—two examples—Gizo Is.; Maramasike Passage, Malaita.

Remarks. *B. goodei* was often found inhabiting crevices in the coral and amongst algal cover. In view of this it is not surprising perhaps that this species should have been discovered cohabiting the burrows of coral-boring sipunculids.

Bhawania sp.

Occurrence. One specimen with *Eurythoë complanata*—Graham Point, Marau Sound.

Remarks. The specimen found with *Eurythoë* is much larger than those discovered with the sipunculids (45 mm in length, compared to 10 to 15 mm for *B. goodei*). It was lying along the length of the dorsal surface of the host and protected by the long notopodial setae of the amphinomid.

Taxonomic note. This relatively large specimen of *Bhawania* corresponds to the description of *B. cryptocephala* var. *Pottsiana*, named by Horst (1917) after Potts who first described this form from Zanzibar (Potts 1910). This variety is similar to *B. goodei*, but differs from it in possessing an additional type of seta on the inferior part of the neuropodium. Since Day (1953) has sunk *B. cryptocephala* as a synonym of *B. goodei* a new name is required for this variety.

Family EUNICIDAE

Eunice sp.

Occurrence. On the upper surface of *Cerithium vertagus* burrowing in a submerged sand flat to the north of West Tankomo Is., Marovo (Kolo) Lagoon.

Remarks. This species of *Eunice* constructs a fragile tube composed of small shell fragments, loosely held together by a mucus secretion, that is attached along the length of the upper surface of its gastropod host (figure 133).

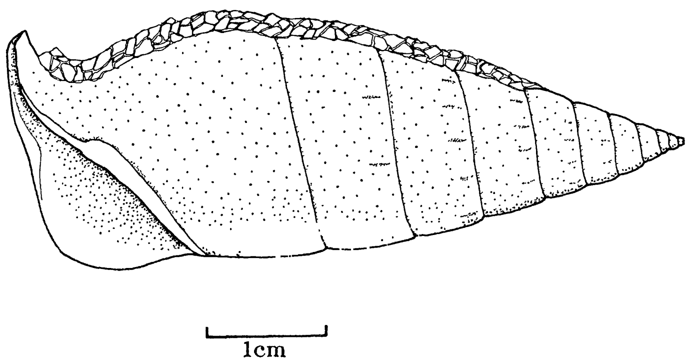

Figure 133. Side view of a specimen of *Cerithium vertagus* with the tube of *Eunice* sp. attached to the upper surface.

Taxonomic notes. It has not proved possible to identify this *Eunice* sp. and possibly it is a new species. It has 21 to 23 pairs of gills, commencing on the third segment, with up to six filaments. The parapodia contain three tridentate acicular setae, which are yellow in colour and are hooded. Comb setae are present in addition to bidentate compound setae.

Discussion

Little is known about the commensal polychaetes of the tropical regions and one of the objects of this preliminary report has been to draw attention to the existence of, and present brief observations on, some new or little-known associations involving polychaetes. During the expedition to the Solomon Islands, it was not possible to concentrate on this aspect of polychaete ecology and, as a consequence, the data that were obtained are insufficient for any firm conclusions to be drawn regarding the nature of the relationships between the commensals and their hosts. For example one might point to the association of *Bhawania* with the boring sipunculids and *Eurythoë complanata*. No previous cases of commensalism in the palmyrids have been reported and since *Bhawania* is often found in the free-living state its association with these two different hosts is probably best regarded as a facultative, rather than obligatory, form of commensalism. Perhaps a similar conclusion might be extended to the *Eunice* sp. that was discovered attached to *Cerithium vertagus* in that this worm may obtain some benefit from living on a mobile host but, on the other hand, the gastropod shell may serve purely as a surface for attachment.

In general the examples of commensalism that are recorded above can be divided into two groups according to whether a single or a number of commensals are found on or with any one host. In each case of commensalism involving the two species of *Hololepidella* or the five species of *Lepidasthenia*, only a single commensal was found either on the host's surface (*Hololepidella*) or in the tube or burrow of the host (*Lepidasthenia*). Little or nothing is known about the behaviour of *Lepidasthenia*, but Devaney (1967) has observed that individuals of *Hololepidella* display a rather aggressive behaviour towards one another when placed in close proximity. Thus it is probable that the host's surface or burrow constitutes a territory that is defended by one individual.

Where multiple 'infection' of the host occurs, as with *C. clavigera* on holothurians or *S. longicirra* on crinoids, the surface area of the host may be too large for it to be defended by one commensal. In these cases it would be interesting to know whether the commensals are territorial, for example, whether *S. longicirra* individuals inhabit only one or several of the numerous arms of the host crinoid.

Potts (1915) has drawn attention to the fact that many of the commensal animals inhabiting crinoids exhibit a colour resemblance to the host. Similar protective coloration has been described above for *G. clavigera* on holothurians and perhaps for *H. commensalis* on ophiuroids, although *H. minuta* is usually darkly coloured and a cryptic coloration is not normally evident. One curious feature of both *L. microlepis* and *L. mossambica* is that the form of the pigmentation on the elytra of the anterior region is such that 'eye-spots' are apparent. The fringe of purple pigment around the edge of the elytra in *L. microlepis* and the purple pigment that is restricted to the fourth pair of elytra in *L. mossambica* give a rather striking effect in living specimens (figure 134). The significance of these eye-spots, and also the luminescence of *L. stylolepis* described by Lloyd (1907), requires further investigation.

Quite a large proportion of *Lepidasthenia* species are now known to have an apparent propensity towards assuming a commensal existence and certain structural modifications can be interpreted as adaptations to a burrow-dwelling habit. The elytra are smooth and lack the ornamentation that is frequently found on free-living polynoids. The importance of the protective function of the elytra appears decreased since the elytra are often quite thin, as in *L. mossambica*, or reduced in area, as in *L. microlepis*, or diminished in over-all size so as to be mere vestiges at the end of long elytrophores, as in *L. stylolepis*. However, it is significant, that the first pair of elytra, situated on the second segment, remain fully developed, presumably to protect the sense organs of the head region (figure 134).

To conclude this discussion it might be stressed that our knowledge of commensal and other types of association in the tropical fauna is relatively scant and in this context it is relevant to point out that about 80 % of the 22 associations described in this report have not been recorded previously.

I should like to express my thanks to the Royal Society, Professor E. J. H. Corner, F.R.S., and Professor J. E. Morton for the opportunity to participate in the expedition to the Solomon Islands in 1965. For their assistance in the field, I should like to acknowledge my colleagues of the Marine Party, particularly Dr R. K. Dell and Dr D. R. Stoddart, Captain S. B. Brown and the crew of the *Maroro* and also Ini Munamaori, our head 'salt-water boy'. I am indebted to Miss Ailsa Clark (British Museum: Natural History) for the identification of the echinoderms and to Dr S. J. Edmonds (University of Adelaide) for the identification of the sipunculids mentioned in this report. This work was financed by a Royal Society Leverhulme Scholarship.

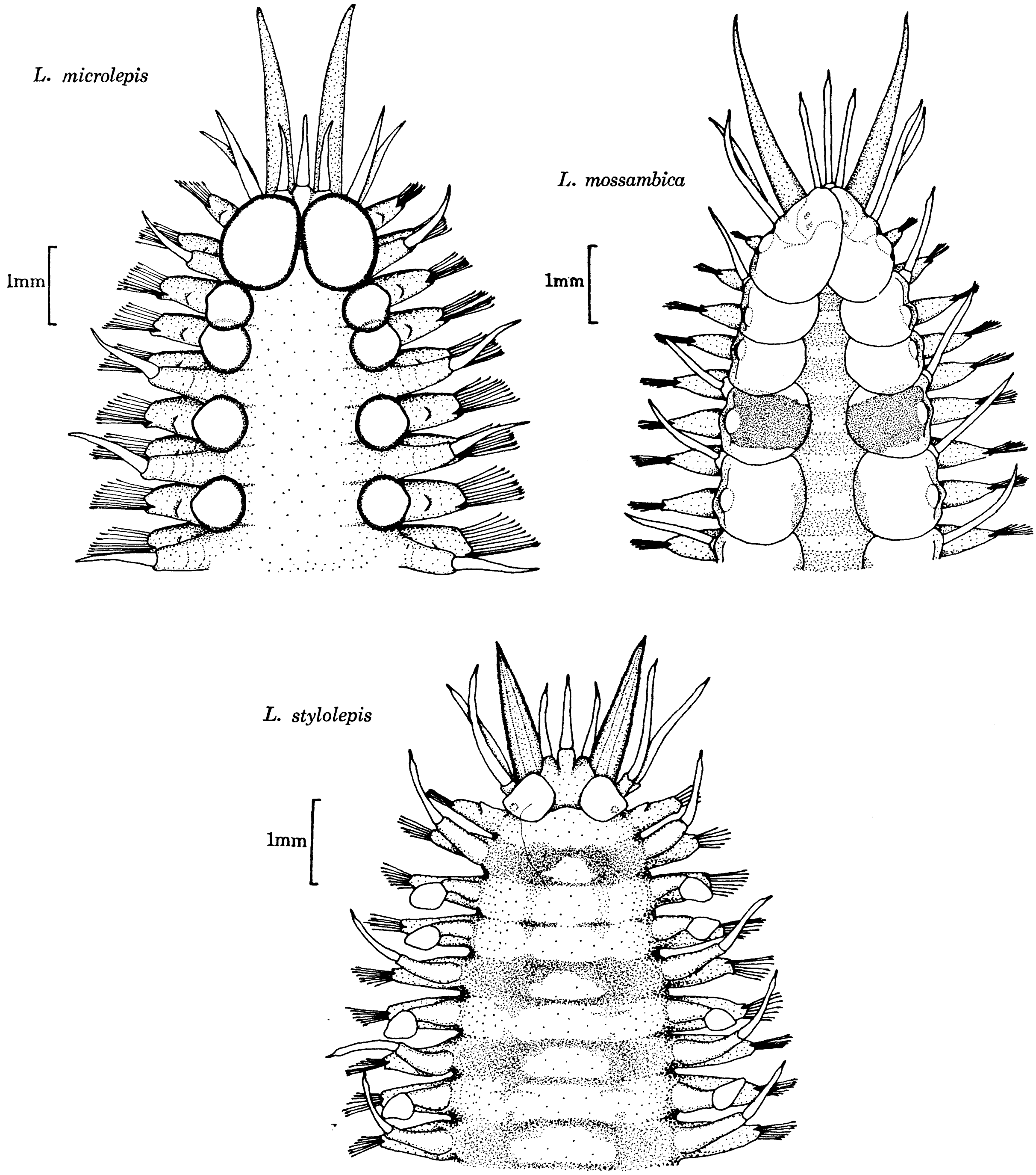

FIGURE 134. Dorsal view of the anterior regions of *Lepidasthenia microlepis*, *L. mossambica*, and *L. stylolepis*.

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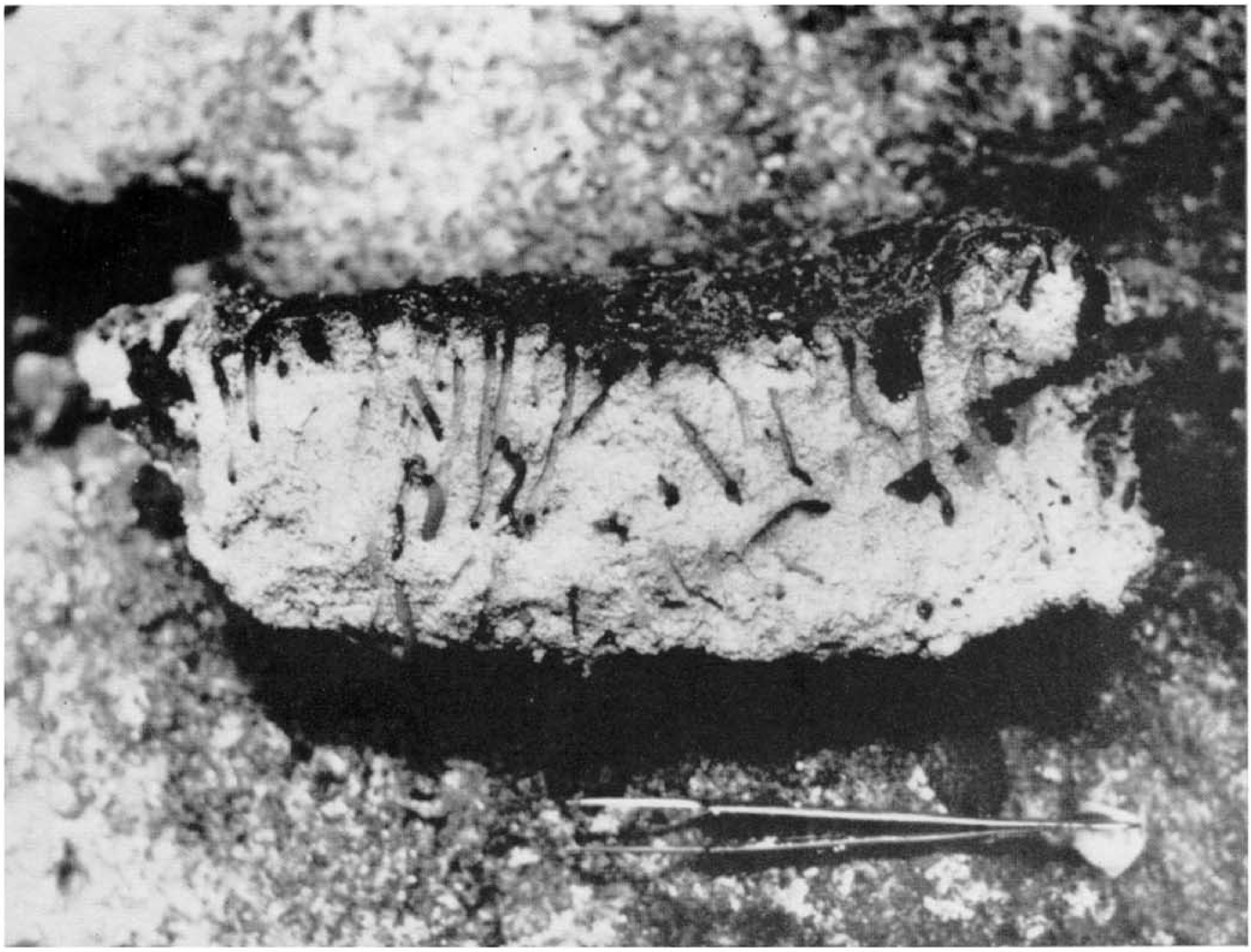

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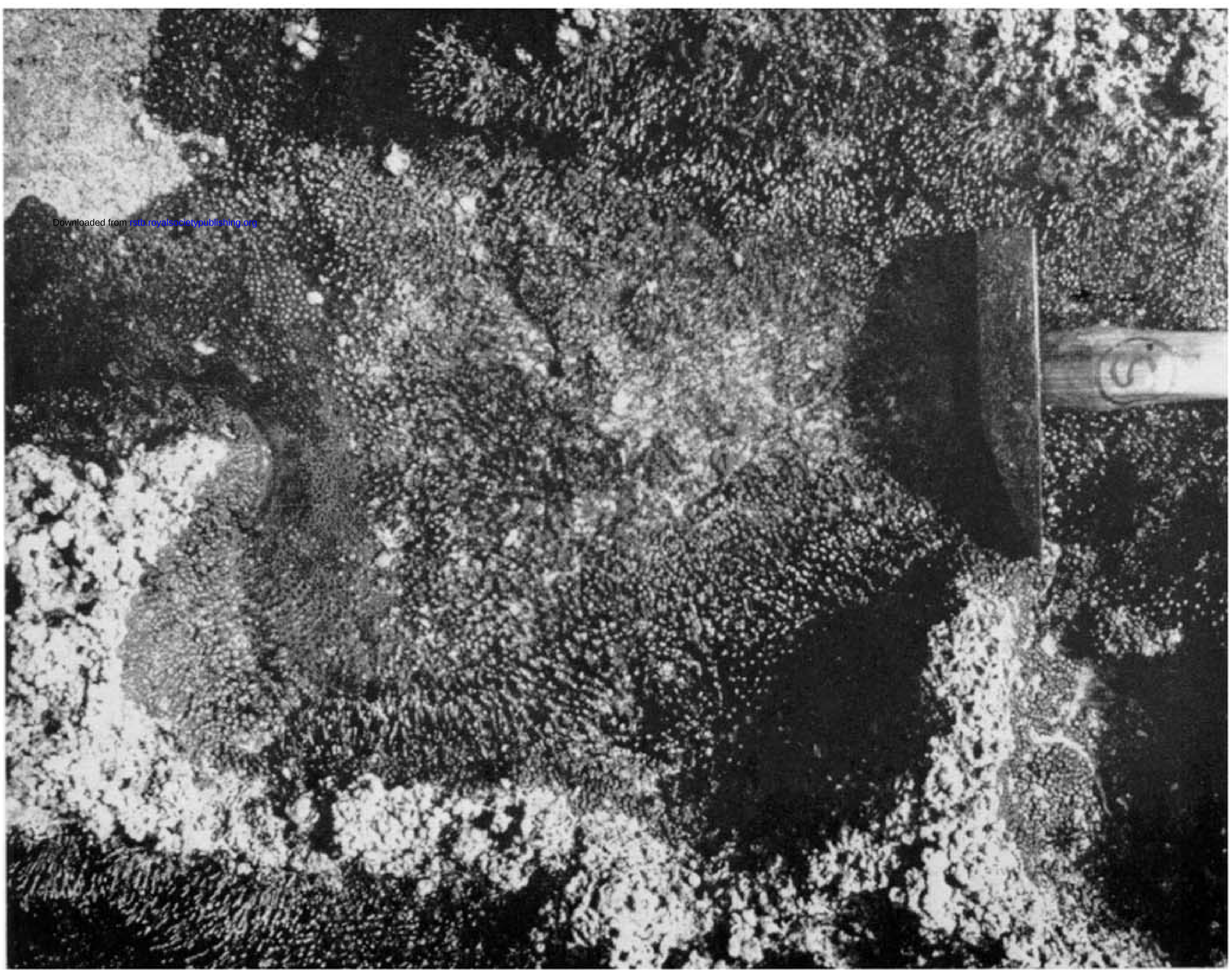

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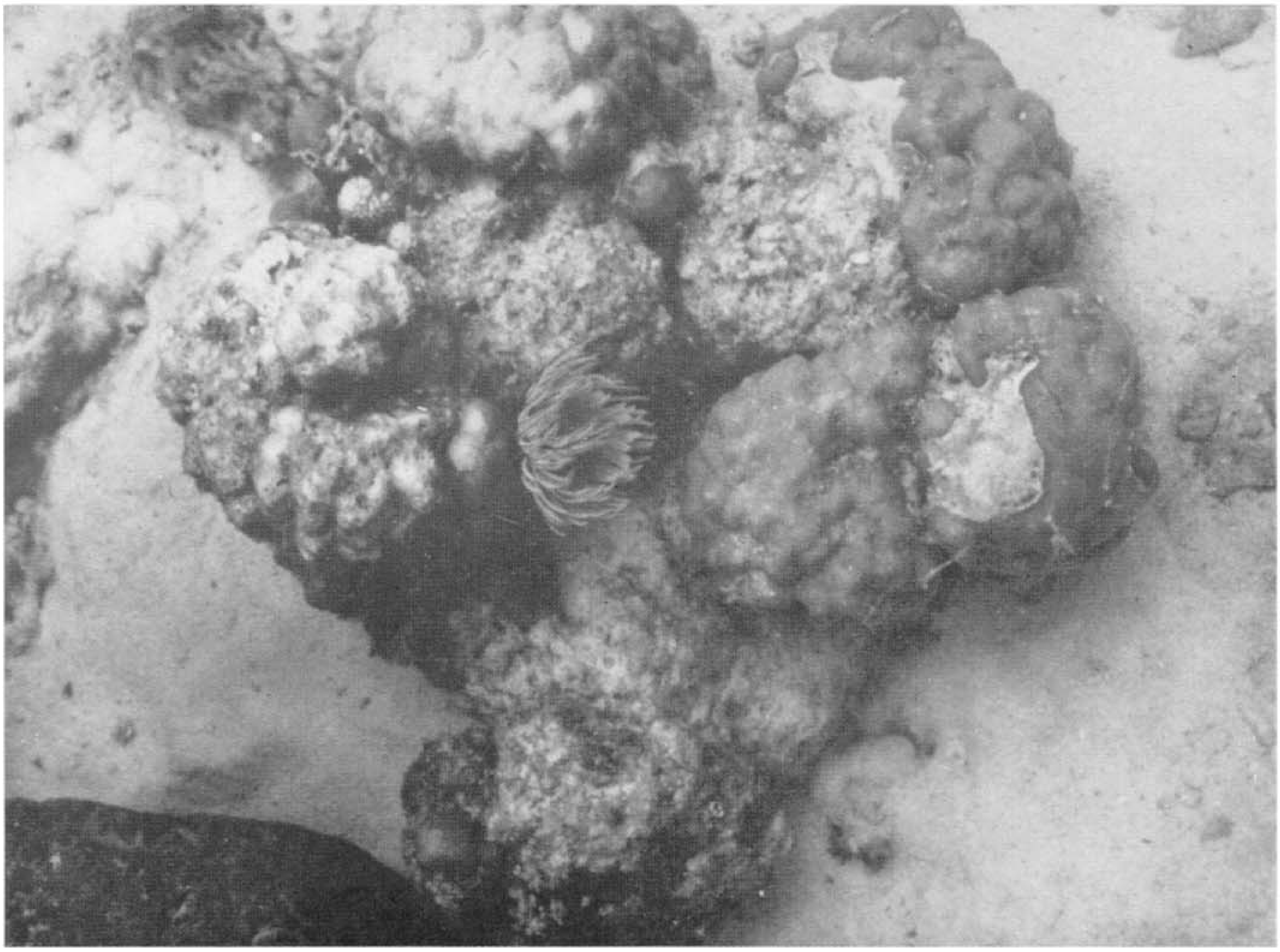
FIGURE 135. Cross-section of a piece of the beachrock at Lauvie Is., Marau Sound, showing the burrows of boring sipunculids (chiefly *Aspidosiphon*) and polychaete worms.

FIGURE 136. Dense colonies of the chaetopterid *Phyllochaetopterus socialis* exposed towards low water mark on the outer shore of Matiu Is., Marovo Lagoon.



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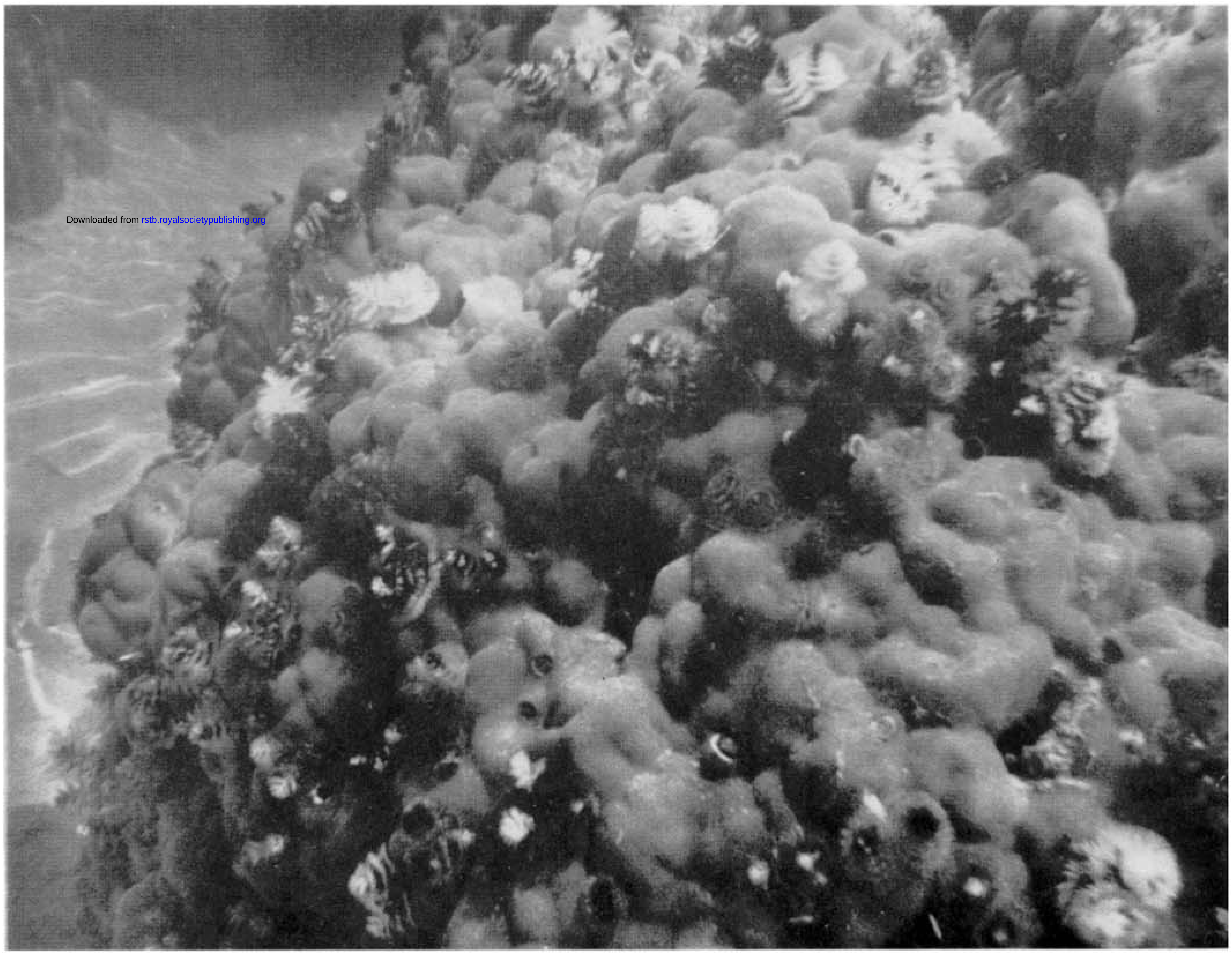

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FIGURE 137. The sabellid *Sabellastarte sanctijosephi* inhabiting a crevice in a *Porites* boulder at Paleki Is., Marovo Lagoon.

FIGURE 138. An underwater photograph showing the branchial crowns of numerous individuals of the serpulid *Spirobranchus giganteus* embedded in a *Porites* boulder at Paleki Is., Marovo Lagoon.