ORBINIIDAE, APISTOBRANCHIDAE, PARAONIDAE AND LONGOSOMIDAE

(Plates 20-45, 1 chart)

By Olga Hartman

ABSTRACT

The polychaetous families ORBINIIDAE, APISTOBRANCHIDAE, PARAONIDAE and LONGOSOMIDAE are reviewed. The ORBINIIDAE are distinguished for 74 species in nine genera and two subgenera. Two new subfamilies, ORBINIINAE and PROTOARICIINAE, are named. *Califia*, new genus, is erected for *C. calida*, new species, from California. Other new species are *Haploscoloplos bifurcatus*, *Scoloplos* (*Leodamas*) *dendrobranchus* and *S.* (*L.*) *fimbriatus*, from South Australia, *Naineris uncinata* from California, and *Naineris grubei australis*, new subspecies, from South Australia.

The APISTOBRANCHIDAE are known for three species in three genera, and known only from the north Atlantic and Arctic oceans.

The PARAONIDAE are recognized for 28 species in three genera and three subgenera. *Aedicira* is a new subgenus in *Aricidea.* New species are *Aricidea* (*Cirrophorus*) *aciculata*, *A.* (*C.*) *furcata*, *Paraonis multibranchiata*, and *P. gracilis oculata*, new subspecies, from California. LONGOSOMIDAE is known for a single species from California.

Aricidea fauveli, new name for *A. fragilis*, *sensu* Fauvel, and perhaps *A. jeffreysii*, *sensu* Fauvel, originates in the Mediterranean Sea. *Haploscoloplos alaskensis* is newly referred to *H. panamensis*, *Aricidea heteroseta* to *A. suecica*, *A. longicornuta* to *A. uschakovi* and *Paraonis filiformis* to *P. gracilis.*

A glossary of terms is given for ORBINIIDAE, and some species are emended.

ORBINIIDAE Hartman, 1942

Introduction

Representatives of the family Orbiniidae (=Ariciidae) are usually regarded as the first family of the suborder Sedentaria although they are freely moving in habit and construct no tube. They forage for food,

have well developed parapodia and the prostomium is fully uncovered. These features ally them to the suborder Errantia. The body is divisible into an anterior thorax and a posterior abdomen and the eversible pharynx is unarmed; these characters are those of the Sedentaria. Orbiniids inhabit mainly the intertidal or littoral zones but a few species are described from greater depths. They are most abundant in shallow marine seas where they are associated with sandy or muddy bottoms or algal holdfasts. They sometimes occur in massed numbers so as to form beds. One species is known from a brackish lake in India and none from freshwater.

Most species are recorded from temperate or warm seas but large numbers of individuals of a few species occur in polar seas. Geographic distribution is so checkered that some large continental areas have up to 20 species and others have few or none (see charts of distribution below).

Orbiniids attain dimensions of considerable size with a length of 400 mm not unusual; most are moderately large and measure 35 to 100 mm long; and a few are minute, measuring only a few millimeters long.

Historical

The oldest generic name, *Aricia* Savigny, was erected for *A. sertulata* Savigny, 1820, from La Rochelle, France. The same species from this locality was later (1833) named *Aricia cuvieri* Audouin and Milne Edwards. Savigny had attributed to the prostomium the presence of four rudimentary antennae, for which he mistook the everted nuchal organs. This interpretation led to a discussion by later authors on the merits of one name against the other. Most are now agreed that the two specific names refer to the same species but have preferred the use of the younger name, *A. cuvieri* Audouin and Milne Edwards since it has received the greatest usage and is best described (Fauvel, 1927a, p. 12); I follow this usage for the specific name.

The family name was more recently erected although its major groupings were noted when Audouin and Milne Edwards (1833, pp. 388-399) used ARICIENS for *Aricia* Savigny with three species (*A. cuvieri*, *A. latreillii* and *A. sertulata*), together with some species in the Spionidae, Opheliidae and Cirratulidae.

Castelnau (1842, p. 20) in a brief and obscure reference erected a name *Venadis* (not to be confused with *Vanadis* Claparède, a pelagic Alciopidae) for *Aricia cuvieri* and *A. latreillii*. *Venadis* was proposed to

include those species without antennae and *Aricia* was retained for *A. sertulata*, which was presumed to have four antennae. The article suffers from omissions and errors of various kinds; its only original name, *Venadis*, is best struck from the list of available names, especially since it has been omitted by more recent authors.

Oersted (1843, p. 35) erected four groups of ARICIAE: they were 1) *Ariciae verae* for *Scoloplos*, *Aricia* and *Aonis* (a spionid), 2) *A. naidinae* for the presently known Spionidae and Disomidae, 3) *A. nerideae* for what is now regarded as the Sphaerodoridae, and 4) *A. lumbricinae* for the Cirratulidae and Opheliidae. Only the *A. verae* would include the Orbiniidae as known at present.

Quatrefages (1865, p. 280) followed Audouin and Milne Edwards (1833) in using the family name ARICIEA; he named species in the genera *Aricia* and *Scoloplos*; he added the new name *Orbinia* for *Aricia sertulata* Savigny and placed *Porcia* Grube and *Anthostoma* Schmarda in the same family. The last one now goes to *Naineris* and *Porcia* is indeterminable (Eisig, 1914, p. 280).

Kinberg (1866, pp. 250-252 and 1867, 337) used the family name ARICIEA Audouin and Milne Edwards for six genera, of which five were newly erected. They included *Aricia* Audouin and Milne Edwards and new genera *Alcandra*, *Phylo*, *Lacydes*, *Leodamas* and *Labotas*. A new family ANTHOSTOMEA Kinberg (1867, p. 337) was erected for the genus *Anthostoma* Schmarda. These names have been reviewed (Hartman, 1948b, pp. 11-12).

Malmgren (1867, p. 203-205) erected the family name ARICIIDAE; he followed the grouping of Oersted but excluded *Aonis*. He named species in *Aricia* (*A. cuvieri*), *Scoloplos* (*S. armiger*), and *Naineris* as *Naidonereis* (*N. quadricuspida*). He noted the resemblance of *A. sertulata* Savigny to *A. cuvieri* and observed that Quatrefages had erected *Orbinia* for the same species.

Claparède (1870, p. 44) used the family name of Audouin and Milne Edwards and concluded that *Orbinia* Quatrefages was a dead name since it was proposed to replace *Aricia* as in *A. sertulata* Savigny, not as in *A. cuvieri*.

Czerniawsky (1881, pp. 368-373) introduced a new system. This brief outline without descriptions or illustrations was based on a theoretical evaluation of characters that had been earlier established. Most of the new names have remained unknown or unconnected with subsequent literature. The family ARICIEA included five genera. 1) *Orbinia* Quatrefages was retained for *Aricia sertulata* Savigny and 2)

Porcia Grube, 1858, for *P. maderensis* Grube (the latter now regarded indeterminable both generically and specifically); 3) *Aricia* Audouin and Milne Edwards was retained for *A. cuvieri* and *A. latreillii*; 4) *Anthostoma* Schmarda was retained for *A. hexaphyllum* and *A. ramosum*, both by Schmarda (both now regarded as species of *Naineris*); and 5) *Theodisca* F. Müller was used for *T. anserina* and *T. liriostoma*, both by Claparède. Czerniawsky considered the following genera indeterminable: *Alcandra*, *Phylo*, *Lacides* (sic), *Leodamos* (sic), *Labotas*, all by Kinberg, 1866 and *Gisela*, *Hermundura*, *Cherusca* and *Drilidium*, all by F. Müller, 1858. (See alphabetical list, below, for further comments.)

Czerniawsky further divided *Aricia* Savigny into eight subgenera. The chief distinction was based on the presence or absence of prostomial eyes. The subgenus *Protoscoloplos* was proposed for *Aricia glossobranchia* Schmarda; *Scoloplos* Blainville was retained for *S. armiger* (O. F. Müller), *Aricia* for *A. laevigata* Grube and *A. cuvieri* Audouin and Milne Edwards. The subgenus *Archiaricia* was erected for *Aricia foetida* Claparède, *Protoaricia* for *Aricia oerstedii* Claparède, *Parascoloplos* for *Aricia capsulifera* Bobretzky, *Paraaricia* had no species assigned to it and *Heteroaricia* was proposed for *Aricia acustica* Langerhans. In this list of new names, *Protoscoloplos* is indeterminable, *Archiaricia* goes to the older *Phylo* Kinberg, *Protoaricia* replaces *Theostoma* Eisig, 1914, and includes *Parascoloplos* and *Heteroaricia*, and *Paraaricia* is a *nomen nudum* (see alphabetical list of names below).

Benham (1896, p. 258) regarded the family ARICIIDAE as an appendix of a suborder Nereidiformia and considered its members intermediate between the Errantia and the suborder Spioniformia. This scheme is not accepted currently.

Mesnil and Caullery (1898, pp. 141-143) retained *Aricia* for seven species, *A. cuvieri* and *A. latreillii* both by Audouin and Milne Edwards, *A. foetida* Claparède, *A. norvegica* Sars, *A. kupfferi* Ehlers, *A. formosa* Hansen and *A. michaelseni* Ehlers. They used *Scoloplos* (*Scoloplos*) for *S. armiger* Müller, *Aricia mülleri* Rathke (including *A. arctica* Hansen and *Scoloplos elongatus* Quatrefages), *A. glossobranchia* Schmarda, *A. cirrata* Ehlers, *A. marginata* Ehlers and *A. tribulosa* Ehlers. *Scoloplos* (*Nainereis*) was used for *Nainereis quadricuspida* Fabricius, *Aricia laevigata* Grube, *A. oerstedii* Claparède, *A. acustica* Langerhans, *A. platycephala* McIntosh, *A. armata* Hansen, *Scoloplos kerguelensis*, McIntosh, *Theodisca anserina* Claparède, *T. liriostoma* Claparède and *T. mamillata* Cunningham and Ramage. The chief distinction between

Scoloplos sensu stricto and *Scoloplos* (*Nainereis*) was thought to be in the shape of the prostomium, pointed in the former and rounded in the latter.

McIntosh (1910, pp. 494-521), in a monographic study for Great Britain, attributed the family name Ariciidae to Audouin and Milne Edwards, 1833, although it had not been so used before Malmgren, 1867. McIntosh used *Aricia* Savigny to include *A. cuvieri*, *A. latreillii*, *A. norvegica* and his three new species *A. edwardsi*, *A. grubei* and *A. armandi*. *Scoloplos* was used only for *S. armiger* and *Nainereis* (sic) for *Scoloplos quadricuspida* and *S. mammillata* (sic) (see alphabetical list of names below).

The most comprehensive study of the family was that by Eisig (1914, pp. 153-600), who reviewed previous works and brought together a vast body of literature. He made detailed studies of organ systems and identified many morphological and anatomical parts; most of the accepted terminology was initiated in this study. He described species in the genera *Nainereis* (sic), *Aricia*, *Scoloplos*, *Scolaricia*, and erected *Theostoma*. Since the study was limited chiefly to species in the Mediterranean Sea, its generic and specific categories were accordingly restricted.

Chamberlin (1919, pp. 353-361) described species in four genera and added *Branchethus*; which is now referred to *Scoloplos* (*Leodamas*) Kinberg. Day (1954, pp. 21-23) added new species in two new genera, *Proscoloplos* and *Orbiniella*.

Fauvel (1927a, pp. 7-26) in the Faune de France gave keys to five genera; included are seven species in *Aricia*, two in *Nainereis* (sic) and single species in *Scoloplos*, *Theostoma* and *Scolaricia*. The first includes *Orbinia* and *Phylo* as used herein, the second is here spelled *Naineris*, and *Theostoma* is called *Protoaricia* (below).

The generic name *Aricia* Savigny is preoccupied and has been replaced by *Orbinia* Quatrefages (Hartman, 1936, p. 32); the family name ARICIIDAE was thus changed to ORBINIIDAE (Hartman, 1942a, p. 57).

The oldest species, now known as *Scoloplos armiger*, was first named *Lumbricus armiger* Müller, 1776; it is now reported from widely scattered geographic areas, including various parts of Europe, eastern United States, Japan and parts of the Southern Hemisphere. The next oldest, first described from Greenland as *Nais quadricuspida* Fabricius, 1780, is now known as *Naineris* and recorded from both sides of the northern Atlantic Ocean. Most of the other species from Europe were

known before the end of the nineteenth century. The earliest American species were described by Verrill (1873 to 1900), Webster (1879 to 1884) and Kinberg (1867). Others have been added in more recent times.

Family Characteristics

Typically the body is long, slender and often appears ragged in its posterior part because of the presence of dorsally directed parapodia and branchiae. Color in life is generally pale orange or yellowish red with bright red branchiae (due to the color of the red blood). The body consists of a shorter thorax and a much longer abdomen. These parts are weakly separable (in the PROTOARICIINAE, new subfamily) to more or less abruptly different (in the ORBINIINAE, new subfamily, especially in the genera *Orbinia* and *Phylo*). The change is most noticeable in the narrowing of the body in the abdomen and in the difference in position and structure of parapodial lobes and setal fascicles. In the thorax the neuropodia have short, transversely prolonged fleshy ridges; in the abdomen they are longer and slenderer to cylindical in shape.

The prostomium is an inconspicuous lobe, truncate or semicircular or elongated conical; it has no appendages but the everted nuchal organs located at the posterior sides have sometimes been mistaken for short antennae. Prostomial eyes are present, especially in juvenile stages, or absent or so deeply embedded as to be unseen in older and preserved individuals. The nuchal organs are ciliated, slitlike invaginations located at the posterior ectal margins of the prostomium. The prostomium may alter its shape with age or method of fixation. In juvenile stages it is more or less semicircular or rounded in front; in later stages it may be long and pointed or conical or abruptly truncate in front.

The proboscis or anterior end of the alimentary tract is unarmed. In the ORBINIINAE it is an eversible, epithelial, simple or multilobed pouch secondarily derived from a portion of the ventral side of the anterior end of the alimentary tract. In adult stages of some species it is voluminous and much branched dendritically; when everted it may conceal the prostomium and the ventral part of the first few segments. In the PROTOARICIINAE, as in *Protoaricia* and perhaps also in *Proscoloplos* and *Orbiniella*, it is muscular and primarily derived from the anterior end of the alimentary tract and of limited proportions (Eisig, 1914, p. 162 as *Theostoma*).

In the ORBINIINAE the first segment or peristomium is a smooth, sometimes partly biannulated ring without parapodia; in the PROTOARICIINAE the first and second segments are without parapodia;

all other segments have biramous parapodia. In the thorax the parapodia are lateral; they gradually ascend so that in middle and posterior segments of the abdomen they are dorsal. The body is broadest in the middle thorax; it is slightly (*Naineris* and some species of *Haploscoloplos*) to greatly depressed (*Scoloplos* (*Leodamas*) and some others). Farther back it is cylindrical in cross section or somewhat flattened dorsally. In some species or genera the ventrum of some anterior segments has transverse rows of fleshy lobes, collectively called ventral fringe; otherwise the ventrum is smooth.

Notopodia are more or less similar throughout the body except for differences in size and relative proportions of parts. Each consists of a simple, papillar or elongated lobe supported by one to several embedded yellow rods or acicula. Each has a tuft of long, slender, distally pointed setae; in some segments, usually in posterior thoracic and anterior or all abdominal segments, they may be accompanied by furcate or forked setae (pl. 20, fig. 5). The postsetal lobe is more or less conspicuous; it may be short and triangular or longer to cirriform (pl. 27, fig. 3) or it may be foliaceous (pl. 22, fig. 1) or fringed; its shape is specific. It has been variously called dorsal cirrus, branchia, secondary branchia, upper cirrus, fleshy lobe, lancet-shaped lip, cirriform or dorsal languet, lanceolate lip, dorsal tubercle, cylindrical process and ligulate thread (see Eisig, 1914, p. 174, for references). The name here used, postsetal lobe, refers to its position behind the notopodial setal fascicle.

The neuropodia are more highly modified and diversified within a single individual than are the notopodia and thus more specific. In the thorax the neuropodium is an oval or crescentic ridge and closely appressed to the body wall. A posterior or postsetal part may be a simple fleshy ridge, or it may have one to several lobes along its margin, or there may be a series of lobes forming a fringe (pl. 23, fig. 2). The prolonged processes are called podial lobes if simple and fringe if multiple or serrated. Thoracic neuropodia are provided with palisaded series of setae or uncini or both. There are no embedded acicula. Abdominal neuropodia are slenderer, longer, and supported by one to several acicula which may be entirely embedded or somewhat emergent; the projecting setae are generally in long, close tufts.

Subpodial lobes or ventral cirri (if located immediately below the neuropodium) are variable in occurrence and distribution. When present they may be located at or near the ventral edge of abdominal and some posterior thoracic neuropodia. Their presence and distribution or absence is specific and has no generic significance. Thus in *Phylo* subpodial lobes

are present in *P. felix* and absent from *P. ornatus*. In *Orbinia* they are present in most species but absent from *O. johnsoni*. In *Haploscoloplos* they are absent from most species but present in *H. fragilis*. In *Naineris*, *Protoaricia*, *Scolaricia*, *Califia*, new genus, and perhaps some others they are altogether absent. In *Scoloplos sensu stricto* they are absent from most species but present in *S. armiger*; in *S.* (*Leodamas*) they are present in *S.* (*L.*) *ohlini*, *S.* (*L.*) *cirratus* and *S.* (*L.*) *verax* and absent from others.

Podial, like subpodial, lobes are conspicuous when present but their occurrence has no generic significance. As the name implies, they are a part of the parapodium and are located along the postsetal margin of thoracic parapodia. They may occur as single or simply divided lobes or as serrated fringed rows. Their greatest development is in some species of *Orbinia* and *Phylo*. Subpodial and podial lobes have been called ventral papillae, pectinated ventral folds, fringes, conical papillae, cirrus-like appendages, short conical cirri and other descriptive terms.

Interramal cirri are present in some species of *Phylo*, *Orbinia* and *Haploscoloplos*. They are simple, cirriform, large to small processes located between the notopodium and neuropodium of some posterior thoracic and sometimes on anterior abdominal segments (pl. 20, fig. 2). Their presence and distribution are specific. They have been called also intermediate cirrus, intercirrus, cirruslike thread, subulate cirrus, cirriform branchia, external branchia of the notopodium, branchial languette, conical languette, branchia, upper ventral cirrus and other descriptive names (see Eisig, 1914, p. 174 for references). Their irregular distribution can be noted in certain species of some genera. They are absent from all species of *Scoloplos*, *Naineris*, *Scolaricia* and PROTOARICIINAE. In *Phylo* they are present in *P. felix*, *P. grubei*, *P. foetida*, *P. michaelseni*, *sensu* Monro; they are absent from *P. ornatus*, *P. nudus*, *P. michaelseni*, *sensu* Okuda, *P. kupfferi* and *P. norvegicus*. In *Orbinia* there are interramal cirri in *O. cuvieri* and *O. latreillii*; there are none in *O. johnsoni* and *O. bioreti*. In *Haploscoloplos* they are present in *H. fragilis* and *H. robustus* but absent from *H. elongatus*, *H. panamensis*, *H. kerguelensis* and possibly others.

Lateral organs ("Seitenorgane" of Eisig, 1914, p. 240) are small, oval, nonretractile elevations between notopodia and neuropodia in some or all thoracic and abdominal (pl. 21, fig. 4) segments of some species in some genera. Each mound has few to many stiff, short to long projecting hairs. Individual hairs are embedded in the epithelium and terminate within in sensory cells, some of which are large, others small

(see Jeener, 1927, pp. 104, 110 and Rullier, 1950, pp. 226-231). The presence of lateral organs has been noted in *Scoloplos armiger*, *Orbinia latreillii*, *Phylo foetida*, *Naineris laevigata*, *Scolaricia typica*, *Protoaricia oerstedi* and possibly others. They are absent in species where an interramal cirrus is present and are considered homologous to the latter. Both are modifications of the epithelium and have no relation to nuchal organs.

Branchiae are conspicuous, segmentally paired processes and present on most body segments; they are absent from a few (two to five) to many (about 30) anterior segments and rarely altogether absent (*Orbiniella*). The first few pairs may be small and papillar, located on the dorsolateral side of the body within the notopodial bases. They enlarge gradually or abruptly and become long, subcylindrical to flattened lobes that are much larger than the accompanying parapodial lobes. Their lateral margins are more or less conspicuously fimbriated or ciliated except for a smooth tapering distal end which may be set off from the fimbriated region by a subdistal swelling (pl. 23, fig. 2). In most species the branchiae are simple; in a few they are branched (pl. 33, fig. 2).

Dorsal ciliated ridges are present in genera in which a middorsal space separates the inner branchial bases, as in *Naineris* and *Protoaricia*. They are more restricted or nearly absent when the branchial bases are close together middorsally. The ciliary rows are more or less continuous with the rows that border the branchial pairs.

Dorsal ciliated mounds (= dorsal organs of Rullier, 1950) homologous with the nuchal organs of the prostomium are segmental and present on most or perhaps all segments. They are located in front of the branchial bases nearer the segmental groove. Each organ is a ciliated, retractile mound developed from epithelium. A pair may be far apart, as in species of *Naineris* (pl. 38, figs. 1 and 6) and *Protoaricia*, or nearer together as in species of other genera. They may be circular, oval or shield-shaped as in *Scoloplos* and *Scolaricia*, or slitlike depressions as in *Orbinia* and *Phylo*. They may be recognized externally by a circlet of dark pigment about their bases. Rullier (1950, pp. 220-225) has described them as groups of ciliated cells with innervation like that of the nuchal organs.

Statocysts or organs of equilibrium are known for some species of *Naineris* and *Protoaricia*. They are segmental, epithelial depressions, sometimes covered with a thin membrane, located on a variable number

of anterior segments. On prebranchial segments they may occur at a place corresponding to the base of the branchia; farther back they are in front of or under the branchial base (Eisig, 1914, p. 249).

Large epithelial glandular pouches are present only in species of *Phylo*, located in posterior thoracic segments, one pair to a segment. They open to the exterior, are lined with secretory cells and covered with a spirally wound outer musculature. Their distribution corresponds with that of the modified spines or spears (pl. 23, fig. 2). The aperture is at the anterior side of the neuropodium and in front of the uppermost modified spine; it is usually accompanied by a fleshy foliaceous or papillar lobe. The pouches are oval or pyriform and have a groove along the posterior side where the uppermost spine lies lengthwise along it. The glands have been considered repugnatory (Claparède, 1870, p. 56, pl. 22, fig. 1b) and thought to function in defense or offense (Claparède, 1873, pp. 137-138). Eisig (1914, p. 229) called them defense glands ("Wehrdrüsen") and considered them homologous with nephridia. Söderström (1920, p. 86) identified similar structures in polydoriid spionids and concluded that they are secretory, emitting a chitinized, setal-like substance.

Nephridia are paired, segmental structures visible externally as small pores located on the lower posterior side of most or all abdominal neuropodia and sometimes on some posterior thoracic segments. At sexual maturity some are modified and function as gonopores (Mau, 1881, pl. 27).

Ventral pads are tumid, glandular areas arising from the body wall below the neuropodial bases of some abdominal segments. They are padlike and conspicuous in species of *Phylo*, *Orbinia* and *Haploscoloplos*; they are foliaceous in *Scoloplos* (pl. 30, fig. 2) and *Scolaricia*, to little developed or inconspicuous in some other genera. At sexual maturity they may enlarge and be filled with developing ova.

The posterior end of the body usually terminates in segments diminishing in length and width. The pygidium in small and collarlike; it has one to many pairs of short papillar to long filamentous processes (pl. 22, fig. 2). The anus is terminal or only slightly dorsal.

Setae and acicula are entirely simple and without articulation. Setae are diversified and highly specific. All notopodia and neuropodia have slender, distally pointed setae ("Pfriemborsten" of Eisig, 1914); the shaft is cylindrical and smooth and the distal end is compressed like a blade and provided with spinelets (seen in reflected light); it appears camerated, canaliculated or fenestrated when seen with transmitted

light, due to internal structures. The spinelets have their origin from longitudinal fibrils lying within the shaft. They can be traced inward to the core, where they are separated by clearer areas. The number of spinelets in a transverse row for a single seta, from base to tip, remains fairly constant but the spinelets are thicker and shorter at the base and longer and slenderer at the tip. These setae have been called also capillary setae, camerated capillaries, awl setae and other descriptive names.

Furcate, lyrate or forked setae (pl. 22, figs. 7, 8) are usually present only in notopodia of the abdominal segments and some posterior thoracic notopodia, or they are absent. They are usually few in a fascicle and located in an inferior position, accompanied by pointed setae. Each consists of a straight cylindrical shaft, smooth or spinous along its outer side, two long diverging tines connected with each other by a thin, translucent membrane that may be pouched (best seen from the edge of a tine), and strengthening fibrils extending out from the shaft. When perfect, the thin connecting membrane may be neatly serrated or crenulated at its free edge (pl. 20, fig. 5); when worn, it is frayed, torn or altogether lacking. The dimensions and positions in the fascicle suggest that these setae function to keep clean the long pointed setae. They may occur more often than reported as their sparse number and small size make them difficult to find.

Uncini or uncinate hooks of characteristic form are found in thoracic neuropodia of some species. They may form thick conspicuous palisaded vertical series, most numerous in middle and posterior thoracic segments. Each is straight or distally curved or has a tip that is blunt, entire or divided. There may be a delicate hyaline hood (pl. 22, figs. 5, 6) or the tip may be uncovered. The outer curved region may be smooth (pl. 35, fig. 6) or have transversely ridged (pl. 20, figs. 3, 4) or denticulated (pl. 40, fig. 4) structures. Uncini are present in some species of *Orbinia*, *Phylo*, *Scoloplos*, *Scolaricia* and *Orbiniella*. They are absent from *Haploscoloplos*, *Califia* and one species of *Naineris*. They are peculiarly curved and have a rostrate tip (= swan-shaped hooks) in *Proscoloplos*. Cauduncini ("Zipfelhaken" of Eisig, 1914, p. 216) are hooded uncini, as the name implies; they are described for species of *Protoaricia* (Eisig, 1914, p. 216) and *Naineris* (Annenkova, 1931, p. 204).

Subuluncini (pl. 37, figs. 5, 6) are transitional between pointed setae and uncini; the base or stalk is uncinate, the distal end abruptly slenderer and long pointed. The outer side of the curved region may be ornamented with rows of spinelets. They are known from some species of *Naineris* and *Protoaricia*.

Modified spines or spears are found only in *Phylo*, in posterior thoracic neuropodia. They form a single row in front of other setae. The uppermost one (pl. 23, fig. 2) is near the aperture of the glandular pouch and may project from the parapodium for a considerable distance. Farther down they are increasingly embedded in parapodial tissue. Replacement of upper or most worn ones is progressively from below. According to the species, the color of the spine varies from pale yellow to very dark or black. In shape they are acicular (pl. 24, fig. 2) or spearlike (pl. 23, fig. 4) or hastate to sagittate. Their position at the sides of a long, otherwise unarmed body suggests that they function in the stabilization or equilibration of the animal.

Brush-tipped setae (pl. 42, fig. 2) are known only in *Califia* (see below); they are, essentially, modified pointed setae in which the internal fibrils are freed to form a broomlike distal end. Pseuduncini or false hooks are delicate spines with a soft dark tip, associated with glandular pouches in *Phylo*; they are small and slender and thus easily overlooked. Flails ("Geiselpfriemen" of Eisig, 1914) are modified pointed setae abruptly bent in their distal part; they occur only in abdominal neuropodia of *Scolaricia*.

Acicula or embedded supporting rods occur in all notopodia and abdominal neuropodia. In most genera they are in bundles of two or more; in *Scoloplos* (*Leodamas*) abdominal neuropodia have single thick, distally curved acicula that project from the parapodial lobe (pl. 32, fig. 2).

Generic limitations are not rigid, because of the high degree of reticulation of most morphological features. This has resulted in an interchangeable use of generic and subgeneric categories, as *Scoloplos* for *Naineris*, or *Aricia* including *Phylo*. The number of thoracic segments varies but is fairly constant specifically in *Phylo* and *Orbinia*; it is inconstant in *Naineris*. The presence of podial and subpodial papillae and interramal cirri and the distribution of branchiae can be used only specifically. The approximate shape of the prostomium varies with the age of individuals but is more or less constant in adult individuals, unless the proboscis is everted.

Podial and subpodial lobes are most highly developed in *Orbinia* and *Phylo*; their distribution and number are fairly specific. The occurrence and distribution of other processes named above are to be examined with the same caution.

Thoracic neuropodia are thick and semilunar to oval; they have transverse rows of podial fringe in some species of *Orbinia* and *Phylo*; they are less modified in species of other genera and least so in *Naineris*

and PROTOARICIINAE. Abdominal neuropodia are long and cylindrical in *Orbinia*, *Phylo* and *Califia*; they are shorter and somewhat compressed in *Scoloplos*, *Haploscoloplos* and *Scolaricia*; they are short and blunt in *Naineris* and PROTOARICIINAE. Abdominal notopodia are widely separated middorsally in *Orbiniella*, *Naineris* and *Califia*; they are increasingly nearer together in *Scoloplos*, *Phylo* and *Orbinia*.

The most significant diagnostic characters are 1) the approximate or exact number of thoracic segments, 2) the extent of the transition region and whether it is abrupt or gradual, 3) the nature of the proboscis, whether epithelial or muscular and the extent of branching, if any, 4) the character of the branchiae, if simple or divided, cylindrical, compressed or laterally fimbriated, 5) the comparative lengths of postsetal notopodial lobes and branchiae, 6) the presence of ventral pads, if any, and their place of origin, 7) the presence or absence of podial lobes, their distribution and their number at maximum development, 8) the presence or absence of subpodial lobes or ventral cirri, their extent and number at maximum development, 9) the kinds of setae, especially those in thoracic neuropodia, 10) the details of uncini, subuluncini, furcate setae or other modified setae, 11) the presence or absence of interramal cirri, lateral organs or other surface structures such as ciliated ridges, ciliated mounds, nephridial or gonadial pores, 12) the form and number of anal appendages, and 13) the approximate size and proportions of the body.

The circulatory system has been described for *Phylo foetida* by Timofeev (1930, pp. 149-180). It consists of longitudinal and transverse connectives in complex arrangement. The longitudinal vessels include a dorsal one which connects with a plexus and lacunae [cardiac body] surrounding the alimentary canal. The ventral vessel is unpaired and slightly to right of center; a pair of much smaller paraneural vessels accompanies the unpaired one. The transverse connecting vessels are especially well developed in gonadial segments. There is a peripheral arch which permits transport of the blood from ventral to dorsal sides of the body, and a visceral arch which carries it in the opposite direction. These arches have ventral and dorsal branches. This author noted the strong development of anastomoses between the branchial and nephridial vessels, especially those which function as gonadial outlets. Parapodial vessels are proportionately weakly developed. The circulatory fluid is red.

Regeneration of lost anterior and posterior ends has been noted (Mau, 1881, p. 425). Caudal regeneration has been described also for *Phylo foetida* by Probst (1931, pp. 369-403).

Glossary in Orbiniidae

abdomen, the longer posterior part of the body in which the neuropodia become more or less dorsal in position, are slenderer and more or less cylindrical, with restricted fascicles of setae, and the branchiae are fully developed.

acicula, or embedded supporting rods, present in all notopodia and in abdominal neuropodia, in fascicles of 2 to 5 or 6 and fully embedded or somewhat projecting from the parapodial lobe, or singly, heavy and sicklelike as in *Leodamas*.

branchiae, the prolonged, laterally fimbriated, fleshy processes originating on the dorsal side of the body within notopodial bases; usually present in all abdominal segments and sometimes on posterior thoracic ones.

cauduncini, like uncini but with a distal tail or pointed hood, present in thoracic neuropodia in *Protoaricia*.

brush-tipped setae, modified setae in anteriormost segments in *Califia* only.

dorsal ciliary ridges (dorsal "Flimmerwülste" of Eisig), the continuous, transverse ridge across the middorsum between branchial bases; more or less continuous with the lateral fimbriae of the branchiae.

dorsal cirrus, see notopodial postsetal lobe.

flails or *flail setae* ("Geisselpfriemen" of Eisig and "soie a fléau" of Fauvel), the abruptly bent abdominal neuropodial setae present only in *Scolaricia*.

furcate setae or lyre, lyrate or forked setae, the short, bifurcated setae accompanying pointed setae in abdominal or posterior thoracic notopodia.

glandular organ, the large, flask-shaped, thick-walled sack located in posterior thoracic segments in *Phylo*, associated with modified spines (called "poches glanduleuses" by Claparède, "Drüsenorgane" by Söderström).

interramal cirrus, or intercirrus, a slender, short to long, simple lobe between notopodia and neuropodia of posterior thoracic and anterior abdominal segments, limited to some species in a few genera and equivalent to the lateral organ.

lateral organ ("Seitenorgane" of Eisig), the small rounded stationary elevation between notopodia and neuropodia, with stiff projecting hairs, present in some species of some genera in which an interramal cirrus is absent.

nephridia, the segmentally arranged organs with external pore, located on the posterior side of neuropodial ridges; at maturity partly functioning as gonopores.

nuchal organs or nuchal slits, the single pair of ciliated, eversible, epithelial pouches or slits at the postlateral margin of the prostomium, homologous with the segmental ciliary organs in more posterior segments.

parapodia, the biramous lateral outgrowths of the body, consisting of notopodia, which are more or less uniform throughout the body, and neuropodia, which are variously modified.

peristomium, the first visible segment behind the prostomium, forming a complete ring about the oral aperture, without parapodia or setae.

podial fringe, the serial rows of lobes or papillae located along the margins of postsetal lobes in thoracic neuropodia and notopodia in some species, especially in *Orbinia*.

podial lobe or lobes, located along the postsetal ridge in thoracic notopodia and neuropodia in some species and genera; usually conical or elongated, or divided, or simpler than podial fringe.

postsetal lobe or lobes (called also dorsal and ventral cirrus), the fleshy foliaceous or cirriform prolongation located behind setal fascicles of both notopodia and neuropodia.

proboscis, the anteriormost part of the pharynx, epithelial and eversible and more or less branched to simple in Orbiniinae or muscular and noneversible in Protoariciinae.

prostomium, the anterior pointed or rounded lobe preceding the oral aperture, without appendages but sometimes with eyes (especially in juvenile stages) and a pair of nuchal organs at the postlateral margins.

pseuduncini, or false uncini, the minute, delicate, uncinal spines associated with the glandular organ in species of *Phylo*.

segmental ciliary organ ("dorsal organ" of Rullier, "Wimperhügel" of Eisig), the paired, metameric, epithelial mound present in middle or later thoracic segments and continued to the end of the body, located in front of the branchial base near the segmental groove, covered with cilia and retractile; in *Naineris* the pair widely separated, in others more modified so that they approach and are more or less embedded anchor-like in the body; innervated like the nuchal organs.

setae, pointed setae ("Pfriemborsten" or "awl setae" of Eisig), the long, distally pointed spinous setae present in all notopodia and most abdominal neuropodia; sometimes called camerated, areolated, canaliculated and fenestrated because of the ladderlike arrangement of the internal structure of the shaft.

spears or spines, the thick, acicular spines in posterior thoracic neuropodia of *Phylo*; arranged in an anterior row, the dorsalmost one associated with the large glandular organ; called also defense spines and other descriptive names.

statocysts, the thoracic paired organs located at the base of branchiae or in a location corresponding to the branchial base; epithelial in origin and present only in species of some genera.

subpodial lobe, or ventral cirrus, a fleshy lobe located immediately below the neuropodium or some distance below it, sometimes simple, or multiple, but less complex than subpodial or ventral fringe.

subuluncini, resembling uncini with a long, distally pointed projection, located in thoracic neuropodia, limited to some species in some genera, as *Naineris*.

swan-shaped setae or hooks, present in some thoracic neuropodia, known only in *Proscoloplos*.

thorax, the anterior part of the body, usually broader and more depressed than the abdomen, with lateral parapodia differing from those in the abdomen.

uncini, the acicular, distally blunt, straight or somewhat curved to sickle-shaped, smooth or ridged or serrated modified setae present in thoracic neuropodia of some species in some genera, especially *Scoloplos*.

ventral cirrus, see subpodial lobe.

ventral fringe, the serial rows of lobes or papillae on the ventral side of some thoracic and abdominal segments, especially in species of *Orbinia*, sometimes more or less continuous or like subpodial fringe.

ventral pads, the glandular areas adjacent to neuropodia of some abdominal segments, especially conspicuous at sexual maturity and distended with gonadial substances.

Reproduction and Development

The development of *Naineris laevigata* from Japan is described by Okuda (1946, pp. 135-139). Adult individuals inhabit muddy bottoms in the *Zostera* zone. Spawning occurs from the end of May to the middle of June. The eggs are laid on the surface of the mud, not in

gelatinous masses but as a thin, irregular ribbon-shaped cluster invested with a delicate pellicle. These irregular pieces may adhere to the stems of *Zostera*. The fertilized egg is nearly spherical and measures about 250 micra across. The young pass through a modified trochophore stage. In 46 hours an elongated larva has developed, with short rows of cilia but no setae. Metamorphosis occurs after about two days and results in a gradual loss of ciliary rows. A six-segmented stage follows; dorsal and ventral fascicles of setae appear in the third and fourth segments. An alimentary tract is formed and the larva begins to feed. After one or two more days setae appear in the fifth and sixth segments and the larva begins to creep. Metamorphosis requires about four days and the formation of the seventh setigerous segment marks its end. This is about ten days after fertilization. The first two segments are asetigerous. During juvenile stages the branchiae are developed and the trunk elongates.

The development of *Haploscoloplos kerguelensis* in Japan is also described by Okuda (1946, pp. 139-144). Adults are mature from June to July; they occur in sandy mud bottoms. The eggs are laid in a pear-shaped gelatinous mass supported by a long stalk. Hatching takes place about three days after fertilization and the pelagic life lasts only one or two days. There are no larval swimming setae. The development resembles that of *Naineris laevigata* from Japan.

The stages of development for some species from Europe are summarized by Thorson (1946, pp. 78, 79, 140). *Scoloplos armiger*, *Phylo foetida* and *Orbinia cuvieri* have no pelagic stages. The best studied species, *Phylo foetida* from the Gulf of Naples, spawns from January to June at four-week periods for a single individual (Schaxel, 1912, p. 384). Eggs are laid in a gelatinous cylindrical mass measuring 60 to 80 millimeters long, attached to the sand. The young hatch in six to twelve days and remain larval for two to three weeks but there is no pelagic stage (Lo Bianco, 1899, pp. 448-573 and Salensky, 1883, pp. 188-220).

Scoloplos armiger spawns in spring; eggs are laid in pear-shaped gelatinous cocoons measuring about 20 by 10 millimeters; they are attached to the sand by a tough strand 15 to 50 millimeters long. A female individual may spawn more than one cocoon and each cocoon may have 400 to 1000 eggs. The larvae remain there for as much as three weeks and hatch in a creeping stage; when hatched they are about 600 micra long. The stages of cell division have been described by Delsman (1916, p. 409).

Name of Species	Alaska	Western Canada and Oregon	California and western Mexico	Pacific Panama	Hawaii	Ecuador to Chile	Antarctic regions	Southern South America	Brazil	West Indies and Bermuda	Gulf of Mexico (see Hartman, 1951)	Eastern Florida to North Carolina	Virginia to eastern Canada	American Arctic	Greenland (see Wesenberg-Lund 1950-1953)
"Alcandra" robusta									X						
Califia calida			X												
Haploscoloplos elongatus	X	X	X											X	
Haploscoloplos foliosus											X				
Haploscoloplos fragilis											X	X	X		
Haploscoloplos kerguelensis							X	X							
Haploscoloplos kerguelensis minutus							X								
Haploscoloplos panamensis	X			X											
Haploscoloplos robustus											X	X	X		
Haploscoloplos sp.															X
Naineris aurantiaca									X						
Naineris bicornis											X				
Naineris dendritica	X	X	X												
Naineris grubei						X									
Naineris laevigata					X	X			X	X	X	X			
Naineris mutilata										X					
Naineris nannobranchia			X												
Naineris quadricuspida															X

Naineris setosa					X								X	X							
Naineris uncinata					X																
Orbinia cuvieri																					X
Orbinia johnsoni					X																
Phylo felix			X		X						X	X									
Phylo kupfferi																					X
Phylo michaelseni, Monro 1930											X										
Phylo norvegicus												X									X
Phylo nudus					X																
Phylo ornatus					X									X	X						
Protoaricia oerstedi													X								
Scoloplos (S.) acmeceps			X		X																
Scoloplos (S.) armiger	X		X							?									X	X	X
Scoloplos (S.) armiger pacificus					X																
Scoloplos (S.) treadwelli					X																
Scoloplos (L.) cirratus										X											
Scoloplos (L.) latum				X																	
Scoloplos (L.) marginatus										X	X										
Scoloplos (L.) marginatus mcleani										X											
Scoloplos (L.) ohlini					X						X										
Scoloplos (L.) rubra													X	X			X				
Scoloplos (L.) tribulosus											X										
Scoloplos (L.) verax											X										
Scoloplos ? treadwelli													X								
Scoloplos armiger Ehlers, 1901											X										

	Japan (Okuda, 1937-1946)	Soviet Arctic regions (Annenkova, 1931-1946 and Uschakov, 1955)	South Pacific areas	Indian Ocean and Red Sea	southeastern Australia	southwestern Australia (Augener, 1914)	Tasmania	New Zealand	southern Africa (Day, 1934-1954)	western Africa	islands in southern Atlantic Ocean	western and southern Europe and northern Africa	northern Europe	islands in northern Atlantic Ocean	Black Sea
"Aricia" birulae		X													
Haploscoloplos cylindrifer, Monro, 1939							X								
Haploscoloplos kerguelensis	X			?											
Haploscoloplos sp.						X									
Naineris grubei australis					X										
Naineris hexaphyllum									X	X					
Naineris jacutica	X	X													
Naineris laevigata	X	X		X					X			X			
Naineris quadricuspida	X	X										X	X	X	
Naineris retusiceps			X												
Orbinia angrapequensis										X					
Orbinia armandi												X	X		
Orbinia bioreti									X			X			
Orbinia cornidei												X			
Orbinia cuvieri												X			

Orbinia cuvieri persica			X							
Orbinia edwardsi								X	X	
Orbinia exarmata			X							
Orbinia latreillii								X		
Orbinia papillosa					X					
Orbiniella minuta							X			
Phylo fimbriatus	X									
Phylo foetida								X		
Phylo foetida adjimensis								X		
Phylo foetida atlantica								X		
Phylo foetida australis						X				
Phylo foetida imitans								X		
Phylo foetida liberiana								X		
Phylo foetida ligustica								X		
Phylo grubei								X		
Phylo kupfferi			X					X	X	
Phylo michaelseni, Okuda, 1937	X									
Phylo norvegicus	X							X	X	
Phylo nudus, Fauvel, 1932			X							
Phylo ornatus										
Proscoloplos cygnochaetus							X			
Protoaricia oerstedi								X		

	Japan (Okuda, 1937-1946)	Soviet Arctic regions (Annenkova, 1931-1946 and Uschakov, 1955)	South Pacific areas	Indian Ocean and Red Sea	southeastern Australia	southwestern Australia (Augener, 1914)	Tasmania	New Zealand	southern Africa (Day, 1934-1954)	western Africa	islands in southern Atlantic Ocean	western and southern Europe and northern Africa	northern Europe	islands in northern Atlantic Ocean	Black Sea
Protoaricia capsulifera															X
Scolaricia haasi												X			
Scolaricia typica												X			
Scoloplos (S.) armiger	X	X										X	X		
Scoloplos (S.) marsupialis				X											
Scoloplos (L.) chevalieri				X						X					
Scoloplos (L.) cylindrifer								X							
Scoloplos (L.) dendrobranchus					X										
Scoloplos (L.) fimbriatus					X										
Scoloplos (L.) johnstonei									X						
Scoloplos (L.) latum				X											
Scoloplos cylindrifer, Augener, 1914						X									
Scoloplos dubius						X									
Scoloplos madagascariensis									X						
Scoloplos novae-hollandiae					X										

The early development of *Haploscoloplos robustus* has been studied by Horn and Bookhout (1950, pp. 1-9, pls. 1-4, as *H. bustoris*). In North Carolina individuals are mature from May through September. Natural spawning was never attained in the laboratory nor were the egg masses ever collected in the field. It was assumed that there are no gelatinous masses in this species as are known for some others (see above). Eggs and sperm were artificially removed from adult individuals. When the eggs were fertilized, only about one percent developed into healthy larvae. A motile trochophore was observed sixteen hours after fertilization. After 40 hours the larvae had grown so that segments 3 and 4 each had a pair of long setae. The presence of ten ciliated bands indicated as many segments. The 70-hour larva showed six setigerous segments. Metamorphosis was complete after three days; at that time the larva had nine setigerous segments and most ciliary rows had disappeared. Branchiae were present on the tenth and eleventh segments and the alimentary tract was differentiated. After four days a juvenile was developed which resembled the adult except for its much smaller size. There was presumably no planktonic stage.

Experimental parthenogenesis was demonstrated for *Aricia* by Kostanecki (1909, pp. 238-253).

Geographic Distribution

The most widely distributed species are *Naineris laevigata* and *Scoloplos armiger*, each occurring in ten of the geographic categories named above. If we include the closely related *Naineris dendritica* with *N. laevigata*, the range covers 14 categories. In the case of *Scoloplos armiger*, with its subspecies it occurs in 11 categories. The closely related species of *Haploscoloplos* (*elongatus* and *kerguelensis* with varities) are found in nine groups. Species of *Orbinia* are limited largely to Europe or coastlines of the Atlantic Ocean. Those of *Scoloplos* (*Leodamas*) come chiefly from the Southern Hemisphere. Those of *Haploscoloplos* and *Naineris* are most diversified in the vicinities of the Gulf of Mexico and West Indian seas. The single species of *Protoaricia* has been recorded from both sides of the tropical Atlantic Ocean. Those of *Scolaricia*, *Proscoloplos*, *Orbiniella* and *Califia* are the most restricted geographically.

The two charts immediately above show the geographic distribution for species of Orbiniidae. (See alphabetical list of species below for further bibliographic citations.)

Ecology and Habit

Most species of Orbiniidae occur in sandy or muddy bottoms of intertidal to shallow or moderately deep seas. Fewer numbers are reported from abyssal depths. These deep-water species are distributed mainly in the genera *Phylo*, *Califia*, *Scoloplos* and *Naineris*. Thus in *Phylo* the type of the genus, *P. felix* Kinberg, is littoral on both sides of America (see below); *P. nudus* (Moore) is recorded from 1242 to 2982 feet off southern California (Moore, 1911, p. 315); *P. fimbriatus* (Moore) occurs off Japan in 120 to 1560 feet (Moore, 1903, p. 464) and *P. norvegicus* (Sars) has been recorded from shallow water to 8040 feet off New York (McIntosh, 1885, p. 352) and in 450 to 888 feet in northern Japan (Annenkova, 1938, p. 170). *Phylo kupfferi* (Ehlers) occurs in the northern Atlantic Ocean in 4305 to 8196 feet (Ehlers, 1874, p. 296) and *P. grubei* (Gravier) is described off Peru in 2532 feet (Gravier, 1908, p. 42). *Naineris quadricuspida* (Fabricius) was taken in 5940 feet off northern Japan (Annenkova, 1938, p. 171). *Califia calida*, new genus and species, is known only from greater depths off southern California (see below). *Scoloplos armiger* (Müller), originally described from shallow seas of western Europe, has a nearly cosmopolitan distribution in shallow to greater depths with a record off northern Japan in 3000 to 6000 feet (Annenkova, 1938, p. 170).

The associations of species from the northern Pacific Ocean are predictable within limits. *Naineris dendritica* and *Scoloplos acmeceps* are commonly found in sandy and mixed bottoms overgrown with grasses, especially in the roots of *Phyllospadix* and *Zostera* or the holdfasts of littoral algae. *Haploscoloplos elongatus* and *Scoloplos armiger* occur in greater ranges of depths (see chart of species in San Pedro Basin). The associations of species of Orbiniidae and Paraonidae are indicated by symbols on the charts. Each group of letters represents species taken together in a single small sample from the area indicated.

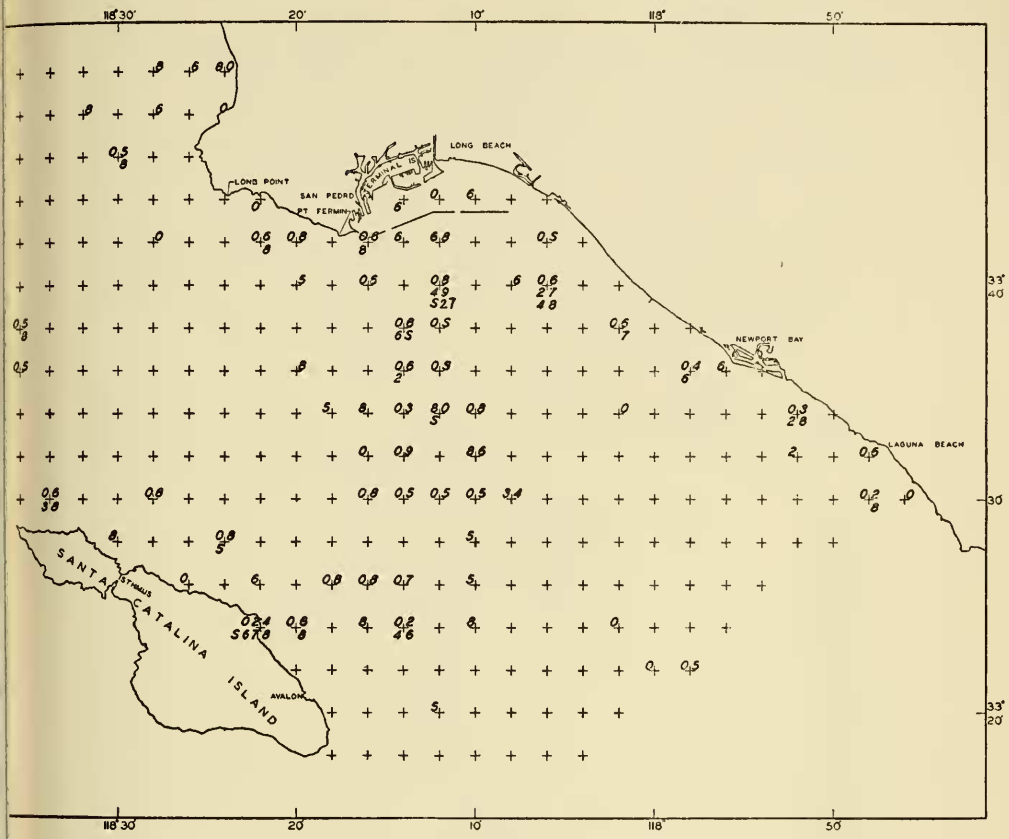

CHART SHOWING DISTRIBUTION OF ORBINIIDAE AND PARAONIDAE IN SAN PEDRO BASIN AND ENVIRONS, CALIFORNIA

Name of Species	Symbol
Aricidea, near *suecica*	0
Aricidea ? ramosa	1
Aricidea uschakovi	2
Aricidea (Cirrophorus) aciculata	3
Aricidea (Cirrophorus) furcata	4
Califia calida	5
Haploscoloplos elongatus	6
Naineris uncinata	7
Paraonis gracilis oculata	8
Paraonis (Paraonides) lyra	9
Scoloplos armiger	S

When disturbed or removed from the substratum, individuals typically roll into a ball or tight coil so that the smooth ventrum of the body is outside and the branchial or dorsal side is within; the cephalic structures are innermost in the coil and the anal appendages outermost. Swimming is accomplished with an abrupt opening and closing of the coil.

The method of feeding has been likened to that of some holothurian echinoderms in which the multilobed proboscis of *Orbinia* is compared with the branched crown of *Cucumaria* (holothurian). The proboscis is extruded, loaded with nutrient particles and retracted, carrying food and other particles into the digestive tract (Eisig, 1914, p. 168).

Station Numbers of the Velero III and Velero IV with species of Orbiniidae, Paraonidae and Longosomidae from each station (see Fraser, 1943, for data on stations 885-38 to 1501-52).

885-38. *Scoloplos armiger* (1).
886-38. *Haploscoloplos elongatus* (1).
887-38. *Scoloplos acmeceps* (1).
888-38. *Phylo felix* (1), *Scoloplos armiger* (1).
901-38. *Naineris dendritica* (1).
905-38. *Haploscoloplos elongatus* (1).
908-38. *Naineris uncinata* (1).
992-39. *Haploscoloplos elongatus* (1).
1021-39. *Scoloplos armiger* (1).
1149-40. *Aricidea* nr. *suecica* (2).
1201-40. *Haploscoloplos elongatus* (1).
1204-40. *Naineris dendritica* (1).
1211-40. *Scoloplos acmeceps* (6).
1222-41. *Naineris dendritica* (12).
1228-41. *Naineris dendritica* (1).
1256-41. *Phylo felix* (1).
1259-41. *Phylo felix* (1).
1299-41. *Aricidea* nr. *suecica* (1).
1315-41. *Naineris dendritica* (1).
1321-41. *Aricidea* nr. *suecica* (1).
1327-41. *Scoloplos armiger* (1).
1330-41. *Naineris uncinata* (1).
1370-41. *Naineris dendritica* (1).
1398-41. *Naineris uncinata* (many juveniles).

1437-41. *Naineris dendritica* (6).
1441-41. *Haploscoloplos elongatus* (1); *Scoloplos acmeceps* (2); *Aricidea pacifica* (1).
1442-41. *Scoloplos acmeceps* (4).
1443-41. *Naineris dendritica* (many).
1445-42. *Scoloplos acmeceps* (3); *Naineris dendritica* (1).
1446-42. *Naineris dendritica* (1).
1447-42. *Naineris dendritica* (1).
1449-42. *Naineris dendritica* (1).
1450-42. *Scoloplos acmeceps* (2); *Scoloplos armiger* (1); *Aricidea pacifica* (1).
1451-42. *Scoloplos acmeceps* (6).
1457-42. *Scoloplos acmeceps* (6); *Naineris dendritica* (4).
1459-42. *Naineris dendritica* (10).
1464-42. *Naineris dendritica* (3).
1468-42. *Naineris dendritica* (18).
1471-42. *Scoloplos acmeceps* (2).
1472-42. *Naineris dendritica* (1).
1474-42. *Naineris dendritica* (1).
1477-42. *Naineris dendritica* (3).
1478-42. *Scoloplos acmeceps* (1).
1479-42. *Scoloplos acmeceps* (2).
1480-42. *Scoloplos acmeceps* (1).
1484-42. *Scoloplos acmeceps* (4).
1487-42. *Naineris dendritica* (1).
1488-42. *Naineris dendritica* (5).
1490-42. *Naineris dendritica* (many).
1491-42. *Naineris dendritica* (10).
1492-42. *Naineris dendritica* (4).
1493-42. *Scoloplos acmeceps* (1).
1496-42. *Naineris uncinata* (1).
1501-42. *Naineris dendritica* (1).
1668-49. Jan. 8. Santa Cruz Basin, California, 33°-50′-00″, 119°-24′-10″, in 2850 to 3600 feet, sticky green mud.
Aricidea uschakovi (1).
1990-50. Aug. 13. ¼ mi off Willow Cove, Santa Catalina Island, California, 33°-22′-25″, 118°-20′-32″, in 224 feet, mud and shell.
Aricidea nr. *suecica* (20).

1995-50. Oct. 1. 7 mi ENE of Long Point, Santa Catalina Island, California, 33°-25′-38″, 118°-12′-46″, in 2400 feet, mud.
Califia calida (1).

2012-51. April 13. Lagoon, San Martin Island, Lower California, Mexico, 30°-28′-53″, 116°-06′-27″, rocky shore, in lagoon.
Scoloplos armiger (3).

2017-51. April 15. 14. 2 miles SSE of Geronimo Island, Lower California, 29°-34′-15″, 115°-43′-00″, in 324 feet, green mud.
Paraonis gracilis oculata (1).

2026-51. April 19. South Bay, Cedros Island, Lower California, 28°-05′-00″, 115°-19′-45″, in 96 to 114 feet, mud and sand.
Haploscoloplos elongatus (7); *Phylo felix* (several); *Paraonis gracilis oculata* (1).

2030-51. Apr. 20. 5.4 miles E of Morro Redondo Point, Cedros Island, Lower California, 28°-02′-23″, 115°-06′-08″, in 240 to 246 feet, green mud.
Aricidea nr. *suecica* (4).

2033-51. May 19. 9.25 miles SSE of Point Fermin, California, 33°-33′-22″, 118°-14′-55″, in 1140 to 1320 feet, mud and shale.
Paraonis lyra (1).

2035-51. May 19. 8.1 miles SSE of Point Fermin, California, 33°-34′-48″, 118°-13′-44″, in 192 to 300 feet, sand and mud.
Aricidea nr. *suecica* (24); *Paraonis gracilis oculata* (3).

2053-51. September 8. 2.6 miles SE of Los Angeles lighthouse, 33°-40′-27″, 118°-13′-20″, in 66 to 72 feet, over kelp bed.
Paraonis lyra (3).

2059-51. October 7. 2.7 miles SSE of Los Angeles lighthouse, 33°-40′-20″, 118°-13′-07″, in 72 to 78 feet, over kelp bed.
Paraonis lyra (3).

2091-52. February 9. 2.6 miles S of Los Angeles lighthouse, 33°-39′-54″, 118°-14′-50″, in 84 to 90 feet, sand and kelp.
Scoloplos acmeceps (1).

(see volume 19, part 1, this series, for data on following stations except for those herein given).

2107-52. *Haploscoloplos elongatus* (4); *Paraonis gracilis oculata* (7).

2113-52. *Scoloplos armiger* (1); *Aricidea* nr. *suecica* (1); *Aricidea furcata* (2).

2114-52. *Haploscoloplos elongatus* (2); *Aricidea* nr. *suecica* (53); *Aricidea furcata* (1); *Paraonis gracilis oculata* (9).

2115-52. *Haploscoloplos elongatus* (2).

2116-52. *Haploscoloplos elongatus* (5); *Aricidea* nr. *suecica* (2); *Paraonis gracilis oculata* (4).

2117-52. *Aricidea uschakovi* (3), *Paraonis gracilis oculata* (4).

2120-52. *Haploscoloplos elongatus* (7); *Aricidea* nr. *suecica* (about 90); *Aricidea uschakovi* (20).

2152-52. *Scoloplos armiger* (9); *Aricidea* nr. *suecica* (1); *Aricidea uschakovi* (8); *Paraonis gracilis oculata* (1).

2126-52. *Scoloplos armiger* (5); *Aricidea* nr. *suecica* (1); *Paraonis gracilis oculata* (1).

2128-52. June 25. 0.3 miles E of Long Point light, Santa Catalina Island, 33°-24′-15″, 118°-21′-35″, in 252 to 402 feet, sand and dead brachiopod shells.
Naineris uncinata (6); *Aricidea* nr. *suecica* (7).

2142-52. *Paraonis gracilis oculata* (2).

2149-52. *Haploscoloplos elongatus* (6).

2152-52. *Scoloplos acmeceps* (5); *Aricidea* nr. *suecica* (16); *Aricidea furcata* (23); *Paraonis gracilis oculata* (4).

2153-52. *Naineris uncinata* (3); *Scoloplos armiger* (3); *Longosoma catalinensis* (3); *Aricidea furcata* (1); *Paraonis gracilis oculata* (1).

2168-52. *Haploscoloplos elongatus* (5).

2172-52. October 31. 8.5 miles W of East end, Santa Catalina Island, California, 33°-17′-29″, 118°-29′-13″, in 3102 feet.
Aricidea ?*ramosa* (1).

2175-52. October 31. 2.8 miles west of Salta Verde Point, Santa Catalina Island, California, 33°-18′-31″, 118°-28′-31″, in 348 feet, mud.
Haploscoloplos elongatus (4); *Aricidea* nr. *suecica* (4); *Paraonis gracilis oculata* (3).

2176-52. *Haploscoloplos elongatus* (9); *Aricidea* nr. *suecica* (6); *Paraonis gracilis oculata* (2).

2189-52. *Haploscoloplos elongatus* (4).

2193-52. *Paraonis gracilis oculata* (1).

2202-53. *Haploscoloplos elongatus* (4); *Paraonis gracilis oculata* (1).

2217-53. *Haploscoloplos elongatus* (6).

2219-53. *Califia calida* (1).

2224-53. *Haploscoloplos elongatus* (6).

2227-53. *Haploscoloplos elongatus* (11); *Aricidea* nr. *suecica* (9); *Paraonis gracilis oculata* (9).

2228-53. *Haploscoloplos elongatus* (2); *Aricidea* nr. *suecica* (10); *Aricidea uschakovi* (1); *Aricidea furcata* (1); *Paraonis gracilis oculata* (2).

2229-53. *Naineris uncinata* (3); *Aricidea* nr. *suecica* (10).
2230-53. *Scoloplos* sp. (1); *Califia calida* (1); *Aricidea* nr. *suecica* (8).
2231-53. *Aricidea* (*Cirrophorus*) *aciculata* (3).
2232-53. *Haploscoloplos elongatus* (14); *Aricidea* nr. *suecica* (11); *Aricidea uschakovi* (6).
2233-53. *Haploscoloplos elongatus* (12); *Aricidea* nr. *suecica* (1); *Paraonis gracilis oculata* (3).
2291-53. *Haploscoloplos elongatus* (6).
2294-53. *Aricidea uschakovi* (1); *Aricidea aciculata* (2); *Paraonis gracilis oculata* (many).
2301-53. *Califia calida* (1); *Paraonis gracilis oculata* (3).
2307-53. *Haploscoloplos elongatus* (6); *Aricidea* nr. *suecica* (1); *Paraonis gracilis oculata* (92).
2311-53. *Haploscoloplos elongatus* (34); *Naineris uncinata* (5); *Aricidea* nr. *suecica* (1); *Aricidea uschakovi* (2); *Aricidea furcata* (2); *Paraonis gracilis oculata* (1).
2312-53. *Scoloplos armiger* (12).
2316-53. *Scoloplos acmeceps* (1).
2317-53. *Scoloplos acmeceps* (1).
2318-53. May 19. 5.8 mi SSE of Point Fermin light, California, 33°-37′-35″, 118°-14′-20″, in 150 feet, sand.
Scoloplos acmeceps (4).
2320-53. May 19. 2.2 mi ESE of Los Angeles breakwater light, California, 33°-41′-38″, 118°-12′-33″, in 78 feet, sand and mud.
Scoloplos acmeceps (2).
2324-53. *Califia calida* (1); *Paraonis gracilis oculata* (1).
2337-53. *Haploscoloplos elongatus* (1); *Aricidea uschakovi* (1); *Aricidea* nr. *suecica* (3); *Paraonis gracilis oculata* (1).
2338-53. *Aricidea* nr. *suecica* (1); *Paraonis gracilis oculata* (1).
2342-53. *Aricidea furcata* (1).
2343-53. *Califia calida* (1).
2389-53. *Haploscoloplos elongatus* (9); *Aricidea* nr. *suecica* (2); *Aricidea aciculata* (5); *Paraonis gracilis oculata* (2).
2403-53. *Aricidea* nr. *suecica* (4); *Paraonis gracilis oculata* (21).
2410-53. *Califia calida* (2); *Paraonis gracilis oculata* (1).
2411-53. *Califia calida* (2); *Aricidea* nr. *suecica* (4).
2412-53. *Califia calida* (1); *Aricidea* nr. *suecica* (12).
2414-53. *Aricidea aciculata* (3); *Aricidea furcata* (1); *Paraonis gracilis oculata* (3).

2418-53. *Haploscoloplos elongatus* (1); *Paraonis gracilis oculata* (several).
2428-53. *Califia calida* (2).
2441-53. *Califia calida* (2).
2445-53. *Naineris uncinata* (1); *Scoloplos armiger* (2); *Aricidea* nr. *suecica* (1); *Aricidea uschakovi* (1); *Paraonis gracilis oculata* (5).
2498-53. *Paraonis gracilis oculata* (1).
2506-53. *Haploscoloplos elongatus* (several).
2507-53. *Aricidea* nr. *suecica* (1).
2508-53. *Haploscoloplos elongatus* (1).
2597-54. Feb. 1. 0.2 mi E of Rock light, Acapulco, Guerrero, Mexico, 16° 50′ 37″N, 99° 55′ 30″W, in 13 fathoms, sand and silt. *Scoloplos treadwelli* (1); *Naineris setosa* (1).
2618-54. *Haploscoloplos elongatus* (1).
2625-54. *Paraonis gracilis oculata* (1).
2628-54. *Califia calida* (1).
2635-54. *Califia calida* (1).
2646-54. *Haploscoloplos elongatus* (4); *Naineris uncinata* (1); *Aricidea* nr. *suecica* (7).
2723-54. *Califia calida* (3); *Aricidea* nr. *suecica* (2).
2725-54. *Haploscoloplos elongatus* (2+).
2749-54. *Aricidea uschakovi* (6); *Paraonis gracilis oculata* (several).
2788-54. *Aricidea* nr. *suecica* (4).
2798-54. *Califia calida* (2).
2835-54. *Paraonis gracilis oculata* (1).
2836-54. *Aricidea* nr. *suecica* (3).
2837-54. *Paraonis gracilis oculata* (6).
2839-54. *Aricidea* nr. *suecica* (2); *Paraonis gracilis oculata* (8).
2853-54. June 25. 1.8 miles SE of Long Point, Santa Catalina Island light, California, 33°-22′-58″, 118°-20′-48″, in 35 to 38 fathoms, rock and sand.
Naineris uncinata (1).
2859-54. *Paraonis gracilis oculata* (2+).
3504-55. Sept. 24. 6.7 mi NW of West Point, Santa Cruz Island, California, 34°-08′-54″, 120°-01′-25″, in 260 fathoms.
Paraonis multibranchiata (2).
3731-55. Dec. 12. 18 mi SE of Point Conception light, California, 34°-14′-10″, 120°-12′-45″, in 275 fathoms, green mud.
Paraonis multibranchiata (15).

3733-55. Dec. 12. 19.5 mi SW of Santa Barbara Point light, California, 34°-10′-40″, 120°-00′-42″, in 305 fathoms, green mud.
Paraonis multibranchiata (1).

4759-56. Dec. 6. 0.7 mi from Cardiff by the Sea Tower, California, 33°-01′-50″, 117°-17′-45″, in 50 feet, very fine green sand.
Longosoma catalinensis (20).

4761-56. Dec. 9. 0.25 mi from Oceanside Pier, California, 33°-11′-50″, 117°-23′-30″, in 38 feet, micaceous black silt.
Longosoma catalinensis (11).

A 32-39. 3 miles north of Coche Island, Venezuela, in 21-33 fathoms.
Paraonis lyra (1).

Systematic Discussion

The ORBINIIDAE are recognized for two subfamilies, the ORBINIINAE, new subfamily and the PROTOARICIINAE, new subfamily. In the former the body is larger and longer; in adults, only the first segment is a smooth ring or it may be superficially divided; the proboscis is epithelial, voluminous and eversible; parapodia are more or less highly developed and have accessory lobes of diversified kinds; branchiae are usually well developed and present on many segments. The ORBINIINAE include the genera *Orbinia* Quatrefages, *Phylo* Kinberg, *Haploscoloplos* Monro, *Scoloplos* (*Scoloplos*) Blainville, *Scoloplos* (*Leodamas*) Kinberg, *Scolaricia* Eisig, *Califia*, new genus, and *Naineris* Blainville.

In the PROTOARICIINAE the body is much smaller, slenderer and measures less than 15 mm long; the first two segments are smooth; branchiae are less conspicuous or absent; the proboscis is muscular and non-eversible in so far as known. It includes the genera *Protoaricia* Czerniawsky, *Proscoloplos* Day and *Orbiniella* Day. Each of these genera is known for a single species limited to areas in the Atlantic Ocean.

The following list gives original generic, subgeneric, specific and subspecific names in alphabetical order. Only original names, new combinations and accepted names are given. The 126 original names of species, subspecies or varieties are reduced to 74 valid names; 31 original generic or subgeneric names to 11 valid ones.

Alcandra Kinberg, 1866, p. 251, erected for *A. robusta* Kinberg. Questionable, see below.

Alcandra robusta Kinberg, 1866, p. 251, and Kinberg, 1910, pp. 62-63, pl. 24, fig. 6. Off Brazil in 20 to 30 fathoms. Questionable, see below.

Anthostoma Schmarda, 1861, p. 61, erected for *A. hexaphyllum* Schmarda. Referred to *Naineris* Blainville, 1828, see Eisig, 1914, p. 440.

Anthostoma acutum Verrill, 1873, pp. 599-600. Massachusetts. Referred to *Scoloplos armiger* (Müller), see Webster and Benedict, 1887, p. 738.

Anthostoma dendriticum Kinberg, 1867, p. 337. Vancouver Island, British Columbia, Canada. Referred to *Naineris dendritica*, see below.

Anthostoma fragile Verrill, 1873, pp. 598-599. New England. Referred to *Haploscoloplos fragilis*, see below.

Anthostoma hexaphyllum Schmarda, 1861, p. 61, pl. 27, fig. 217, text-figs. a-c. Cape of Good Hope, Africa. Referred to *Naineris hexaphyllum*, see Augener, 1918, p. 421, and Monro, 1930, p. 145.

Anthostoma latacapitata Treadwell, 1901, pp. 203-204, figs. 61-65. Puerto Rico. Referred to *Naineris setosa* (Verrill), see Hartman, 1951, p. 67.

Anthostoma ramosum Schmarda, 1861, p. 62, figs. a-c. Jamaica, West Indies. Referred to *Naineris laevigata* (Grube), see Eisig, 1914, p. 480.

Anthostoma robustum Verrill, 1873, pp. 597-598, pl. 14, fig. 76. New England. Referred to *Haploscoloplos robustus*, see Hartman, 1951, p. 78 and below.

Anthostomea Kinberg, 1867, p. 337, family name erected for *Anthostoma* Schmarda. Referred to Orbiniidae, see Hartman, 1948b, p. 12.

Aricia Savigny, 1820, pp. 35-36, erected for *A. sertulata* Savigny. Referred to *Orbinia* Quatrefages, 1865, see Hartman, 1936, p. 32.

Aricia acustica Langerhans, 1880, pp. 88-89, pl. 4, fig. 1 a-g. Madeira. Referred to *Protoaricia oerstedi* (Claparède), see Fauvel, 1927a, p. 24.

Aricia angrapequensis Augener, 1918, pp. 413-415, pl. 6, fig. 146, pl. 7, fig. 225, text-fig. 56. Southwest Africa in 0 to 10 meters. Referred to *Orbinia angrapequensis* by generic change.

Aricia (*Archiaricia*) Czerniawsky, 1881, p. 371, erected for *Aricia foetida* Claparède, see *Phylo* Kinberg, 1866.

Aricia arctica Hansen, 1878b, p. 269, pl. 2, figs. 1-8. North Sea. Referred to *Scoloplos armiger* (Müller), see Eisig, 1914, p. 367.

Aricia armandi McIntosh, 1910, pp. 508-509, pl. 87, figs. 19, 20. Shetland, England in 80 meters. Referred to *Orbinia armandi* by generic change.

Aricia armata Hansen, 1882, p. 18, pl. 5, figs. 28-32. Brazil. Referred to *Naineris laevigata* (Grube), see Eisig, 1914, p. 483.

Aricia bioreti Fauvel, 1919b, pp. 34-35, fig. 2a-f. Madagascar. Referred to *Orbinia bioreti* by generic change. Redescribed in Fauvel, 1919, pp. 430-433, pl. 16, figs. 52-56.

Aricia birulae Idelson, named *in* Zenkevich, 1947, p. 98. Barents Sea, Russian Arctic Ocean.

Aricia capsulifera Bobretzky, 1870, p. 248. Black Sea. Referred to *Protoaricia capsulifera*, see Eisig, 1914, p. 517, and by generic change.

Aricia chevalieri Fauvel, 1902, pp. 83-86, figs. 23-28. Senegal, tropical West Africa. Referred to *Scoloplos* (*Leodamas*) *chevalieri* by generic change.

Aricia cirrata Ehlers, 1897, pp. 94-95, pl. 6, figs. 148, 149. Southern South America in 62 fathoms. Referred to *Scoloplos* (*Leodamas*) *cirratus*, see Hartman, 1953, p. 38.

Aricia cirrata Treadwell, 1901, pp. 201-202, figs. 54-57. Puerto Rico. Referred to *Scoloplos treadwelli*, see Eisig, 1914, pp. 405-407.

Aricia cochleata Ehlers, 1901, pp. 166-167, pl. 21, figs. 14-21. Southern South America. Referred to *Scoloplos* (*Leodamas*) *ohlini*, see Augener, 1926, pp. 165-166.

Aricia cornidei Rioja, 1934, pp. 433-438, figs. 1-15. Southwestern Europe. Referred to *Orbinia cornidei* by generic change.

Aricia cuvieri Audouin and Milne Edwards, 1833, pp. 397-398, pl. 15, figs. 5-13. Western France. Referred to *Orbinia cuvieri* by generic change.

Aricia cuvieri perpapillata Eisig, 1914, pp. 334-338, pl. 18, figs. 1-14. Gulf of Naples. Referred to *Orbinia cuvieri*, see Fauvel, 1927a, p. 12, and by generic change.

Aricia cuvieri persica Fauvel, 1932a, p. 162, fig. 24a-d. Persian Gulf. Referred to *Orbinia cuvieri persica* by generic change.

Aricia edwardsi McIntosh, 1910, pp. 501-502, pl. 87, fig. 8. Off England. Referred to *Orbinia edwardsi* by generic change.

Aricia exarmata Fauvel, 1932a, pp. 163-165, figs. 26a-d, 27a-e. Bay of Bengal, India. Referred to *Orbinia exarmata* by generic change.

Aricia fimbriata Moore, 1903, pp. 464-467, pl. 24, figs. 31-35. Northern Japan in 20 to 260 fathoms. Referred to *Phylo fimbriatus*, see below.

Aricia foetida Claparède, 1870, pp. 46-49, pl. 20, fig. 2. Gulf of Naples. Referred to *Phylo foetida* by generic change.

Aricia foetida adjimensis Fauvel, 1925, p. 525. Tunisia, northern Africa. Referred to *Phylo foetida adjimensis* by generic change.

Aricia foetida atlantica Fauvel, 1925, p. 525. Western France. Referred to *Phylo foetida atlantica* by generic change.

Aricia foetida australis Fauvel, 1919, pp. 429-430. Madagascar. Referred to *Phylo foetida australis* by generic change.

Aricia formosa Hansen, 1882, p. 18, pl. 5, figs. 23-27. Rio de Janeiro, Brazil. Questionably *Phylo felix*, see below.

Aricia glossobranchia Schmarda, 1861, p. 61, pl. 27, fig. 215. English Channel. Indeterminable, see Eisig, 1914, p. 518.

Aricia groenlandica McIntosh, 1879, p. 504, pl. 65, figs. 5-9. Davis Strait, Greenland, in 20 meters. Referred to *Phylo norvegicus*, see Levinsen, 1883, p. 115.

Aricia grubei McIntosh, 1910, pp. 505-506, pl. 85, fig. 8, pl. 86, fig. 1. British Isles. Referred to *Phylo grubei* by generic change.

Aricia (*Heteroaricia*) Czerniawsky, 1881, p. 371, erected for *Aricia acustica* Langerhans, referred to *Protoaricia* Czerniawsky, 1881.

Aricia imitans Eisig, 1914, pp. 317-321, pl. 15, figs. 1-9, pl. 16, figs. 1-16. Gulf of Naples. Referred to *Phylo foetida imitans*, see Fauvel, 1924, p. 523 and by generic change.

Aricia johnsoni Moore, 1909, pp. 260-262, pl. 8, figs. 30-33. Monterey, California. Referred to *Orbinia johnsoni*, see below.

Aricia kupfferi Ehlers, 1874, p. 296 and 1875, pp. 57-59, pl. 4, figs. 1-7. North Atlantic Ocean in 725 to 1366 fathoms. Referred to *Phylo kupfferi* by generic change.

Aricia laevigata Grube, 1855, pp. 112-113, pl. 4, figs. 6-8. Mediterranean Sea. Referred to *Naineris laevigata*, see Eisig, 1914, pp. 450-479.

Aricia latreillii Audouin and Milne Edwards, 1833, pp. 398-399. France. Referred to *Orbinia latreillii* by generic change. Redescribed in St. Joseph, 1894, pp. 85-91, pl. 5, figs. 109-118.

Aricia liberiana Augener, 1918, pp. 416-421, text-fig. 57, pl. 6, fig. 167, pl. 7, figs. 209, 210. Senegal, Liberia and French Congo. Referred to *Phylo foetida liberiana*, see Fauvel, 1924, p. 523, and by generic change.

Aricia ligustica Orlandi, 1896, pp. 154-157, pl. 2, figs. 3-12. Mediterranean Sea. Referred to *Phylo foetida ligustica*, see Fauvel, 1924, p. 523, and by generic change.

Aricia longithorax Eisig, 1914, pp. 324-327, pl. 18, figs. 15-26. Gulf of Naples. Referred to *Orbinia latreillii*, see Fauvel, 1924, p. 519, and by generic change.

Aricia macginitii Berkeley and Berkeley, 1941, pp. 40-41, figs. 7-10. Newport Bay, California. Referred to *Phylo ornatus*, see below.

Aricia marginata Ehlers, 1897, pp. 95-97, pl. 6, figs. 150-156. South Georgia. Referred to *Scoloplos* (*Leodamas*) *marginatus*, see Hartman, 1953, p. 38.

Aricia marginata mcleani Benham, 1921, p. 78, pl. 8, fig. 90. Commonwealth Bay, Australian Antarctic, in 25 fathoms. Referred to *Scoloplos* (*Leodamas*) *marginatus mcleani* by generic change.

Aricia michaelseni Ehlers, 1897, pp. 88-91, pl. 6, figs. 136-140. Southern South America. Referred to *Phylo felix*, see Hartman, 1948b, p. 105.

Aricia michaelseni Monro, 1930, pp. 144-145, fig. 54. East Falkland Islands in 1 meter. Referred to *Phylo michaelsensi, sensu* Monro, see below.

Aricia michaelseni Okuda, 1937, pp. 101-102, fig. 3. Japan. Referred to *Phylo michaelseni, sensu* Okuda, see below.

Aricia mülleri Rathke, 1843, pp. 176-180, pl. 8, figs. 9-15. Norway. Referred to *Scoloplos armiger*, see Eisig, 1914, p. 367.

Aricia norvegica Sars, 1872, p. 408, and 1873, pp. 236-240, pl. 16, figs. 1-8. Norway. Referred to *Phylo norvegicus* by generic change.

Aricia nuda Moore, 1911, pp. 311-315, pl. 21, figs. 172-176. Off San Diego, California, in 207-497 fathoms. Referred to *Phylo nudus*, see below.

Aricia oerstedii Claparède, 1864, pp. 502-503, pl. 4, fig. 7. Mediterranean Sea. Referred to *Protoaricia oerstedi*, see Eisig, 1914, p. 503, and by generic change.

Aricia ohlini Ehlers, 1901, pp. 167-169, pl. 21, figs. 9-13. Southern South America. Referred to *Scoloplos* (*Leodamas*) *ohlini*, see below.

Aricia ornata Verrill, 1873, pp. 596-597. New England. Referred to *Phylo ornatus*, see below.

Aricia papillosa Ehlers, 1907, pp. 16-20, figs. 7-14. New Zealand. Referred to *Orbinia papillosa* by generic change.

Aricia (*Paraaricia*) Czerniawsky, 1881, p. 371. Invalid, no type species named.

Aricia (*Parascoloplos*) Czerniawsky, 1881, p. 371. Erected for *Aricia capsulifera* Bobretzky. Referred to *Protoaricia* Czerniawsky, see Eisig, 1914, p. 503.

Aricia platycephala McIntosh, 1855, pp. 353-354, pl. 43, figs. 1-3, pl. 22a, figs. 16, 17. Off Bermuda. Referred to *Naineris laevigata*, see Eisig, 1914, p. 483.

Aricia (*Protoaricia*) Czerniawsky, 1881, p. 371, erected for *Aricia oerstedii* Claparède. Referred to *Protoaricia* Czerniawsky, see Eisig, 1914, p. 503.

Aricia (*Protoscoloplos*) Czerniawsky, 1881, p. 371. Erected for *Aricia glossobranchia* Schmarda, indeterminable, see Eisig, 1914, p. 518.

Aricia ramosa Eisig, 1914, pp. 321-324, pl. 15, figs. 10-17, pl. 16, figs. 17-36. Gulf of Naples. Referred to *Phylo foetida*, see Fauvel, 1927a, p. 14.

Aricia rubra Webster, 1879, pp. 253-255, pl. 9, figs. 123-126. Virginia. Referred to *Scoloplos* (*Leodamas*) *rubra*, see Hartman, 1945, p. 28.

Aricia (*Scoloplos*) *fuscibranchis* Grube, 1878c, p. 105. North Japan. Referred to *Naineris laevigata*, see Eisig, 1914, p. 499 and Okuda, 1937, p. 104.

Aricia (*Scoloplos*) *quadricuspidata* Leuckart, 1849, pp. 198-200, pl. 3, fig. 11. Iceland. Referred to *Naineris quadricuspida*, see Eisig, 1914, p. 488.

Aricia sertulata Savigny, 1820, p. 36. France. Questionably *Orbinia cuvieri*, see Malmgren, 1867, p. 204.

Aricia setosa Verrill, 1900, pp. 651-653. Bermuda Islands. Referred to *Naineris setosa*, see Hartman, 1942a, p. 61.

Aricia tribulosa Ehlers, 1897, pp. 91-94, pl. 6, figs. 141-147. Southern South America. Referred to *Scoloplos* (*Leodamas*) *tribulosus*, see below.

Aricia tullbergi Théel, 1879, pp. 45-48, pl. 3, figs. 40-43. Novaya Zemblya. Referred to *Apistobranchus tullbergi*, family Apistobranchidae, see Levinsen, 1883, p. 114 and Eisig, 1914, p. 523.

Aricia (*Venadis*) Castelnau, 1842, p. 20. Erected for *Aricia cuvieri* and *A. latreillii*. Invalid.

Ariciidae Malmgren, 1867, p. 203, see Orbiniidae.

Branchethus Chamberlin, 1919a, pp. 357-358. Erected for *B. latum*. Referred to *Scoloplos* (*Leodamas*) Kinberg, see below.

Branchethus latum Chamberlin, 1919a, pp. 357-361, pl. 64, figs. 7-11, pl. 65, figs. 1, 2. Off Pacific Panama in 322 fathoms. Referred to *Scoloplos* (*Leodamas*) *latum*, see below.

Califia, new genus, erected for *C. calida*, new species, see below.

Califia calida, new species. San Pedro Basin, California, see below.

Clytie simplex Grube, 1855, p. 114, pl. 4, figs. 9, 10. France. Indeterminable, see Fauvel, 1927a, p. 63.

Gisela heteracantha F. Müller, 1858, p. 216. Brazil. Indeterminable. According to its account the prostomium is cordate and has four eyes; biramous parapodia have hooks resembling those of the family Spionidae.

Haploscoloplos Monro, 1933c, p. 261. Erected for *Scoloplos cylindrifer* Ehlers, 1905.

Haploscoloplos alaskensis Hartman, 1948a, pp. 30-32, figs. 8 a-c. Alaska. Referred to *Haploscoloplos panamensis*, see below.

Haploscoloplos bifurcatus, new species. Southeastern Australia, see below.

Haploscoloplos cylindrifer (Ehlers) 1905, as *Scoloplos cylindrifer*. New Zealand, see below.

Haploscoloplos elongatus (Johnson) 1901, as *Scoloplos elongatus*. Northeastern Pacific Ocean, see below.

Haploscoloplos foliosus Hartman, 1951, pp. 78-79. Gulf of Mexico.

Haploscoloplos fragilis (Verrill), 1873, as *Anthostoma fragile*. New England, see below.

Haploscoloplos kerguelensis (McIntosh) 1885, as *Scoloplos kerguelensis*. Kerguelen Islands, Antarctic regions, see below.

Haploscoloplos kerguelensis minutus Hartman, 1953, p. 37, fig. 11. South Georgia, Antarctic regions in 95-310 meters, gray mud.

Haploscoloplos panamensis Monro, 1933d, pp. 1045-1046, fig. 1A-D. Pacific Panama in 6-12 fathoms, see below.

Haploscoloplos robustus (Verrill) 1873, as *Anthostoma robustum*. New England, see below.

Haploscoloplos tortugaensis Monro, 1933c, p. 261, fig. 10. Florida. Referred to *Haploscoloplos fragilis*, see Hartman, 1951, p. 76.

Haploscoloplos sp. Hartman, 1948a, pp. 32-33, fig. 8 d-f. Murchison Sound, Greenland, in 60 fathoms.

Hermundura F. Müller, 1858, p. 216. Erected for *H. tricuspis* Müller. Questionable as to family.

Hermundura tricuspis F. Müller, 1858, p. 216, pl. 7, figs. 19-21. Brazil. Doubtful to family, possibly related to Pilargiidae.

Labotas Kinberg, 1866, p. 252. Erected for *L. novae-hollandiae* Kinberg. Referred to *Scoloplos* Blainville, see Augener, 1922c, p. 40.

Labotas novae-hollandiae Kinberg, 1866, p. 252 and 1910, p. 63, pl. 24, fig. 8. Sydney, New South Wales, Australia. Referred to *Scoloplos novae-hollandiae*, see Augener, 1922c, pp. 40-41, fig. 9.

Lacydes Kinberg, 1866, p. 252. Erected for *L. havaicus* Kinberg. Referred to *Naineris* Blainville, 1828, see Eisig, 1914, p. 440.

Lacydes havaicus Kinberg, 1866, p. 253, and 1910, p. 63, pl. 24, fig. 7. Honolulu, Hawaii. Referred to *Naineris laevigata*, see Hartman, 1948b, pp. 104-105.

Leodamas Kinberg, 1866, p. 252. Erected for *L. verax* Kinberg, 1866. Referred to *Scoloplos* (*Leodamas*), see Hartman, 1948b, p. 104.

Leodamas verax Kinberg, 1866, p. 252. Off Cape Virgin, Patagonia, in 32 fathoms. Referred to *Scoloplos* (*Leodamas*) *verax*, see Hartman, 1948b, p. 104, and below.

Lumbricus armiger Müller, 1776, p. 215. Norway. Referred to *Scoloplos armiger*, see Eisig, 1914, p. 372.

Naidonereis Malmgren, 1867, p. 205, variant of *Naineris* Blainville, 1828, see Eisig, 1914, p. 440.

Nainereis Grube, 1850, p. 160, variant of *Naineris* Blainville, 1828, *quod vide*.

Nainereis hespera Chamberlin, 1919b, pp. 14-15. California. Referred to *Naineris dendritica*, see below.

Nainereis jacutica Annenkova, 1931, pp. 204-205, figs. 1-4. Laptev Sea, Arctic Ocean. Referred to *Naineris jacutica* by generic change.

Naineris longa Moore, 1909, pp. 264-267, pl. 8, figs. 38-42. California. Referred to *Naineris dendritica*, see Hartman, 1948b, pp. 102-103.

Nainereis mutilata Treadwell, 1931, pp. 5-6, figs. 13-18. Jamaica, West Indies. Referred to *Naineris mutilata*, see below.

Nainereis nannobranchia Chamberlin, 1918, pp. 260-261, pl. 2, fig. 10, pl. 3, fig. 1. California, see below.

Nainereis retusiceps Chamberlin, 1919a, pp. 355-357, pl. 65, figs. 3-5. Paumotu Islands, Pacific Ocean. Referred to *Naineris retusiceps* or perhaps *Naineris laevigata*, see Monro, 1933d, p. 1045.

Naineris robusta Moore, 1909, pp. 262-264, pl. 8, figs. 34-37. California. Referred to *Naineris dendritica*, see Hartman, 1948b, pp. 102-103.

Naineris Blainville, 1828, pp. 490-491. Erected for *Nais quadricuspida* Fabricius, see below.

Naineris aurantiaca (Müller) 1858, as *Theodisca aurantiaca*. Brazil. Questionable.

Naineris bicornis Hartman, 1951, pp. 72-74, pl. 19, figs. 1-6. Western Florida, see below.

Naineris dendritica (Kinberg) 1866, as *Anthostoma dendriticum*. Northeastern Pacific Ocean, see below.

Naineris grubei (Gravier) 1908, as *Scoloplos grubei*. Peru, see below.

Naineris grubei australis, new subspecies. Southern Australia, see below.

Naineris hexaphyllum (Schmarda) 1861, as *Anthostoma hexaphyllum*. Southern Africa, see below.

Naineris jacutica (Annenkova) 1931, as *Nainereis jacutica*. Asiatic Arctic Ocean, see below.

Naineris laevigata (Grube) 1855, as *Aricia laevigata*. Cosmopolitan in warm seas, see below.

Naineris mutilata (Treadwell) 1931, as *Nainereis mutilata*. West Indies, see below.

Naineris quadricuspida (Fabricius) 1780, as *Nais quadricuspida*. Greenland and western Europe.

Naineris retusiceps (Chamberlin) 1919, as *Nainereis retusiceps*. Southern Pacific Ocean; perhaps *N. laevigata*, see Monro, 1933d, p. 1045.

Naineris setosa (Verrill) 1900, as *Aricia setosa*. Bermuda, see below.

Naineris uncinata, new species. California, see below.

Nais quadricuspida Fabricius, 1780, pp. 315-316. Greenland. Referred to *Naineris quadricuspida*, see Eisig, 1914, p. 488.

Orbinia Quatrefages, 1865, p. 288. Erected for *Aricia sertulata* Savigny which is generally regarded as *Aricia cuvieri* Audouin and Milne Edwards, see below.

Orbinia angrapequensis (Augener) 1918, as *Aricia angrapequensis*. Southwestern Africa.

Orbinia armandi (McIntosh) 1901, as *Aricia armandi*. Shetland Islands, England.

Orbinia bioreti (Fauvel) 1919, as *Aricia bioreti*. Madagascar.

Orbinia cornidei (Rioja) 1934, as *Aricia cornidei*. Southwestern Europe.

Orbinia cuvieri (Audouin and Milne Edwards) 1833, as *Aricia cuvieri*. Europe, see below.

Orbinia cuvieri persica (Fauvel) 1932, as *Aricia cuvieri persica*. Persian Gulf.

Orbinia edwardsi (McIntosh) 1910, as *Aricia edwardsi*. England.

Orbinia exarmata (Fauvel) 1932, as *Aricia exarmata*. Bay of Bengal, India.

Orbinia johnsoni (Moore) 1909, as *Aricia johnsoni*. California, see below.

Orbinia latreillii (Audouin and Milne Edwards) 1833, as *Aricia latreillii*. Europe.

Orbinia papillosa (Ehlers) 1907, as *Aricia papillosa*. New Zealand.

Orbiniella Day, 1954, p. 22, erected for *O. minuta* Day.

Orbiniella minuta Day, 1954, pp. 22-23, figs. 3g-k. Tristan da Cunha, southern Atlantic Ocean.

Orbiniidae Hartman, 1942a, p. 57. Erected for *Orbinia* Quatrefages, 1866.

Orbiniinae, new subfamily, for *Orbinia* and related genera, see below.

Phylo Kinberg, 1866, p. 251. Erected for *P. felix* Kinberg, see below.

Phylo felix Kinberg, 1866, pp. 251-252. Near Rio de Janeiro, Brazil, see below.

Phylo fimbriatus (Moore) 1903, as *Aricia fimbriata.* Northern Japan, see below.

Phylo foetida (Claparède) 1870, as *Aricia foetida.* Europe.

Phylo foetida adjimensis (Fauvel) 1925, as *Aricia foetida adjimensis.* Tunisia.

Phylo foetida atlantica (Fauvel) 1925, as *Aricia foetida atlantica.* France.

Phylo foetida australis (Fauvel) 1919, as *Aricia foetida australis.* Madagascar.

Phylo foetida imitans (Eisig) 1914, as *Aricia imitans.* Mediterranean Sea.

Phylo foetida liberiana (Augener) 1918, as *Aricia liberiana.* Liberia, Africa.

Phylo foetida ligustica (Orlandi) 1896, as *Aricia ligustica.* Mediterranean Sea.

Phylo grubei (McIntosh) 1910, as *Aricia grubei.* England.

Phylo kupfferi (Ehlers) 1874, as *Aricia kupfferi.* Northern Atlantic Ocean.

Phylo norvegicus (Sars) 1871, as *Aricia norvegica.* Norway.

Phylo nudus (Moore) 1911, as *Aricia nuda.* Southern California, see below.

Phylo ornatus (Verrill) 1873, as *Aricia ornata.* New England, see below.

Phylonidae Stφp-Bowitz, 1948, p. 66. Erected for *Phylo* Kinberg, see Orbiniidae.

Porcia Grube, 1859, p. 105, erected for *P. maderensis* Grube, indeterminable, see Eisig, 1914, p. 280.

Porcia maderensis Grube, 1859, pp. 105-106. Madeira. Indeterminable, see Eisig, 1914, p. 280.

Proscoloplos Day, 1954, p. 21, erected for *P. cygnochaetus* Day.

Proscoloplos cygnochaetus Day, 1954, pp. 21-22, fig. 3 a-f. Tristan da Cunha, southern Atlantic Ocean.

Protoaricia Czerniawsky, 1881, p. 371. Erected for *Aricia oerstedii* Claparède. Includes *Theostoma* Eisig, 1914, see Hartman, 1947, p. 487.

Protoaricia capsulifera (Bobretzky) 1870, as *Aricia capsulifera.* Black Sea.

Protoaricia oerstedi (Claparède) 1864, as *Aricia oerstedii.* Europe.

Protoariciinae, new subfamily, for genera *Protoaricia*, *Proscoloplos* and *Orbiniella*, see below.

Scolaricia Eisig, 1914, pp. 426-428, erected for *S. typica* Eisig, see below.

Scolaricia haasi Monro, 1937b, pp. 83-85, fig. 1a-d. Palestine, Mediterranean Sea.

Scolaricia lucia Eisig, 1914, in explanation of figs. *lapsus calami* for *S. typica, quod vide.*

Scolaricia typica Eisig, 1914, pp. 426-439, pl. 19, figs. 8-16. Mediterranean Sea.

Scoloplos Blainville, 1828, p. 493, erected for *Lumbricus armiger* Müller, see below.

Scoloplos acmeceps Chamberlin, 1919b, pp. 15-16. California, see below.

Scoloplos armiger (Müller) 1776, as *Lumbricus armiger.* Europe, see below.

Scoloplos bustorus Eisig, 1914, pp. 422-423, for *Anthostoma robustum* Verrill, presumed preoccupied. Referred to *Haploscoloplos robustus*, see below.

Scoloplos canadensis McIntosh, 1901, p. 79. Eastern Canada. Referred to *Scoloplos armiger*, see McIntosh, 1910, p. 511.

Scoloplos cylindrifer Ehlers, 1905, pp. 45-46, pl. 6, figs. 16-19. Chatham Islands, New Zealand. Referred to *Haploscoloplos cylindrifer*, see below.

Scoloplos elongatus Quatrefages, 1865, p. 286. France. Referred to *Scoloplos armiger*, see Grube, 1870b, p. 316.

Scoloplos elongata Johnson, 1901, pp. 412-413, pl. 10, figs. 105-110. Puget Sound, Washington. Referred to *Haploscoloplos elongatus*, see Hartman, 1944c, p. 257.

Scoloplos grubei Gravier, 1908, p. 42 and 1909, pp. 646-649, pl. 18, figs. 49-57. Peru. Referred to *Naineris grubei*, see Eisig, 1914, p. 499.

Scoloplos jeffreysi McIntosh, 1905b, p. 47. North Atlantic Ocean in 1100 fathoms. Referred to *Scoloplos armiger*, see Eisig, 1914, p. 367.

Scoloplos johnstonei Day, 1934, pp. 58-60, fig. 11. False Bay, South Africa. Referred to *Scoloplos* (*Leodamas*) *johnstonei*, see below.

Scoloplos kerguelensis McIntosh, 1885, pp. 355-356, pl. 43, figs. 6-8, pl. 22a, fig. 19. Off Kerguelen Islands. Referred to *Haploscoloplos kerguelensis*, see Hartman, 1953, p. 37.

Scoloplos madagascariensis Fauvel, 1919, pp. 36-37, figs. 3 a-h. Madagascar on reefs. Referred to *Scoloplos* ?(*Leodamas*) *madagascariensis*, see below.

Scoloplos marsupialis Southern, 1921, pp. 632-634, pl. 27, figs. 19 a-g, text-fig. 18 a-b. Chilka Lake, India, in brackish water.

Scoloplos mawsoni Benham, 1921, pp. 78-81, pl. 8, figs. 91-94. Commonwealth Bay, Australian Antarctic Ocean. Referred to *Haploscoloplos kerguelensis*, see Monro, 1936, p. 160.

Scoloplos minor Oersted, 1843b, p. 125. Denmark. Referred to *Naineris quadricuspida*, see Eisig, 1914, p. 488.

Scoloplos mülleri Rathke, 1843, pp. 176-180, pl. 8, figs. 9-15. Norway. Referred to *Scoloplos armiger*, see McIntosh, 1910, p. 510.

Scoloplos novae-hollandiae (Kinberg) 1866, as *Labotas novae-hollandiae*. New South Wales, Australia, see below.

Scoloplos rufa Treadwell, 1941b, p. 1, figs. 1-6. Texas. Referred to *Haploscoloplos robustus*, see Hartman, 1956, and below.

Scoloplos treadwelli Eisig, 1914, p. 405, for *Aricia cirrata* Treadwell, 1901, preoccupied. Puerto Rico.

Scoloplos (*Leodamas*) Kinberg, 1866, p. 251. Erected for *Leodamas verax* Kinberg, see below.

Scoloplos (*Leodamas*) *chevalieri* (Fauvel) 1902, as *Aricia chevalieri*. Senegal, West Africa.

Scoloplos (*Leodamas*) *cirratus* (Ehlers) 1897, as *Aricia cirrata*. Southern South America, see below.

Scoloplos (*Leodamas*) *dendrobranchus*, new species. South Australia, see below.

?*Scoloplos* (*Leodamas*) *dubius* (Augener) 1914, as *Scoloplos* (*Naidonereis*) *dubius*. Southwestern Australia.

Scoloplos (*Leodamas*) *fimbriatus*, new species. South Australia, see below.

Scoloplos (*Leodamas*) *johnstonei* (Day) 1934, as *Scoloplos johnstonei*. False Bay, Africa.

Scoloplos (*Leodamas*) *latum* (Chamberlin) 1919, as *Branchethus latum*. Pacific Panama in 322 fathoms, see below.

Scoloplos ?(*Leodamas*) *madagascariensis* Fauvel, 1919. Madagascar, as *Scoloplos madagascariensis*.

Scoloplos (*Leodamas*) *marginatus* (Ehlers), 1897, as *Aricia marginata*. South Georgia, Antarctic regions, see below.

Scoloplos (*Leodamas*) *marginatus mcleani* (Benham) 1921, as *Aricia marginata mcleani*. Australian Antarctic regions, see below.

Scoloplos (*Leodamas*) *ohlini* (Ehlers) 1901, as *Aricia ohlini*. Southern South America, see below.

Scoloplos (*Leodamas*) *rubra* (Webster) 1879, as *Aricia rubra*. Eastern United States, see below.

Scoloplos (*Leodamas*) *tribulosus* (Ehlers) 1897, as *Aricia tribulosa*. Patagonia, see below.

Scoloplos (*Leodamas*) *verax* Kinberg, 1866, as *Leodamas verax*. Patagonia, see below.

Scoloplos (*Naidonereis*) *dubius* Augener, 1914, pp. 31-32, pl. 1, fig. 5, text-fig. 3. Southwestern Australia. Questionably referred to *Scoloplos* (*Leodamas*) *dubius* but named *Paraonis dubia* by Augener, 1923, p. 72.

Scoloplos (*Protoscoloplos*) Czerniawsky, 1881, p. 371, erected for *Aricia glossobranchia* Schmarda. Indeterminable, see Fauvel, 1927a, p. 26.

Theodisca F. Müller, 1858, p. 216, erected for *T. aurantiaca* Müller. Referred to *Naineris* Blainville, see Eisig, 1914, p. 440.

Theodisca anserina Claparède, 1864, pp. 504-505, pl. 4, fig. 6. Mediterranean Sea. Referred to *Naineris laevigata*, see Eisig, 1914, p. 481.

Theodisca aurantiaca Müller, 1858, p. 216, pl. 6, figs. 13-15. Brazil. Referred to *Naineris*, species indeterminable, see Eisig, 1914, p. 498.

Theodisca liriostoma Claparède, 1870, pp. 50-52, pl. 24, fig. 2. Naples. Referred to *Naineris laevigata*, see Eisig, 1914, p. 482.

Theodisca mamillata Cunningham and Ramage, 1888, pp. 642-643, pl. 38, fig. 8. Scotland. Referred to *Naineris quadricuspida*, see Eisig, 1914, p. 488.

Theostoma Eisig, 1914, pp. 503-506, erected for *Aricia oerstedii* Claparède. Referred to *Protoaricia* Czerniawsky, 1881, see Hartman, 1947, p. 487.

Key to Subfamilies, Genera and Subgenera

1. First two segments without parapodia; body smaller, less than 15 mm long; proboscis presumably muscular, not eversible . . . . . PROTOARICIINAE 9

1. Only the first segment without parapodia; body more than 20 mm long when adult; proboscis epithelial and eversible . . . . . ORBINIINAE 2
2. Prostomium rounded or truncate (pl. 38, fig. 1) at its anterior margin . . . . . *Naineris*
2. Prostomium more or less acutely pointed at its anterior margin when mature 3
3. All thoracic parapodia provided with only slender, pointed setae . . . . . *Haploscoloplos*
3. Some thoracic neuropodia with setae of another kind . . 4
4. Thoracic neuropodia of two abruptly different kinds . . 5
4. Thoracic neuropodia not abruptly different 6
5. Anterior three thoracic neuropodia different from those farther back and provided with bristle-tipped setae (pl. 42, fig. 2) . . . . . *Califia*
5. Posterior thoracic neuropodia with thick, modified spines associated with a glandular pouch . . . . . *Phylo*
6. Abdominal neuropodia with flail setae (abruptly bent near the distal end); neuropodial ridges foliaceous . *Scolaricia*
6. Flail setae absent 7
7. Some thoracic segments with rows of fringe along the ventrum and sometimes on parapodial postsetal ridges . . *Orbinia*
7. Without rows of fringe on the ventrum 8
8. Abdominal neuropodia, especially in median and posterior segments, with thick acicula, occurring singly in a ramus and projecting from the parapodial lobe (pl. 32, fig. 2); branchiae usually first present from about the fifth or sixth segment . . . . . *Scoloplos* (*Leodamas*)
8. Without such thick acicula projecting from abdominal neuropodia; branchiae usually not present before about the tenth segment . . . . . *Scoloplos* (*Scoloplos*)
9. Branchiae absent . . . . . *Orbiniella*
9. Branchiae present on some segments 10
10. Some thoracic neuropodia with uncini and subuluncini . . . . . *Protoaricia*
10. Some neuropodia with geniculate setae with rostrate tip (swan-shaped setae) . . . . . *Proscoloplos*

Subfamily **Orbiniinae**, new subfamily
Genus **Orbinia** Quatrefages, 1865

Includes *Aricia* Savigny, 1820, pp. 12, 35-36. Not *Aricia* R. L., Anon., 1817, or Godart, 1819, and questionably *Protoscoloplos* Czerniawsky, 1881, p. 371.

Orbinia Quatrefages, 1865, p. 288; Hartman, 1936, p. 32.

Type **O. cuvieri** (Audouin and Milne Edwards)

The thorax has 15 to 40 segments. Transition to the abdomen is more or less abrupt. The prostomium is conical and pointed in front; eyespots are present or absent. Branchiae are first present from the fifth or a later segment and continue on more posterior segments to the end of the body. Thoracic neuropodia have blunt uncinal hooks in palisaded series. Furcate setae may be present in some abdominal notopodia and posterior thoracic notopodia; they are accompanied by pointed setae. Ventral cirri are usually present. An interramal cirrus is present in some species (*O. cuvieri*, *O. latreillii* and *O. edwardsi*) and absent in others (*O. angrapequensis*, *O. bioreti*, *O. exarmata*, *O. armandi*, *O. johnsoni* and *O. papillosa*.) Subpodial lobes may be so conspicuous as to form transverse rows on some thoracic, and anterior abdominal segments. Podial lobes may be present on neuropodia and notopodia. The pygidium is terminal and has paired short to long, filiform processes attached dorsolaterally.

Eisig (1914, p. 273), who revised the family and its various groupings, regarded *Phylo* Kinberg (1866, p. 251) as a synonym of *Aricia* Savigny and selected *Aricia foetida* Claparède as the genotype of *Orbinia* (as *Aricia*). However, since *O. cuvieri* (Audouin and Milne Edwards)—as *Aricia sertulata* Savigny— was the first species attributed to *Aricia* Savigny, and as *Aricia foetida* goes to *Phylo* Kinberg, a valid genus, the genotype of *Orbinia* can be only *O. cuvieri* (Audouin and Milne Edwards), generally regarded as including the incompletely described *Aricia sertulata* Savigny.

Orbinia cuvieri (Audouin and Milne Edwards) 1833
Plate 20, figs. 1-5

Aricia cuvieri Audouin and Milne Edwards, 1833, pp. 397-398, pl. 15, figs. 5-13; Fauvel, 1927a, pp. 12-13, fig. 3.

Collection.—Gullmar Fjord, Sweden (2).

This species attains a large size with length to 300 mm and width to 5-6 mm; segments number about 400 (Fauvel, 1927a, p. 12). In the specimens studied, the thorax has 20 setigerous segments and the 21st

is transitional. Branchiae are first present, though small (fig. 1), on the fifth and increase in size on more posterior segments (fig. 2) to exceed in length the parapodial lobes. They are simple and lingulate throughout. Thoracic notopodial lobes are simple and tapering; the corresponding neuropodial lobes are fimbriated from the second parapodium and have up to 15 uniformly small lobes in a single row in a postsetal position. A subpodial lobe, resembling a ventral cirrus, is present from the sixteenth segment and continues in the abdomen at the lower edge of the neuropodium (fig. 2). A ventral fringe occurs on the last three thoracic, the transitional and the first three abdominal segments. It gradually diminishes thereafter to a subpodial fringe on about the next 14 abdominal segments.

Notopodia have slender pointed setae and a close fascicle of thin, yellow embedded acicula. Abdominal notopodia have furcate setae (fig. 5) in which the two tines are unequally long and the investing membrane is supported by fibrillae; the stalk is smooth. Thoracic neuropodia have palisaded ranks of uncini and long, pointed setae. Those of the first four segments are in shorter and thicker series, with 5 to 7 vertical rows; after the fifth such segment, there are at most three longer transverse rows. Anteriormost uncini are pale, slenderer and less curved than those farther back, otherwise of the same kind. Each has transverse ridges (figs. 3 and 4) at the outer curved side. Long pointed setae are present in a vertical series behind the other setae, or they are limited to slender fascicles at uppermost and lowermost parts of the setal ridge. An interramal cirrus is first present at the thirteenth setigerous segment; it resembles an uppermost lobe of the postsetal neuropodial fringe and is continued back through abdominal segments (fig. 2).

Distribution.—*Orbinia cuvieri* is known from European seas (Fauvel, 1927a, p. 13) and Greenland (Wesenberg-Lund, 1953, p. 56).

Orbinia johnsoni (Moore) emended

Plate 21, figs. 1-4; pl. 22, figs. 1-8

Aricia johnsoni Moore, 1909, pp. 260-262, pl. 8, figs. 30-33.
Orbinia johnsoni Hartman, 1944c, p. 258.

Collections.—Dillon Beach, Marin County, California, in sandy beach at low tide line, June, 1941 (about 20); Tomales Bay, California, in sandy beaches in an intertidal zone (several); La Jolla, California, in sandy beach at low tide line (9); Mission Bay, California, in sandy beach near entrance to the sea (several); Enseñada, Lower California, Mexico (1); Port Parker, Costa Rica, in 3-8 fathoms, sandy mud (2).

Total length of mature individuals is 80 to 90 mm; segments number to about 300. The thorax has 16 to 19 (pl. 21, fig. 1) setigerous segments. Transition from thorax to abdomen is abrupt and involves one to three segments; it is marked by an abrupt change in parapodia and the appearance of ventral fringe. Epithelial welts nearly encircle the body (preserved) in the thorax. The prostomium is about twice as long as broad and tapers anteriorly to an acute tip (pl. 21, fig. 3); eyespots are absent, at least in mature individuals. A pair of nuchal organs occupies the posterior lateral position. In individuals from a single collection the peristomium may be only one-third as long as the prostomium or it may exceed the latter in length. The eversible proboscis is a much folded epithelial sack.

Branchiae are first present from setigerous segment 15 or not before 20. The first branchiae are small and they gradually increase in size on the next five to ten segments, becoming erect and lanceolate in shape. When fully developed they have conspicuous ciliated marginal fringe and taper distally to a smooth tip (pl. 21, fig. 4); they are simple and unbranched throughout.

In the thorax the postsetal lobe is simple, small or inconspicuous in notopodia and neuropodia (pl. 21, fig. 1). In neuropodia a simple lobe is located at the middle of a long, low fleshy ridge; it is only slightly thicker than the notopodial postsetal lobe. At about segment thirteen, or where the fringed region begins, the notopodial lobe elongates and gives rise to the dorsal postsetal lobe farther back. At the same place the neuropodial lobe increases in size.

Ventral fringe is first present on segment 17 or not before 19 or 20 and is continued back through 12 to 14 segments (pl. 21, fig. 1). It begins as a pair of elongated lobes on the ventrolateral side of the body; on the next few segments there are 3 or 4 to 9 pairs of lobes forming a continuous series across the ventral side of the body. Thereafter there is a gradual diminution of lobes to only one on the thirty-third or following segment.

Neuropodial ventral pads in the abdomen are foliaceous, entire ridges, most conspicuous in sexually mature individuals when they are crowded with gonadial products, at which time they are thick and inflated at the base. These pads are first present, though small, where the ventral fringe disappears; they gradually increase in size and length.

Thoracic neuropodia are elongate oval ridges with a small papillar lobe at their midlength. Abdominal neuropodia consist of two lobes, of which the upper one is longer and thicker than the lower one (pl. 22,

fig. 1). A ventral cirrus and interramal cirrus are absent. Thoracic neuropodia have up to 5 or 6 rows of setae in the middle region where best developed; the rows diminish to 2 or 3 farther forward and back. The anteriormost vertical row has alternating pointed setae (pl. 21, figs. 2, 3) resembling those in front. The outer side of the seta is provided with transverse rows of spinelets. Uncini are slightly curved and distally blunt. When perfect they are distally covered with a close hyaline hood; most uncini have no hood, perhaps as a result of wear. The convex curved region has 5 to 7 or 8 transverse ridges (pl. 22, figs. 5, 6) or it may be nearly or entirely smooth.

Furcate setae are first present in notopodia after the disappearance of the ventral fringe. They may number up to 9 in a bundle but diminish to only 2 to 4 or 5 in some fascicles. They are continued back to near the end of the body and have the usual position in the inferior part of the notopodial fascicle. The shaft or stem is nearly cylindrical; externally it is smooth except for 14 to 20 transverse, incomplete rows of short spinelets on the side marking that of the shorter distal tine (pl. 22, figs. 7, 8). The rows of spinelets extend about one-third to one-half way around the stem. The core of the stem is penetrated by strong parallel fibrillae. The two distal tines are unequally long; the shorter is slightly the slenderer. Each tine terminates in a flaring tip that is cupped or grooved at its outer side (pl. 22, fig. 7). The inner sides of the tines give rise to a continuous thin flange or membrane traversed lengthwise by 5 to 10 strands continuous with those within the stalk. This membrane, when perfect, is pouched (pl. 22, fig. 7); when torn or imperfect, there may be only a few of the several fibrils of the membrane, resembling long teeth or a diverging spine. It seems likely that a similar condition of wear is illustrated in published accounts of furcate setae for some other species.

Acicula number 3 to 5 or 6 in a fascicle; they are fully embedded. The pygidium has a series of long, slender filaments attached dorsolaterally (pl. 22, fig. 2).

Some individuals taken in June in central California and in March in southern California are mature; ova are first visible 4 or 5 segments behind the fringed region and continue back to near the end of the body. In these segments the nephridial pore, located on the posterior side of the neuropodial flange, is more conspicuous and tumid than elsewhere.

Color in life is satiny pale green. In central California the species is associated with *Nephtys caecoides* Hartman; in southern California it is found in sandy beaches where *Euzonus* (*Thoracophelia*) *mucronata* (Treadwell) occurs.

Orbinia johnsoni differs conspicuously from the genotype *O. cuvieri* (see above) and most species of the genus in having no ventral or interramal cirri. It is the only known species of the genus from the Americas.

Distribution.—*O. johnsoni* is known from central and southern California south to Port Parker, Costa Rica, in sandy beaches, especially in protected bays or coves; it is intertidal to 3-8 fathoms.

Genus **Phylo** Kinberg, 1866
Type **P. felix** Kinberg, 1866

Includes *Aricia* in part, and *Archiaricia* Czerniawsky, 1881.

Phylo differs from *Orbinia* (see above) in having the thorax modified into two regions, an anterior one with normal setae and a posterior one with modified spines and special glandular pouches (pl. 23, fig. 2). Anterior segments have long pointed setae and uncini. Parapodial and ventral fringe are usually present on some thoracic or anterior abdominal segments or limited to neuropodia. Ventral fringe is absent in *P. norvegicus* and *P. nudus* (see below).

The prostomium is short and conical (pl. 23, fig. 1). The first or peristomial segment is a smooth ring but may be transversely divided so as to appear double (*P. nudus*, below). Branchiae are first present from the fourth to sixth segment and continue back to near the end of the body; they are simple, usually lingulate and have fimbriated margins. Interramal cirri are present, or reduced or absent.

Posterior thoracic neuropodia have thick, modified spines in an anterior series; the uppermost one is near the aperture of the epithelial glandular organ (pl. 24, fig. 2). The modified spines have been named also "aciculae glochideae" (Kinberg, 1866, p. 251), spears or "spiessig Borsten" (Ehlers, 1897, p. 90), arrow-formed defense setae or "pfeilförmigen Wehrborsten" (Augener, 1923, p. 71), "grosses soies en épieu ou lancéolées" (Fauvel, 1927a, p. 10), "spear-headed chaetae" (Monro, 1930, p. 144), "spear-headed spines" (Okuda, 1937, p. 102) and other descriptive names. They are here called spears or spines, depending on their shape.

Species of this genus have been included in *Orbinia* (Eisig, 1914, p. 273, and Fauvel, 1927a, p. 10). On the other hand they have been considered remote enough to regard them as a distinct family, Phylonidae (Stφp-Bowitz, 1948, p. 66). For the present their affinities are believed to be with *Orbinia*, with which they have many features in common.

The erratic occurrence of some conspicuous characters is shown in the following chart.

Comparison of Some Morphological Characters in Species of *Phylo* Kinberg

Name of species	Ventral fringe	Neuropodial fringe	Notopodial fringe	Shape of modified spine	Color of modified spine	Setigerous segment with first branchiae	Interramal cirrus	Anterior thoracic segments number	Posterior thoracic segments from	Posterior thoracic segments number
P. felix	present	present	absent	sagittate	dark	sixth	present	10	11-16 to 19	6 to 9
P. ornatus	present	present	absent	acicular	yellow	fifth	absent	14-11	15-27 or 12-29	13 or 17-18
P. grubei	present	present	absent	hastate	dark	sixth	present	12	13-15	3
P. kupfferi	present	present	absent	weakly hastate	dark	fourth to sixth	absent	11-13	12-14 or 13-17	3 or 4
P. foetida and varieties*	present	present	absent	acicular	dark?	sixth to ninth	present	10-11	11 or 12 to 20-29	10 to 18
P. fimbriatus	present	present	present	hastate	dark	fifth	absent	12	13-16	4
P. norvegicus	absent	absent	absent	hastate	dark	sixth	absent	12-14	13 or 15 to 15-17	3 to 5
P. nudus	absent	present	absent	weakly hastate	dark	sixth	absent	11	12-15	4
P. michaelseni Okuda	present	present	absent	hastate	dark	fifth	rudimentary	13	14-18	5
P. michaelseni Monro	present	present	absent	hastate	dark	sixth	present	13	14-21	8

*See Fauvel, 1924, p. 524, for key to varieties.

Key to Species of *Phylo* Kinberg

1. Without ventral fringe 2
1. With ventral fringe (pl. 23, fig. 7) on some thoracic and sometimes on abdominal segments 3
2. With fimbriated postsetal lobe on the first 15 thoracic segments . . . . . *P. nudus*
2. Without neuropodial fringe . . . . *P. norvegicus*
3. Ventral fringe conspicuous, extending across the ventrum of some thoracic segments 4
3. Ventral fringe sparse, limited to 2 to 4 lobes on segments 14 to 16 or back to segments 19 to 21 . . . *P. fimbriatus*
4. Without interramal cirrus (pl. 24, fig. 3) in abdominal parapodia 7
4. With interramal cirrus (pl. 23, fig. 3) in some abdominal parapodia 5
4. With very small or rudimentary interramal cirrus; ventral fringe on segments 12 to 21, with up to 23 lobes in a row . . . . . *P. michaelseni, sensu* Okuda
5. With large spears in 11 or 12 posterior thoracic segments . . . . . *P. foetida* and varieties
5. With hastate or sagittate spines in 3 to 9 posterior thoracic segments 6
6. With 16 to 19 thoracic segments; ventral fringe on segments 13 to 20 . . . . . *P. felix*
6. With 21 or 22 thoracic segments; ventral fringe on segments 14 to 23 . . . . . *P. michaelseni, sensu* Monro
7. Ventral fringe present on only 3 to 5 segments; modified thoracic spines acicular . . . . . *P. kupffери*
7. Ventral fringe on more numerous segments or in double rows on some segments . . . . . *P. ornatus*

Phylo felix Kinberg, 1866

Plate 23, figs. 1-7

Phylo felix Kinberg, 1866, pp. 251-252; Hartman, 1948b, pp. 105-106, pl. 15, fig. 10; Hartman, 1953, pp. 37-38.

Aricia formosa Hansen, 1882, p. 18, pl. 5, figs. 23-27; Augener, 1934, pp. 146-148.

Aricia michaelseni Ehlers, 1897, pp. 88-91, pl. 6, figs. 136-140; Augener, 1918, p. 420, fig. 58; Augener, 1923, p. 71.

Collections.—888-38 (1); 1256-41 (1); 1259-41 (1); 2026-51 (several); near La Paz, Lower California, Mexico (1, collected by Jens Knudsen, February, 1955); Osoflaco and Oceano, San Luis Obispo County, California, in dead Olive shells (many, collected by Conrad Limbaugh, 1955).

The dorsum is elevated through the fourth setigerous segment and depressed to concave in segments farther back. There are 16 to 18 thoracic segments. The first 10 neuropodia are long and thick, with their parapodial ridges flanked by postsetal fringe (fig. 1). Their neurosetae are of two kinds; there are 3 to 5 rows of yellow uncini distally curved and transversely ridged (fig. 6), some of which are distally hooded. They form palisaded series. The setae in the posterior row are longer, distally pointed and have transverse series of fine spinelets along their free length. There is no inferior fascicle of pointed setae. The next 6 to 8 neuropodia are smaller and less elevated. The corresponding notopodia have long, simple postsetal lobes and fascicles of pointed setae (fig. 1).

The thoracic neuropodial fringe is present from the first parapodium as two or three lobes; their number gradually increases to 9 to 12 lobes on middle and posterior thoracic segments. Ventral fringe forms a single row of lobes across the ventrum where best developed. It is first present as a pair of lobes on the eleventh, or not before the twelfth to fourteenth segments; it increases to five lobes on the next, and 15 lobes on the fourth or fifth fringed segment. It is absent after thoracic segment 17 to 20.

Branchiae are first present from the fourth or fifth setigerous segment and continue back to the end of the body; they are simple, lingulate and laterally fimbriated (fig. 3).

From about segment 11 the uncini are replaced by dark brown spears (figs. 1 and 4); the posterior pointed setae and inferior uncinal rows remain as in front but are more limited in number. Thoracic notopodia have full fascicles of long pointed setae and a close fascicle of slender yellow embedded acicula.

Abdominal notopodia are similar to those in the thorax but have fewer setae. Furcate setae (fig. 7), numbering one to three in a bundle, occupy the inferior position of the fascicle. In median and posterior abdominal parapodia they increase in number to 6 to 10 and are accompanied by pointed setae. Notopodial acicula are embedded, pale yellow, slender and number 2 or 3 in a close fascicle. Abdominal neuropodia have 4 to 6 slender, shorter setae and one or 2 slender embedded acicula.

An interramal cirrus (fig. 3) is present as a long simple lobe, from the second last thoracic or not before the first abdominal segment. It is continued back through a long abdominal region. A subpodial lobe, resembling a ventral cirrus, is present on the same segments (fig. 3).

The modified spines of posterior thoracic segments are sagittate (fig. 4) and number 4 to 6 in an anterior transverse row. The uppermost one projects from the neuropodium and is more conspicuous than the others. These spines are present in setigerous segments 11 to 16 or 18. The side of the spine directed forward is deeply grooved; the back side is smooth. The same spine, seen in different views, can thus be seen as sagittate to acicular, depending on the orientation of the observer.

Phylo felix Kinberg (1866) from Brazil has branchiae first present from segment 5; the thorax consists of 19 setigerous segments; interramal cirri are long; modified spines are present in segments 11 to 19; neuropodial fringe numbers 5 to 10 lobes at maximum development; ventral fringe is present on segments 13 to 20; furcate setae have not been described.

Phylo felix, as *Aricia michaelseni* Ehlers (1897) from Patagonia, differs from the type in that the thorax consists of 17 to 19 setigerous segments; modified spines are present only in setigerous segments 15 to 17 or 19 (or 3 to 5 segments); neuropodial lobes number up to 15 lobes at greatest development. The details of parapodia and setae seem to be identical for the individuals from Brazil and Patagonia.

Phylo michaelseni, *sensu* Monro (1930, pp. 144-145, fig. 54), from the East Falkland Islands, is said to have branchiae from the sixth setigerous segment; the thorax consists of 22 segments; modified spines are present in segments 14 to 22; neuropodial lobes number to 12 in a series; ventral fringe is present on segments 14 to 23 with up to 15 lobes in a row; furcate setae are present. This differs from *P. felix* Kinberg in its later presence of branchiae, higher thoracic count and perhaps some other characters not yet defined.

Phylo michaelseni, *sensu* Okuda (1937, pp. 101-102, figs. 3 a-e), from Japan, differs from the type in that interramal cirri are rudimentary; modified spines are present in only 5 segments; neuropodial lobes number to 12 in a row; ventral fringe is present on setigerous segments 12 to 21 with up to 23 lobes in a row; furcate setae are present.

Most of these records are in general agreement. The record from Japan departs most widely with respect to its rudimentary interramal cirri; it may refer to a distinct subspecific or lesser systematic category.

Distribution.—*Phylo felix* is known from Brazil (Kinberg, 1866), Patagonia (Ehlers, 1897), California, in shallow dredging to 55 fathoms, Gulf of California south to La Paz, Mexico, in shallow dredging, East Falkland Islands, Antarctic Ocean (Monro, 1930), and questionably Japan (Okuda, 1937).

Phylo ornatus (Verrill), 1873

Plate 24, figs. 1-10

Aricia ornata Verrill, 1873, pp. 596-597; Webster and Benedict, 1884, p. 724; Andrews, 1891, p. 292; Sumner, 1913, p. 623; Pearse, 1942, p. 183.

Orbinia ornata Hartman, 1944a, p. 340; Hartman, 1945, pp. 28, 30.

Aricia macginitii Berkeley and Berkeley, 1941, pp. 40-41, figs. 7-10.

Phylo ornatus Hartman, 1951, pp. 79-80.

Collections.—North Carolina south to southwestern Florida (many); Mission Bay, California (some); San Quintin Bay, Lower California, Mexico (several).

Length is over 100 millimeters but the posterior end is seldom perfect because of the high degree of fragmentation on preservation. The long posterior branchiae and postsetal lobes present a ragged appearance, especially of the postabdominal region. The thorax consists of an anterior region of about 14 and a posterior one of about 16 segments, after which the transition to the abdomen is abrupt.

The prostomium is small, acutely pointed in front and much narrower than the segments which follow. Thoracic notopodia have a simple lingulate postsetal lobe. Thoracic neuropodia of the anterior region resemble one another except for a gradual increase in size posteriorly. There are 3 to 5 rows of yellow uncini in anterior series and a single row of pointed, slightly curved spinous setae in back. The lowermost setae are uncinate (fig. 9). In posterior thoracic segments the neuropodial uncini of the upper half of the series are replaced by an anterior row of 8 or more large, evenly spaced modified spines (fig. 1) accompanied by more posterior rows of slightly curved uncinate hooks like those in front. The lower part of the neuropodium has setae as in front except for a conspicuous fascicle of distally pointed setae located in an inferior-posterior position.

Modified spines are present in setigerous segment 15 to the end of the thorax; they are translucent amber or somewhat rust colored, due to a coat of extraneous substance. When clean they are smooth, straight

and taper distally to a blunt point; in cross section they are subcircular, not longitudinally grooved. They are most numerous in the fifteenth segment, where they number about 17 in a single row; they diminish gradually in number to only 4 or 3 in the last thoracic segment. At first they occupy the entire anterior row in a fascicle; in the last thoracic segment they lie only in the uppermost end of the fascicle and are replaced by normal uncinate hooks below. The posteriormost part of the fascicle has stiff pointed setae. The aperture of the glandular pouch is accompanied by a foliaceous lobe (fig. 2) in front of the uppermost modified spine.

Branchiae are present from the fifth setigerous segment and continue back to the end of the body; they are simple, lingulate and fimbriated along their lateral margins (fig. 3). Subpodial or ventral fringe begins as a single paired filament on setigerous segment 12 or 13, located below the ventral edge of the neuropodium. On the next segment the fringe forms a nearly continuous row across the ventrum and is so continued on 15 to 20 segments as a single or partly double row. The fringe is usually absent after the fifth abdominal segment.

Thoracic neuropodial fringe begins on the first setigerous segment; the number of lobes in a row increases from about 6 on the first, to 12 to 14 on the last thoracic neuropodium. The fringe is continued in abdominal neuropodia so that the first may have 5, the second 2 lobes and thereafter it is absent.

Anterior thoracic neuropodia have setae of two kinds; one is longer, slenderer and gently curved and is in the posterior part of the fascicle; the other is shorter, thicker and more curved (fig. 4). The spinous region is extensive along the curved part of the seta. Transverse rows of spinelets (fig. 6) are continued around the sides and leave bare only a narrow space (figs. 7 and 8); the distal end of the seta is smooth and under high magnification (seen with transmitted light) shows the so-called canaliculations or chevrons (fig. 5) which are internal, not surface structures.

Aricia macginitii Berkeley and Berkeley (1941) from southern California is here referred to *Phylo ornatus* (Verrill) since the two agree in characters indicated on the chart above. The only difference, considered nonspecific, concerns the number of segments in the posterior thoracic region. This number differs to an even greater degree in individuals from a single locality, such as North Carolina, where many specimens were taken in a single season.

Distribution.—Phylo ornatus occurs on both sides of temperate United States and western Mexico, especially in mud flats in littoral zones. It is recorded from New England south to Florida and in the Gulf of Mexico; also from southern California and Lower California, Mexico.

Phylo fimbriatus (Moore) 1903

Aricia fimbriata Moore, 1903, pp. 464-467, pl. 24, figs. 31-35; Okuda, 1937, pp. 99-101, figs. 1 to 2 a-g.

This species is here referred to *Phylo* Kinberg because posterior thoracic segments have modified spear-headed spines. The prostomium is bluntly conical and much narrower than the smooth peristomium. The thorax consists of 12 anterior and 4 posterior setigerous segments. Branchiae are first present on the fifth and continue on all posterior segments as simple, lingulate, distally pointed processes. In abdominal segments the pair approach middorsally and their bases are united by a transverse epithelial fold.

Thoracic notopodial and neuropodial postsetal lobes are fringed; the notopodium has up to 7 to 9 and the neuropodium 12 to 20 lobes at maximum development or in middle thoracic segments; there are fewer lobes in front of and behind this region. Neuropodia of anterior thoracic segments have palisaded series of many uncini accompanied by long pointed setae. Uncini are slightly curved and distally covered with a hyaline hood; each has transverse rows of spinelets along the outer curved region. The shortest, bluntest and most curved uncini are in anteriormost rows, and the longest and least curved ones are farthest back. Okuda (1937, p. 100) refers to these various uncini and setae as genuine hooks, subuluncini and canaliculated serrated setae respectively.

Posterior thoracic parapodia (13 to 16) resemble those in front but are shorter and have modified spines. These form an anteriormost vertical row of 5 to 7 dark, lanceolate spines (called acicula by Moore, 1903) and are accompanied by more posterior rows of uncini and pointed setae, like those in anterior thoracic neuropodia but fewer in number.

Interramal cirri are absent. Ventral fringe is sparse; it is first present as 2 to 4 lobes on segments 14 to 16, then increases to about 9 pairs of lobes through the next 6 to 8 segments (Okuda, 1937, fig. 2c shows 9 lobes on a side and a transitional or seventeenth setigerous segment). Furcate setae are present in abdominal notopodia (Moore, 1903, p. 467 gives neuropodium, which should perhaps be notopodium).

Distribution.—Phylo fimbriatus is known only from northern Japan in 20 to 260 fathoms.

Phylo nudus (Moore) 1911

Aricia nuda Moore, 1911, pp. 311-315, pl. 21, figs. 172-176; Fauvel, 1932a, pp. 162-163, fig. 25a-d.

This species is here referred to *Phylo* Kinberg because posterior thoracic segments have modified glandular organs and spines (Moore, 1911, fig. 174). It differs from typical species of the genus in having no ventral fringe. The anterior thoracic region consists of 11 segments in which only pointed setae are present. The posterior thoracic region comprises segments 12 to 15; they have modified dark brown spines in anterior vertical series numbering 5 to 7 in a row; each spine is narrowly lanceolate or acicular; more posterior rows of setae are all pointed.

Thoracic neuropodia have fringed postsetal lobes present between segments 9 and 13; the fringes consist of 12 to 15 lobes in a row. Branchiae are first present from the fifth setigerous segment and continue back to the end of the body; they are simple and lingulate throughout. Interramal cirri are absent; furcate setae have not been identified.

Distribution.—Phylo nudus comes originally from southern California in 207 to 497 fathoms from a mixed muddy bottom (Moore, 1911); it is further recorded from off Akyab, Burma, in 34 fathoms (Fauvel, 1932a).

Genus Haploscoloplos Monro, 1933
Type H. cylindrifer (Ehlers) 1905

The prostomium is conical, varying from long and acutely pointed to bluntly equitriangular. Eyes are present, especially in juvenile stages, or absent. The thorax consists of 14 to 20 or more segments. The first segment is a smooth apodous ring. Branchiae are first present from segment 10 (rarely before) to 25 and continued back on all or most segments; they are simple and branched (in the type of the genus) or entirely simple. Thoracic neuropodia have setae that are all long and distally pointed; they are more or less spinous or serrated along their free ends. Furcate setae are present in abdominal notopodia or absent. Embedded acicula are present in all notopodia and abdominal neuropodia. Interramal cirri are present on few to many segments or absent. Subpodial lobes (sometimes also ventral cirri) are present on few to many segments or absent. Ventral fringe and parapodial fringe are absent.

Haploscoloplos differs from *Scoloplos* Blainville (see below) mainly in having no thoracic neuropodial uncinate or other modified setae. The species of *Haploscoloplos* show the same relation to those of *Scoloplos, sensu stricto,* as *Naineris setosa* (Verrill) (see below) does to other species of *Naineris* Blainville. In the case of *Haploscoloplos,* a separate generic grouping is justified because of the wide geographic range of its several species and the number of species concerned (at least 10 species or subspecies are congeneric).

Key to Species of *Haploscoloplos*

1. Branchiae in part branched . . . . *H. cylindrifer*
1. Branchiae simple (pl. 25, fig. 2) 2
2. Interramal cirrus (pl. 25, fig. 1) present in some posterior thoracic or anterior abdominal segments 3
2. Without interramal cirri 4
3. Posterior thoracic and anterior abdominal neuropodia without ventral cirrus (pl. 25, fig. 5) . . . . . *H. robustus*
3. Posterior thoracic and abdominal neuropodia with ventral cirrus (pl. 25, fig. 1) . . . . . *H. fragilis*
4. Subpodial lobe (pl. 28, fig. 2) present on some thoracic neuropodia . . . . . *H. panamensis*
4. Subpodial lobe absent 5
5. Thoracic neuropodial postsetal lobe bifid on segments 10 or 11 to 19 . . . . . *H. bifurcatus*
5. Thoracic neuropodial postsetal lobe not bifid or obscurely so 6
6. Abdominal neuropodia with long triangular postsetal lobe extending distally beyond the branchial tips . . *H. foliosus*
6. Abdominal neuropodia with postsetal lobe much shorter than branchiae 7
7. Thorax with 18 or more segments; branchiae present on posterior thoracic segments; thoracic neuropodia a low ridge with a small papilla near its midlength . . . *H. elongatus*
7. Thorax consisting of 9 or 10 setigerous segments (rarely more); branchiae limited to abdomen; thoracic neuropodial postsetal lobe triangular 8
8. Length of body when adult 40 mm or more *H. kerguelensis*
8. Length of body when adult 8 mm or less . . . . . *H. kerguelensis minutus*

Haploscoloplos cylindrifer (Ehlers) 1905

Scoloplos cylindrifer Ehlers, 1905, pp. 45-46, pl. 6, figs. 16-19; Augener, 1914, pp. 29-30, pl. 1, fig. 4; Augener, 1926, p. 166; Augener, 1927b, p. 353.

Haploscoloplos cylindrifer Monro, 1939b, pp. 124-125, figs. 13 a-c.

According to the several accounts indicated above, based on individuals originating from New Zealand (Ehlers, 1905), Australia (Augener, 1914) and Tasmania (Monro, 1939b), it is generally agreed that the prostomium is conical in mature specimens and that thoracic parapodia have only pointed setae. In some posterior abdominal segments the branchiae are divided in dichotomous arrangement (shown by Augener, 1914, pl. 1, fig. 4, and by Monro, 1939b, fig. 13).

According to Ehlers (1905) the body is about 17 mm long, 1.5 mm wide, and consists of about 115 segments; branchiae are present from setigerous segment 18 or 25 and cylindrical in shape; the prostomium is acutely triangular and longer than wide; the peristomium is a smooth ring. In posterior neuropodia there are a few setae and sometimes projecting acicula. This recalls the diagnostic feature in *Scoloplos* (*Leodamas*) (see below). Abdominal neuropodia have a long vertical flange continuous with the parapodial ridge and extending beyond the subpodial thickening (shown by Ehlers, 1905, pl. 6, fig. 19).

Augener (1914, pp. 29-30) described the prostomium as oculate; branchiae are present from setigerous segment 17 or not before 22 and bifid from about branchial segment 37, with the number of terminal filaments increasing to 4 in posterior segments. Augener (1926, p. 166), in collections from Dunedin, New Zealand, noted that branchiae are distally bifid or trifid, and (1927b, p. 353), in individuals from Tauranga, New Zealand, noted an anterior abranchiate region of 19 to 21 segments and divided branchiae farther back.

Monro (1939b, pp. 124-125), in specimens from Tasmania, found branchiae first present on segments 24 to 29 or not before 50; they were simple for about 25 segments and dichotomously branched thereafter, with up to 5 terminations (Monro, fig. 13); transition from thorax to abdomen was at about setigerous segment 14.

If these accounts refer to a single species, the degree of variability is considerable, with branchiae not present before segment 17 to 50. Thoracic parapodia have conspicuous rounded, lamellar postsetal lobes in anterior segments. These lobes increase in length and are distally

pointed farther back, especially in posterior thoracic segments. The postsetal lamella of neuropodia diminishes in size posteriorly and in abdominal segments it is a low transverse ridge extending mainly below the acicular lobe. Transition from thorax to abdomen coincides more or less closely with the origin of the first branchiae and varies accordingly. The individual branchial filaments are cylindrical, increase in size posteriorly and are divided in some abdominal segments. In mature individuals, segments 26 to 65 have gonopores.

Distribution.—*H. cylindrifer* is known from southern shores and islands of Australia and New Zealand in littoral zones.

Haploscoloplos fragilis (Verrill) 1873

Plate 25, figs. 1-3

Anthostoma fragile Verrill, 1873, pp. 598-599; Verrill, 1874, p. 370; Webster, 1879, p. 258; Webster, 1879b, p. 121; Webster, 1886, p. 151.

Scoloplos fragilis Verrill, 1881, p. 301, 317, 322; Webster and Benedict, 1884, p. 724; Hartman, 1942a, pp. 60-61, figs. 113-115.

Haploscoloplos tortugaensis Monro, 1933c, p. 261, fig. 10.

Haploscoloplos fragilis Hartman, 1944a, p. 340, pl. 46, fig. 5, pl. 50, fig. 6; Hartman, 1945, p. 30, pl. 6, fig. 5; Hartman, 1951, pp. 76-78, pl. 21, figs. 1-3.

Collections.—Many individuals come from Massachusetts, North Carolina, western Florida and Louisiana in intertidal zones from sandy beaches.

The body is long and appears ragged in its posterior parts due to the presence of long parapodial and branchial processes. The prostomium is long, triangular and acutely pointed in front. Branchiae are first present from segment 17 or not before 21 to 30. The parapodial change from thorax to abdomen is abrupt at segment 17 or not until 23. An interramal cirrus is first present from the first branchial segment or the one following; its occurrence is continued back through about 90 to 100 segments; at maximum development it is long and cirriform (fig. 2). Thoracic parapodia have postsetal lobes that are broadly foliaceous in both dorsal and ventral rami. A subpodial lobe is first present from the first branchial segment; it gradually enlarges through anterior abdominal segments and becomes well separated from a similarly shaped lobe resembling a ventral cirrus.

The synonymy indicated above has been established (Hartman, 1951).

Distribution.—*Haploscoloplos fragilis* is common in intertidal sandy shores from New England south to southern Florida and in the Gulf of Mexico.

Haploscoloplos robustus (Verrill) 1873

Plate 25, figs. 4-6

Anthostoma robustum Verrill, 1873, pp. 597-598, pl. 14, fig. 76; Webster, 1879, p. 258.
Scoloplos robustus Verrill, 1881, p. 301.
Scoloplos robusta Webster and Benedict, 1884, p. 724.
Scoloplos bustorus Eisig, 1914, pp. 422-423; Hartman, 1942a, p. 58, figs. 110-112; Hartman, 1944a, p. 340; Hartman, 1945, p. 30.
Scoloplos rufa Treadwell, 1941b, p. 1, figs. 1-6.
Haploscoloplos bustoris Horn and Bookhout, 1950, pp. 1-9, pls. 1-4.
Haploscoloplos robustus Hartman, 1951, p. 78, pl. 21, figs. 4-6; Hartman, 1956.

Collections.—Many individuals from intertidal sandy beaches are from Massachusetts south to North Carolina; others are from the Gulf of Mexico.

This grossly resembles *H. fragilis* (see above), with which it sometimes occurs, but it is a larger species and easily distinguished by its having no ventral and subpodial lobes such as are present in *H. fragilis*. The prostomium is less acutely pointed. The first branchiae are present, though small, at about segment 23 and they rapidly increase in size so that they stand erect over the dorsum. Transition from thorax to abdomen is about at segment 22 to 24 or somewhat farther back. Interramal cirri are first present from the first branchial segment and continue back through many (about 54) segments; they are absent farther back.

Thoracic neuropodia have a small short papilla at the midlength of the postsetal lobe; the corresponding notopodia have a larger and broader process, also near the middle of the parapodial ridge. Abdominal neuropodia have a conspicuous transverse flange (figs. 5, 6); in ovigerous individuals it is greatly distended due to the presence of great numbers of gonadial products.

Anthostoma robustum Verrill was thought to be a homonym of *Alcandra robusta* Kinberg (1866) by Eisig (1914, p. 422), who proposed the specific name *bustorus*. Since Verrill's species rightly goes to *Haploscoloplos* and Kinberg's species is in another genus (Hartman, 1948b, p. 106), the change in specific name is unnecessary.

Distribution.—Haploscoloplos robustus is common in littoral sands from New England south to southern Florida and in the Gulf of Mexico.

Haploscoloplos elongatus (Johnson) 1901

Plate 26, figs. 1-11

Scoloplos elongata Johnson, 1901, pp. 412-413, pl. 10, figs. 105-110; Treadwell, 1914, p. 199; Berkeley, 1927, p. 413; Monro, 1933d, pp. 1045-1046.

Aricia sp. Treadwell, 1914, p. 199 (in part).

Haploscoloplos elongata Hartman, 1944c, p. 257; Hartman, 1948a, p. 30; Hartman, 1955, p. 174.

Collections.—Many individuals, including the type collection, come from Puget Sound, Washington, Alaska, central and southern California in intertidal zones to 293 fathoms, including the following stations of the *Velero III* and *Velero IV* (data for stations are published in Fraser, 1943, and Hartman, 1955): 886-38 (1); 905-38 (1); 992-39 (1); 1201-40 (1); 1441-41 (1); 2026-51 (7); 2107-52 (4); 2114-52 (2); 2115-52 (2); 2116-52 (5); 2120-52 (7); 2149-52 (6); 2168-52 (5); 2175-52 (4); 2176-52 (9); 2189-52 (4); 2202-53 (4); 2217-53 (6); 2224-53 (6); 2227-53 (11); 2228-53 (2); 2232-53 (14); 2233-53 (12); 2291-53 (6); 2307-53 (6); 2311-53 (34); 2337-53 (1); 2389-53 (9); 2418-53 (1); 2506-53 (1); 2508-53 (1); 2618-54 (1); 2646-54 (4); 2725-54 (2+).

The type collection from Puget Sound, Washington, shore, consists of twelve large individuals 100 to 200 mm long. The prostomium is depressed, conical and has no eyes. Branchiae are first present from setigerous segment 14 to 16; the transition from thorax to abdomen varies between segment 19 to 21 and the change is complete thereafter. Thoracic neuropodia have a low transverse postsetal ridge from which a small papillar lobe projects at midlength.

In another lot of 5 individuals from Tomales Bay, California, branchiae are first present from setigerous segment 18 and the transition from thorax to abdomen is at 23. Others from off southern California, measuring less than half as long, have branchiae first present from segment 13 to 16 and the transition from thorax to abdomen is at segment 16 or not before 21. The first appearance of branchiae thus varies from segment 13 to 18 and the transition of thorax to abdomen from segment 15 to 21.

In mature individuals the prostomium is acutely pointed, a little longer than wide and has no eyes. The dorsum between the bases of the larger branchiae usually has a reticulated brown pigment persisting in

alcohol. Branchial tips and the foliaceous neuropodial flanges (often with ruffled margins) on the ventrolateral side of the abdomen are often darkly pigmented, with the color concentrated as clusters of minute dark spots, as shown by Johnson (1901, pl. 10, fig. 108). Branchiae are small at first and gradually increase in size to form flat, dorsally directed processes with an asymmetrical subapical swelling (fig. 3). Where best developed in abdominal segments, they are fimbriated along their lateral margins and the fimbriae are not visibly continued across the middorsum of the body.

Thoracic setae are all slender and distally pointed; those in neuropodia form fuller tufts than those in notopodia. The upper ramus is supported by about 5 yellow acicula in a close bundle; each one is very slender, sickle-shaped at the distal end and has a long, pointed tip (fig. 1). Transitional parapodia have about 4 notopodia and 6 similar neuropodial acicula (fig. 2). Thoracic setae (fig. 4) are shorter and thicker (fig. 9) than abdominal setae (fig. 11). All have transverse rows of spinelets (figs. 6, 7) that number 10 to 12 in a row (fig. 5). Furcate setae are present in abdominal notopodia (fig. 3), located at the inferior end of the setal fascicle; they number 2 to 5 in a bundle; their tines are unequally long and the shaft is spinous (fig. 8). Lateral organs are clearly visible in abdominal segments; they are provided with short stiff hairs.

Many individuals taken in quantitative samples from San Pedro Basin of southern California in 13 to 293 fathoms (Hartman, 1955) are uniformly alike in that the transition from thorax to abdomen is at setigerous segment 15/16; branchiae are present, though small, on the last several thoracic segments and become larger thereafter; abdominal neuropodia have the foliaceous flange like those from more northern localities. The ovigerous region comprises abdominal segments 7 to 26.

The pygidium is collarlike and has a pair of long slender filaments attached at the dorsolateral margin.

Specimens reported as *Scoloplos elongata* (Treadwell, 1914, p. 199) from Salmon Bay, Puget Sound, have been found to agree with *Haploscoloplos elongatus*; others coming from Tomales Bay and Coronado, California, are here referred to *Scoloplos* (*Scoloplos*) *acmeceps*. *Aricia* sp. Treadwell (1914, p. 199) from San Diego, California, is also referred to *Haploscoloplos elongatus*. *H. kerguelensis* Berkeley and Berkeley (1941, p. 41) from southern California may also be referred to what I am calling *H. elongatus*, since it comes from the same geographic area.

The affinities of *H. elongatus* are clearly with *H. kerguelensis* (McIntosh). Both have branchiae limited largely to abdominal segments; both have rather simple thoracic notopodial and neuropodial lobes; interramal cirri are absent. In *H. elongatus* the thoracic neuropodial postsetal ridge is low and has a papillar lobe at its midlength; in *H. kerguelensis* the corresponding process is a triangular lobe. In *H. elongatus* abdominal neuropodia have a foliaceous flange extending considerably below the neuropodial postsetal lobe and more or less dark; such a flange is absent from *H. kerguelensis*. In *H. elongatus* the branchiae are more conspicuously developed and lingulate, with fimbriae along the lateral margins; in *H. kerguelensis* the branchiae are far less developed and depressed cylindrically; the fimbriae are obscure.

Distribution.—*H. elongatus* is common in littoral sandy mud flats of the northeast Pacific Ocean from Alaska south to California. In its more southern range it is subintertidal and has been taken in soft bottoms in San Pedro area, California, to 293 fathoms but is most abundant in 7 to 136 fathoms (Hartman, 1955). At its upper levels, its range overlaps that of *Scoloplos* (*Scoloplos*) *acmeceps* (see below), with which it is apt to be confused.

Haploscoloplos kerguelensis (McIntosh) 1885

Plate 27, figs. 1-3

Scoloplos kerguelensis McIntosh, 1885, pp. 355-356, pl. 43, figs. 6-8, pl. 22a, fig. 19; Gravier, 1911, pp. 108-110, pl. 5, figs. 60-63; Fauvel, 1916, pp. 443-445, pl. 8, figs. 23-25; Fauvel, 1932a, pp. 165-167.

Haploscoloplos kerguelensis Monro, 1936, p. 160; Okuda, 1937, p. 103, figs. 5-6; Okuda, 1938, p. 98; Monro, 1938, p. 623; Monro, 1939b, p. 124; Hartman, 1953, p. 37.

Collection.—South Georgia, Antarctic regions (2).

This species comes originally from Kerguelen Islands, subantarctic waters. Monro (1936 to 1939) re-examined the type collection and emended the first account. He showed that the prostomium is distally pointed and not rounded; the thoracic dorsum is inflated and not depressed; thoracic setigerous segments number from 9 to 11; branchiae are first present from segments 11 to 16 and are thus absent from the thorax. There are no interramal cirri, no ventral cirri and no subpodial lobes. Podial postsetal lobes are limited to single, short, triangular processes in both rami of the thorax. Immature individuals have furcate setae in some notopodia but their presence has not been observed in mature specimens.

Other accounts (see references above) describe variations of considerable magnitude, as follows:

First appearance of branchiae on setigerous segment	Number of thoracic setigerous segments	Locality	Authority
12	9	Kerguelen Islands	McIntosh, 1885, p. 356
12-13	9	South Georgia	Hartman, 1953, p. 37
13	(not given)	Antarctic regions	Gravier, 1911, p. 108
18-20	10-12	Falkland Islands	Fauvel, 1916, p. 444
12-15	14 (or 9-10)	South Orkney Islands	Monro, 1936, p. 160; Monro, 1939b, p. 124
14 or 18	15 or 19	Japan	Okuda, 1937, p. 103; Okuda, 1938, p. 98
11-16	9-11	Australia	Monro, 1939b, p. 124
12	?12	Australian Antarctic	Benham, 1921, pp. 78-81 (as *Scoloplos mawsoni*)

Scoloplos mawsoni Benham (1921, pp. 78-81), from the Australian Antarctic region, has been referred to *Haploscoloplos kerguelensis* by Monro (1936, p. 160).

Scoloplos kerguelensis, sensu Fauvel (1932a, pp. 165-167), from India in a small creek at low water, differs from typical representatives in its high thoracic count (18-20 segments); thoracic parapodia are plain except for the last 3 to 6, which have a small conical notopodial postsetal lobe and an inconspicuous lobe at the midlength of the neuropodial ridge; branchiae are first present from segment 21 and are short, broad, triangular in shape.

Haploscoloplos kerguelensis, sensu Okuda (1937 and 1938) from Japan more nearly resembles *H. elongatus* (see above) in that branchiae are present on the last thoracic segment and the transition from thorax to abdomen is at 15/16 to 19/20.

Distribution.—Haploscoloplos kerguelensis comes originally from Kerguelen Islands in 110-120 fathoms (McIntosh, 1885); it is reported from Patagonia (Ehlers, 1897, p. 97), from Antarctica in 8-10 fathoms (Willey, 1902, p. 275), Port Lockroy, Antarctica, in 28 meters (Gravier, 1911, p. 108), Falkland Islands (Fauvel, 1916, p. 445), India (Fauvel, 1932a, p. 165), South Orkney Islands (Monro, 1936, p. 160) and Japan (Okuda, 1937 and 1938). As indicated above, some of these records may refer to other species.

Haploscoloplos panamensis (Monro) 1933

Plate 28, figs. 1-3

Haploscoloplos panamensis Monro, 1933d, pp. 1045-1046, fig. 1 A-B.
Haploscoloplos alaskensis Hartman, 1948, pp. 30-32, fig. 8 a-c.

Collection.—Southern Alaska (several).

The thorax consists of 17 segments. Branchiae are first present from the twelfth setigerous segment and are simple and lanceolate throughout. The notopodial postsetal lobe is small in the first few segments and increases in size to a slender elongate lobe extending distally about half as far as the longest setae. Anterior thoracic neuropodial ridges have a simple postsetal lobe at the midlength. In posterior thoracic segments this lobe is divided so that there are two similar lobes; the lower one resembles a ventral cirrus. There are no interramal cirri.

Haploscoloplos alaskensis Hartman (1948, pp. 30-32, fig. 8 a-c), from southern Alaska, is here referred to *H. panamensis* Monro. Both have a unique development of postsetal lobes in posterior thoracic neuropodia. A second lobe is present at segments 13 or 14 below the subpodial lobe and in the fifteenth or last thoracic segment a third lobe is present which is continued back through the first 8 to 10 abdominal segments.

Distribution.—Haploscoloplos panamensis is known only from the Pacific side of Panama in 6-12 fathoms and from southeast Alaska at low tide to 25 fathoms.

Haploscoloplos bifurcatus, new species

Collections.—Encounter Bay, on limestone reef among *Zostera* roots, pebbles and sand (2) and Port Vincent, Yorke Peninsula, South Australia (1) all collected by S. J. Edmonds; Camp Cove, Watsons Bay, Port Jackson, New South Wales, dredged in 6-8 fathoms (1) collected by Barbara Dew.

The largest individual, from Yorke Peninsula, measures about 65 mm long, 4 mm wide in the thorax, and consists of more than 200 segments (a posterior end is missing). Two other individuals (from Encounter Bay, chosen as cotypes) include an anterior end of an ovigerous individual measuring 35 mm long for 78 segments and 4 mm wide in the thorax; the other one measures about 50 mm long for 134 segments and 4 mm wide in the thorax.

Transition from thorax to abdomen is at setigerous segments 21/22. Branchiae are present from the ninth segment and very small; they

gradually increase in size in posterior thoracic and anterior abdominal segments. The prostomium is equitriangular in shape and has no eyes. The everted proboscis is voluminous and multilobed at its distal everted end.

In the thorax the neuropodial postsetal lobe is triangular in the first ten segments; thereafter it is divided so that a smaller second lobe is present below the larger one but both are postsetal (in the specimen from New South Wales, the divided condition is present from the eighth setigerous segment). In the last two thoracic segments the ventral lobe resembles a ventral cirrus. These lobes are abruptly absent thereafter. There are no interramal cirri, no subpodial fringe and no other cirri resembling ventral cirri.

In middle abdominal segments the branchiae are large at the base and conspicuously fimbriated along their sides for the basal third; more distally they are slender and terminate in attenuate tips. Branchial bases are widely separated middorsally. In posterior abdominal segments the neuropodial superior lobe is long and triangular, the inferior one is much shorter but also triangular. The neuropodium is supported by 3 or 4 slender pale acicula in a close, fully embedded fascicle. The corresponding notopodia have a long, foliaceous postsetal lobe exceeded in length by the accompanying erect, lanceolate branchiae.

In ovigerous individuals large ova are present from the ninth abdominal segment and continue back through at least 46 segments; on these individuals the glandular pads are visible from the thirteenth or fourteenth abdominal segment.

The largest individual from Yorke Peninsula agrees with the type specimens except that branchiae are not present before the fifteenth setigerous segment and the prostomium is proportionately longer and greatly attenuated at its tip. Another one from Encounter Bay has a similar pointed prostomium and branchiae are present from the ninth segment. Still another from the same place has 19 thoracic segments, the twentieth being transitional; branchiae are first present from segment 15 and the prostomium is short and triangular. Posterior thoracic neuropodial lobes are elongate triangular and only the last four segments have a small accessory ventral lobe. Two posterior ends from South Australia have a pygidial ring provided with a pair of long cirriform filaments attached dorsolaterally.

Haploscoloplos bifurcatus differs from other species of the genus (see also key above) in that posterior thoracic neuropodia have divided postsetal lobes (hence the specific name); branchiae are present in posterior thoracic segments; the transition from thorax to abdomen is abrupt and about at segment 21/22.

Distribution.—Haploscoloplos bifurcatus is known only from South Australia in intertidal sandy or pebbly beaches and from New South Wales, Australia, in 6-8 fathoms.

Haploscoloplos sp.

Scoloplos armiger Augener, 1914, pp. 20-24. Not O. F. Müller, 1776.

Individuals from Sharks Bay, Denham, southwestern Australia, in intertidal zones under stones, in detritus and sand, reported as *Scoloplos armiger* (Augener, 1914, p. 23), are here referred to *Haploscoloplos* sp. The thorax is said to have only pointed setae; the prostomium is long and conical; ventral and parapodial fringe are absent. Branchiae are first present in postthoracic segments. The first 7 parapodial pairs are much reduced; thereafter a small ventral and a slightly larger dorsal lobe are visible along the parapodial ridges. The separation between thorax and abdomen is not sharp. This brief diagnosis agrees reasonably with that of *H. kerguelensis* (see above).

Haploscoloplos sp.

Plate 28, figs. 4-6

Haploscoloplos sp., Hartman, 1948, pp. 32-33, fig. 8 d-f.

Transition from thorax to abdomen is abrupt at the fifteenth setigerous segment. Branchiae are present from the eleventh one, increase in size going back and stand erect over the dorsum; they are simple and unbranched throughout. Thoracic parapodia have long triangular postsetal lobes (fig. 4) in notopodia and neuropodia. Abdominal parapodia have a longer notopodial and a shorter neuropodial lobe (fig. 5). Setae are all slender and distally pointed, as characteristic of the genus, except for furcate setae (fig. 6) present in notopodia of middle segments. There are no interramal cirri, no ventral cirri and no subpodial lobes.

Distribution.—This is known only from Murchison Sound, Greenland, in 60 fathoms.

Genus Scoloplos Blainville, 1828

Key to Subgenera

Abdominal neuropodia with two or more acicula in fascicles that are more or less completely embedded; branchiae usually present from about segment 10 to 26 . . . . . *Scoloplos, sensu stricto*

Abdominal neuropodia with single heavy aciculum projecting from distal end of parapodium; branchiae first present from about segment 5 or 6 . . . . . *Scoloplos* (*Leodamas*)

Scoloplos, sensu stricto
Type **S. armiger** (O. F. Müller) 1776

The prostomium is triangular and more or less acutely pointed in front. Branchiae are first present from about segment 10 to 26 and continue back to the end of the body; they are simple lingulate or straplike. The thorax consists of many segments. Notopodia have long pointed setae; some notopodia, especially in the middle region of the body, may have furcate setae. Thoracic neuropodia have palisaded rows of curved uncini (pl. 29, fig. 6) and sometimes accompanied by pointed setae (pl. 29, fig. 3). There are no interramal cirri and no ventral or parapodial fringes.

Key to species of *Scoloplos*, *sensu stricto*

1. A pocket-shaped membrane located behind the ventral cirrus present from about segment 18 and continued more posteriorly . . . . . *S. marsupialis*
1. Without such pocket-shaped membrane 2
2. Thoracic neuropodia have vertical rows of heavy brown spines . . . . . *S. treadwelli*
2. Neuropodia without such heavy brown spines 3
3. Thoracic neuropodial ridge with two papillae and a subpodial lobe present on some thoracic segments (pl. 29, fig. 2) . . . . . *S. armiger*
3. Thoracic neuropodial ridge with a single short lobe; parapodia without subpodial lobe . . . . . *S. acmeceps*

Scoloplos armiger (Müller) 1776
Plate 29, figs. 1-7

Lumbricus armiger Müller, 1776, p. 215.

Scoloplos armiger Eisig, 1914, pp. 367-403; Fauvel, 1927a, pp. 20-21, fig. 6 k-q; Okuda, 1937, pp. 102-3, fig. 4 a-d; Monro, 1930, p. 145; Berkeley and Berkeley, 1952, p. 97, figs. 197-199.

Scoloplos sp. Hartman, 1955, p. 183.

Collections.—885-38 (1); 888-38 (1); 1021-39 (1); 1327-41 (1); 1450-42 (1); 2012-51 (3); 2113-52 (10); 2125-52 (9); 2126-52 (5); 2153-52 (5); 2312-53 (12); 2445-53 (21); Osoflaco and Oceano, San Luis Obispo County, California (2, collected by Conrad Limbaugh, 1955).

In individuals from California the thorax consists of 19 to 22 setigerous segments; it is depressed through most of its length. The next two segments are transitional (fig. 3). The prostomium is acutely pointed and prolonged so that it is about three times as long as wide at the base; there are no eyes; nuchal slits are visible at the sides of the posterior margin. The peristomium is about as long as the first setigerous segment. Branchiae are first present from the twelfth to sixteenth setigerous segment or not before segment 24 (1327-41). The first eight or ten pairs are small, but they gradually enlarge and stand erect over the dorsum. The lateral fimbriae are most conspicuous at greatest branchial development, the subdistal enlargement is asymmetrical and the distal tip is smooth (figs. 3, 4).

In about the first 16 parapodia the thoracic neuropodia have a single papillar lobe (fig. 2) in postsetal position. Between segments 14 to 17 a second small lobe is present below the middle one and thereafter both lobes become longer and extend behind the larger neuropodial uncini. In addition a smaller, prolonged lobe some distance below the parapodium is present (fig. 1). A purplish pigment spot is visible between the base of the parapodium and the subpodial lobe. Between segments 19 to 32 (or only to 28) the subpodial lobe increases, is largest on about segment 26 (fig. 3), and decreases to absence after segment 32. The neuropodium has only a postsetal lobe to segment 22.

The abdominal region begins at segment 20 to 23; it is marked especially by an abruptly slenderer neuropodial fascicle and more prolonged setal lobes (fig. 4) and broad neuropodial flanges. The flange is first noticeable on about segment 18 as a small dark spot between the ventral cirrus and the subpodial lobe (fig. 3); thereafter it enlarges, becoming padlike through a few segments and a flange in abdominal segments. The dark spot (persisting in preservative) is visible on the posterior face of the flange. Anterior thoracic notopodia have a long triangular postsetal lobe and neuropodia have a short papillar lobe near the midlength of the ridge (fig. 2).

Notopodia have full fascicles of pointed setae. Neuropodia have similar pointed setae and ridged uncini (figs. 6, 7). The transverse ridges extend across the outer curved side of the uncinus and number 4 or 5

in parallel series. There are no subuluncini. The uncini are in 3 or 4 vertical rows immediately in front of a single row of pointed setae. Abdominal notopodia have pointed setae and furcate setae (fig. 5) in which the shaft is slightly spinous on the side with the shorter tine.

There is some variation in individuals from eastern Pacific regions. In specimens from 885-38 and 888-38, ventral cirri are present from the fourteenth segment and subpodial lobes only between segments 16-21; branchiae are present from the twelfth segment and the thorax comprises 19 setigerous segments. In two others from 1021-39, the subpodial lobes are on segments 19 to 29 and on 20 to 32 respectively; in one from 1450-42, subpodial lobes are on segments 17 to 32; and in another on 19 to 29. In specimens reported from the Korean Archipelago, Okuda (1937, pp. 102-103) described subpodial lobes on segments 14-16 to 18-20.

Distribution.—Scoloplos armiger is widely reported from cosmopolitan areas in littoral depths. Its occurrence in California is limited to mixed bottoms in moderate depths (see also Chart for species in San Pedro area, above).

Scoloplos acmeceps Chamberlin

Plate 30, figs. 1-7

Scoloplos elongata Hilton, 1918, p. 61.

Scoloplos acmeceps Chamberlin, 1919b, pp. 15-16; Hartman, 1936, p. 32; Hartman, 1944c, p. 257.

Collections.—887-38 (1); 1211-40 (6); 1441-41 (2); 1442-41 (4); 1445-42 (3); 1450-42 (2); 1451-42 (6); 1457-42 (6); 1471-42 (2); 1478-42 (1); 1479-42 (2); 1480-42 (1); 1484-42 (4); 1493-42 (1); 2091-52 (1); 2152-52 (5); 2316-53 (1); 2317-53 (1); 2318-53 (4); 2320-53 (2); many others from various parts of the northeastern Pacific Ocean from southern Alaska south to Mazatlán, Mexico, in littoral zones.

Larger specimens measure more than 150 mm long, 3 to 4 mm wide, and have more than 200 segments. The anterior two-thirds of the thorax is broadly depressed; farther back it is less so. The change from thorax to abdomen is variable within limits, between segments 21 to 24 or from 19 to 26; it is noticeable because of a change in neuropodial lobes and setae. The prostomium is small and inconspicuous and pointed in front; it lacks visible eyespots. Branchiae are first present from segments 14 to 20 in smaller individuals, or from about segment 25 in larger ones. The first branchiae are small and they increase rapidly in size, standing erect over the dorsum within five to ten segments; they are heavily fimbriated at the outer lateral margins (fig. 2).

Thoracic parapodia are inconspicuous in anterior segments; both notopodia and neuropodia have small papillar lobes located about midway along the postsetal ridge. Farther back the notopodial lobe is longer and triangular (fig. 1), the neuropodium has a longer ridge with the upper part prolonged. Notopodia have only pointed setae accompanied by slender embedded acicula. Neuropodia have thicker fascicles of yellow, distally pointed setae and fewer uncini in palisaded series. They are so arranged that the anterior one to several rows are pointed setae, followed by one to three rows of uncini with 8 to 15 in a row at maximum development or the uncini may be absent from the upper part of the fascicle; the posteriormost row consists of pointed setae only. The uncini are distally curved; each has 6 to 8 transverse ridges along its outer side (figs. 6, 7); a translucent hyaline hood ensheaths the distal part (lacking from worn uncini). The pointed setae are spinous beyond the shaft, with the spines in numerous transverse rows (fig. 3) and extending nearly around the seta (fig. 4). Furcate setae (fig. 5) are present in abdominal notopodia; the shaft is spinous and the distal tines are unequally long.

In the abdomen the notopodial postsetal lobe is long and erect; the neuropodium consists of a longer supra-acicular lobe and a shorter subacicular one (fig. 2). Dorsal ciliated mounds are visible from segments 11 to 13 and continue on more posterior segments; the pair are widely separated at first but rapidly approach middorsally, so that by segment 20 or 21 they are proximal to each other. Statocysts are present on branchial segments in front of the branchial base (fig. 2), at least from the second or third branchial segment. The pygidium has a pair of very long, cirriform processes inserted dorsolaterally.

Scoloplos acmeceps is sometimes associated with *Haploscoloplos elongatus*. They are distinguishable grossly in that the first has a greatly depressed thorax, the second a slightly depressed one; the first has thoracic uncini, the second lacks them; the first has more spinous notosetae than the second.

Distribution.—*Scoloplos acmeceps* is known from Alaska south to western Mexico in littoral zones; it is associated especially with holdfasts of algae and grasses, in littoral zones.

Scoloplos treadwelli Eisig, 1914

Aricia cirrata Treadwell, 1901, pp. 201-202, figs. 54-57.
Scoloplos treadwelli Eisig, 1914, pp. 405-407; Augener, 1927d, p. 69.
Collection.—2597-54 (1).

This species was originally described from three specimens in which the transition from thorax to abdomen was at segment 14, 16 and 20 respectively; in the present individual the transition is abrupt after segment 23. The branchiae are absent from the thorax and begin on the first abdominal segment. The prostomium is acutely pointed and longer than wide; the peristomium or first segment is a little longer than the prostomium and intermediate in width between the prostomial base and the first setigerous segment. There are no ventral cirri or subpodial lobes. In the thorax the notopodia have a long triangular postsetal lobe and neuropodia are represented only by very low postsetal ridges. Thoracic neuropodial setae are almost entirely dark brown with smooth brown acicular spines, except for an occasional long, capillary seta in a few of the anteriormost segments, irregularly strewn in the fascicles with the brown spines. The first seven neuropodia have spines in double rows; thereafter the rows are single. The rows are longest in middle thoracic segments and diminish in the last 8 thoracic segments so that only about 4 spines are present in the last two such segments. The pigment of the neuropodial spines is most intense in middle thoracic segments and in the lowermost spines; the uppermost in the series are pale.

Abdominal notopodia consist of a long, tapering postsetal lobe and a fascicle of long, slender setae accompanied by 3 to 6 furcate setae in which the tines are unequally long. The corresponding neuropodia terminate distally in a bulbous lobe as originally shown and have a few long, slender setae and several pale, very slender embedded acicula.

This individual differs from the original account in that the transition from the thorax to the abdomen is at a later segment; but since it is variable in the type collection, the difference may not be significant. The proportions of prostomial and peristomial lengths differ but no more than in some other species of the family.

Distribution.—Scoloplos treadwelli was first described off Puerto Rico in 12-18 fathoms with mud and shale, 161-172 fathoms, sand and mud, and 97-120 fathoms, coral. The greatest extension of its range is the present record which comes from off Acapulco, Pacific side of Mexico, in 13 fathoms on a bottom of sand and silt.

Scoloplos (Leodamas) Kinberg, 1866
Type Scoloplos (Leodamas) verax Kinberg, 1866

Includes *Branchethus* Chamberlin, 1919.

The prostomium is acutely pointed and usually prolonged. Abdominal neuropodia have acicula which are heavy, single and project from the parapodium. Branchiae are first present from about the fifth or

sixth segment (sometimes farther back) and are present to the end of the body; they are simple or branched. Podial lobes, subpodial lobes or ventral cirri are present or absent. Interramal cirri are absent. Thoracic notopodia have only pointed setae with embedded acicula. Thoracic neuropodia have pointed setae and uncini, or uncini only. Furcate setae are present in some notopodia or absent. *Scoloplos* (*Leodamas*) differs from *Scoloplos sensu stricto* chiefly in having projecting acicula in abdominal neuropodia and branchiae present in more anterior segments.

Key to Species of *Scoloplos* (*Leodamas*)

1. Branchiae branched (pl. 33, fig. 2) on some segments . . 2
1. Branchiae simple throughout though sometimes abnormally divided 3
2. Some branchiae palmately divided and with up to 5 terminal filaments . . . . . *S.* (*L.*) *latum*
2. Some branchiae dichotomously divided (pl. 33, fig. 2) . . . . . *S.* (*L.*) *dendrobranchus*
3. Some notopodial postsetal lobes in thorax and abdomen bifurcated . . . . . *S.* (*L.*) *verax*
3. Notopodial postsetal lobes not bifurcated 4
4. Thoracic neuropodia with uncini only (an occasional one may have one or a few long pointed setae) 6
4. Thoracic neuropodia with uncini accompanied by pointed setae in regular arrangement 5
5. Uncini with transverse ridges (pl. 32, fig. 4); posterior thoracic neuropodia with a postsetal lobe at lower third of ridge; transition from thorax to abdomen at about segment 24 to 28 . . . . . *S.* (*L.*) *tribulosus*
5. Uncini smooth (pl. 31, fig. 3) 11
6. Last 5 thoracic segments and anterior abdominal segments with 4 or more subpodial lobes in a row (pl. 34, fig. 1) . . . . . *S.* (*L.*) *fimbriatus*
6. Thoracic segments with few or no subpodial lobes . . . 7
7. Last two thoracic segments with subpodial lobe; furcate setae with tines of equal length . . . *S.* (*L.*) *johnstonei*
7. Without subpodial lobes in thoracic segments; furcate setae with tines of unequal length 8
8. About the first 18 abdominal segments with subpodial lobes; transition from thorax to abdomen at about segments 27 to 31 . . . . . *S.* (*L.*) *cirratus*

8. Abdominal segments without subpodial lobes 9
9. Thoracic neuropodia without postsetal lobes 10
9. Last thoracic neuropodia with a long postsetal lobe, present also in abdominal segments as a long, slender postsetal lobe (pl. 32, fig. 2) . . . . . *S.* (*L.*) *rubra*
10. Transition from thorax to abdomen at about segment 19 or 20 . . . . . *S.* (*L.*) *ohlini*
10. Transition from thorax to abdomen at about segment 11 to 14 . . . . . *S.* (*L.*) *marginatus*
11. Transition from thorax to abdomen at about segment 21 or 22 . . . . . *S.* (*L.*) *chevalieri*
11. Transition from thorax to abdomen at about segment 27 . . . . . *S.* ?(*L.*) *madagascariensis*

It is noteworthy that *S.* (*L.*) *rubra* (Webster), *S.* (*L.*) *ohlini* (Ehlers) and *S.* (*L.*) *marginatus* (Ehlers) are distinguishable from one another only by characters known to be variable in other species. It is therefore possible that these three names refer to a single widely distributed species. Furthermore, *S.* (*L.*) *marginatus mcleani* (Benham) differs from its stem species in having thoracic neuropodia provided with 3 to 6 dark spines behind the other setae, located at the inferior end of the series; this distinction is not altogether reliable in other species.

Scoloplos (Leodamas) verax Kinberg

Plate 31, figs. 1-4

Leodamas verax Kinberg, 1866, p. 252.

Scoloplos (*Leodamas*) *verax* Hartman, 1948b, pp. 104-105, pl. 15, figs. 3, 4.

The prostomium is equitriangular, depressed conical and without eyes. The everted proboscis is a smooth, unbranched spacious epithelial pouch. The peristomium is longer than the prostomium and about twice as long as the first setigerous segment. Thoracic segments number 25. Branchiae are first present from the sixth setigerous segment and continue on all other segments; they are simple and lingulate.

Thoracic notopodial postsetal lobes are deeply bifurcated from the first parapodium and through most of the thorax. The corresponding neuropodial postsetal lobe is triangular and undivided. Thoracic neuropodia have palisaded rows of thick yellow uncini which are distally curved and smooth at the outer curved side (fig. 3); there are no pointed setae or subuluncini.

In the abdomen only a short middorsal space separates the branchial bases. Branchiae are large, compressed and terminate in a slenderer tip; they exceed the notopodial lobe in size. Typical abdominal notopodia have a large triangular postsetal lobe and two or three embedded yellow acicula, together with about 20 long, pointed setae and two or three furcate setae (fig. 1). The corresponding neuropodia have a smaller triangular postsetal lobe and a thick yellow aciculum that is curved near the tip and projects from the lobe; in addition there are 12 to 15 long pointed setae. A simple ventral cirrus is present, at least in anterior abdominal segments, located at the sides of the body and immediately below the neuropodial base.

Furcate setae (fig. 4) have tines of unequal length and a smooth shaft. Abdominal acicula (fig. 2) are thick, distally curved and smooth; they differ from thoracic uncini in having a longer, tapering distal end.

Distribution.—*Scoloplos* (*Leodamas*) *verax* is known only from southeastern South America in 32 fathoms.

Scoloplos (Leodamas) ohlini (Ehlers) 1901

Plate 31, figs. 6-8

Aricia ohlini Ehlers, 1901, pp. 167-169, pl. 21, figs. 9-13.
Aricia cochleata Ehlers, 1901, pp. 166-167, pl. 21, figs. 14-21.
Scoloplos ohlini Augener, 1926, pp. 165-166.

Collections.—Type collections from Tribune Bank, southern South America, in 25 fathoms (deposited in the Swedish State Museum); San Quintin Bay, Lower California, Mexico (many, collected by Dr. Donald J. Reish); Cuchra Beach, Chile, in semiexposed sandy beach, February, 1955 (many, collected by Dr. Eric Guiler).

A small posteriorly incomplete, coiled specimen labeled *Aricia ohlini* Ehlers in the Swedish State Museum has 20 thoracic setigerous segments and 26 abdominal segments (the posterior end is missing). Segments 20 and 21 are transitional. The everted proboscis is a simple globular pouch. Branchiae are present from the sixth setigerous segment; they are simple and continue on all segments. A subpodial lobe resembling a ventral cirrus (fig. 1) is present from the last thoracic segment and continues at least through segment 46, hence is largely abdominal in occurrence.

Thoracic neuropodia are simple transverse ridges without lobes or papillae. They are provided with palisaded rows of uncini (fig. 3), either unaccompanied by pointed or other setae or with an occasional

pointed seta in irregular arrangement. In partial three-quarter view some of these uncini appear cuspidate on the inner convex edge, as originally shown by Ehlers (pl. 21).

Furcate setae (fig. 4) are present in posterior thoracic and abdominal notopodia; they have tines of unequal length and a smooth shaft. Abdominal neuropodia (fig. 1) have heavy yellow acicula (fig. 2) which project from the distal end of the neuropodium for a short distance; a second developing aciculum may be more deeply embedded.

In a collection of many individuals from San Quintin Bay, Lower California, the length of the body is more than 60 mm (the posterior ends are fragmented); number of segments is more than 300. The thorax is 1.04 mm wide at most and deeply depressed through most of length, so that its width/depth ratio is about 3/1. The prostomium is long and distally pointed and about 1.4 times as long as wide; it has no eyes. The everted proboscis is a large, spacious smooth epithelial pouch that extends across the ventrum of anteriormost segments; there are no terminal lobes. The peristomium or first segment is a smooth ring about two-thirds as long as the prostomium.

Branchiae are first present from the sixth setigerous segment and stand erect with each pair close together in the thorax and thus far removed from the parapodial bases; they form trim rows on the greatly depressed thorax and are uniform in size and appearance. In the abdomen they increase in size and are more conspicuously ciliated at their lateral margins. Branchiae are simple lobes throughout.

The thorax consists of 21 setigerous segments and the change to the abdomen is abrupt thereafter. Thoracic notopodial postsetal lobes are slender, erect and long triangular, but are largely concealed by the much longer notopodial setal fascicle. Thoracic neuropodia have conspicuous palisaded rows of uncini arranged in about four vertical rows; they emerge from a low ridge that lacks papillae. The anteriormost uncini number about 10 in a row, are thick and rust-colored due to an extraneous deposit; they are distally bluntly rounded. The two middle rows of uncini more nearly resemble those in the posteriormost row except that they lack a hyaline hood; in their distal end they are slightly curved, have a shallow cuspidate depression immediately beyond the weakly developed transverse rows of ridges (which are hardly visible on most uncini). The posteriormost row of uncini are distally hooded and have transverse rows of delicate ridges at their outer curved side. There are no pointed setae except for an occasional one, resembling the notopodial setae, accompanying the posteriormost row of uncini.

Abdominal notopodia have a long triangular postsetal lobe and 10 to 12 longer to shorter pointed setae accompanied by two furcate setae. Abdominal neuropodia have a postsetal lobe that is much shorter and triangular. The single projecting aciculum at maximum development has a characteristic shape, not found in the type from southern South America; in its distal end it is sharply recurved in the form of an inverted capital J; its basal shaft is dark to light brown, its distal end is paler. The aciculum is accompanied by about six slender pointed setae.

The pygidium is surrounded by a thick flange and two pairs of tapering cirriform appendages; a longer pair is inserted at the sides and a shorter pair ventrally; the largest are slightly longer than the depth of the anal ring and the others are about two-thirds as long.

The individuals from Lower California were first thought to differ from *S.* (*L.*) *ohlini* from Tribune Bank, South America, especially because of the sharply recurved acicula in abdominal neuropodia. It was found however that these characteristic recurved acicula are absent from anterior abdominal neuropodia. In other respects, especially in the greatly depressed thorax, the unadorned thoracic neuropodia, and the cuspidate thoracic uncini, there is close agreement.

Distribution.—S. (*L.*) *ohlini* is recorded from southern South America (Ehlers, 1901) and off Lower California, Mexico.

Scoloplos (Leodamas) marginatus (Ehlers) 1897

Aricia marginata Ehlers, 1897, pp. 95-97, pl. 6, figs. 150-156; Ehlers, 1908, pp. 116-117; Monro, 1930, p. 144.
Scoloplos marginatus Monro, 1936, p. 159; Monro, 1939b, pp. 123-124.
Scoloplos (*Leodamas*) *marginatus* Hartman, 1953, p. 38.

The thorax consists of 11-14 or up to 18-19 segments; transition to the abdomen is abrupt thereafter. The prostomium is acutely conical and longer than wide. Branchiae are present from the sixth setigerous segment and continue on all other segments; they are simple and undivided. Thoracic neuropodia have uncini only. Abdominal neuropodia have singly occurring yellow curved acicula that extend from the neuropodial lobe. Furcate setae are present in abdominal notopodia.

The last six thoracic segments have a postsetal lobe at the middle of the neuropodial ridge, differing in this respect from *S.* (*L.*) *ohlini* (see above). The variety *mcleani* Benham (1921, p. 78) differs from the stem species in that posterior thoracic neuropodia are said to have three to six dark spines behind and below the uncini.

Distribution.—Scoloplos (*Leodamas*) *marginatus* comes from Antarctic and subantarctic regions in shallow depths to 270 fathoms.

Scoloplos (Leodamas) cirratus (Ehlers) 1897

Aricia cirrata Ehlers, 1897, pp. 94-95, pl. 6, figs. 148, 149.
Scoloplos (*Leodamas*) *cirratus* Hartman, 1953, p. 38.

Branchiae are present from the sixth setigerous segment to the end; they are simple. The thorax consists of 27 to 31 segments. A subpodial lobe resembling a ventral cirrus is present from segment 20-25, or from about the sixth last thoracic segment, and continues through 18 anterior abdominal segments. The last six thoracic neuropodia have a podial lobe at the midlength of the setigerous ridge.

Distribution.—Scoloplos (*Leodamas*) *cirratus* is known only from the vicinity of the Falkland Islands off southern South America, in shallow depths to 62 fathoms.

Scoloplos (Leodamas) johnstonei (Day) 1934

Scoloplos johnstonei Day, 1934, pp. 58-60, fig. 11.

This species is here referred to the subgenus *Leodamas* because branchiae are present from the sixth setigerous segment; the presence of projecting acicula from abdominal neuropodia is not established but in other respects the species agrees with those of this subgenus. The prostomium is acutely pointed and longer than wide. Thoracic neuropodia have three rows of uncini that are distally curved and smooth. Thoracic parapodia have no podial or subpodial lobes and thus agree with those of *S.* (*L.*) *ohlini* (Ehlers) with which *johnstonei* may have its nearest affinities.

Distribution.—Scoloplos (*Leodamas*) *johnstonei* is recorded only from South Africa.

Scoloplos (Leodamas) tribulosus (Ehlers) 1897

Aricia tribulosa Ehlers, 1897, pp. 91-94, pl. 6, figs. 141-147.
Scoloplos tribulosus Eisig, 1914, p. 408; Fauvel, 1941, p. 286.

This species is here referred to the subgenus *Leodamas* because the branchiae are first present from the fifth to seventh setigerous segments; the thorax consists of 25 to 28 segments. Subpodial lobes are absent.

Distribution.—Scoloplos (*Leodamas*) *tribulosus* is known from southern South America in intertidal zones.

Scoloplos (Leodamas) rubra (Webster) 1879

Plate 32, figs. 1-6

Aricia rubra Webster, 1879, pp. 253-255, pl. 9, figs. 123-126.

Scoloplos (Leodamas) rubra Hartman, 1951, pp. 74-76, pl. 20, figs. 1-6.

Collections.—Many from littoral sands in North Carolina and Florida.

The body is long, slender and greatly depressed in the thorax; length is about 70 and width only 1 mm. The prostomium is acutely pointed and longer than wide; it lacks eyes (fig. 1). Transition from thorax to abdomen is at segment 24 or 25 and more or less abrupt. Branchiae are first present from the sixth and continue on all other segments; they are simple, lingulate throughout and conspicuously fimbriated.

Thoracic neuropodia have a long transverse postsetal ridge without lobes (fig. 3). They have three to five transverse rows of uncini, most of which are distally curved and have transverse rows of ridges (fig. 4). Abdominal parapodia have a long tapering notopodial postsetal lobe and a similar, though smaller, neuropodial postsetal lobe (fig. 2). Furcate setae (fig. 6) accompany the pointed setae in notopodia. Neuropodia have a projecting yellow aciculum that is distally hooked (fig. 5).

Distribution.—*Scoloplos (Leodamas) rubra* is known from eastern and southeastern shores of the United States, in intertidal sandy beaches.

Scoloplos (Leodamas) dendrobranchus, new species

Plate 33, figs. 1-3

Collections.—Encounter Bay, on limestone reef among *Zostera* roots, pebbles and sand (6); Snapper Point in midtidal part of sandy beach (6); and Port Willunga on jetty piles and dug up from sand (4); all from South Australia, collected by S. J. Edmonds.

Total length of the largest individual is about 45 mm; greatest width in the middle thorax is about 3 mm; number of segments is 230 or more. The body is greatly depressed in the thorax; it is narrowed forward to an acutely pointed prostomium and backward to a narrower, cylindrical abdomen. The separation between thorax and abdomen is weakly visible except for a change in neuropodial lobes. The posterior end of the body appears unusually ragged because of the extensively divided branchiae (fig. 2).

The prostomium is longer than wide and only slightly depressed; there are no visible eyes. The nuchal organs are large, transversely oval invaginations at the sides, located near the anterior margin of the peristomium. The proboscis, partly everted in some individuals, is a large vesicular pouch. Only the first segment is a simple, smooth ring, longer than the first setigerous segment and narrower. Transition from thorax to abdomen occurs at setigerous segments 15 to 18. Parapodia of the first 12 segments are lateral; thereafter they shift upward and become dorsal in the abdomen.

Branchiae are first present on the eighteenth setigerous segment and are thus entirely abdominal. The first pairs are slender, digitate simple lobes, located at the dorsal base of the notopodium, leaving a wide middorsal space bare. They are visibly fimbriated at their lateral margins. Farther back they slowly increase in size. At about segment 80 there is an occasional divided branchia but many segments continue to have simple ones. In the posterior half of the body the branchiae rapidly divide dichotomously so that in the posterior fourth of the body they are all branched, with as many as six terminal filaments (fig. 2); together they form a dense mass of filaments over the dorsum of the body.

Parapodia from the first segment are well developed but there is a gradual increase in the development of neuropodial fascicles to about segment ten, after which the fascicles diminish through segments 11 to 15 and gradually become more limited. Notopodial and neuropodial postsetal lobes from the first segment are long, triangular; in middle thoracic segments they are foliaceous (fig. 1) with the neuropodial one the larger. The third thoracic notopodium has a digitate postsetal lobe and about 12 pointed setae, with the longest ones in the upper part of the fascicle. Each seta is distally tapered to a point and closely barred along its length. The corresponding neuropodia have a shorter postsetal lobe; their setae are similar but shorter, with the longest ones in the upper and lowermost positions in the fascicle; in addition there are 8 to 14 uncini in a single series, located in the anterior and inferior part of the fascicle in a line approximating the shape of a printed letter J, with the long end of the letter at the anterior end and the short one at the posterior end. The uncini are distally blunt, slightly curved and have no hood; at their outer curved region they are closely but vaguely pectinated. Other thoracic parapodia resemble those of the third segment but are larger as far as the eleventh to fourteenth segment, after which there is a gradual diminution. By the eighteenth segment there are only about seven uncini in a neuropodial fascicle, accompanied by a small number of pointed setae.

Abdominal parapodia have longer postsetal lobes (fig. 2) than those in front; they are provided with long pointed setae and embedded acicula; furcate setae have not been found. Neuropodia have slender fascicles of long pointed setae supported by a single projecting yellow aciculum (fig. 3) sharply curved near its distal end.

There are no subpodial lobes, ventral cirri or interramal cirri.

Scoloplos (*Leodamas*) *dendrobranchus* belongs to a small group of orbiniids in which abdominal segments have branched branchiae. *S.* (*Leodamas*) *latum* Chamberlin (see below) from off Pacific Panama is another one but it differs in that the branching is palmate instead of dichotomous.

Distribution.—South Australia in intertidal zones, associated with sand, *Zostera* beds and mixed bottoms.

Scoloplos (Leodamas) latum (Chamberlin) 1919

Branchethus latum Chamberlin, 1919a, pp. 358-361, pl. 64, figs. 7-11, pl. 65, figs. 1-2.

Scoloplos latus Fauvel, 1932a, pp. 167-169, fig. 28 a-e.

This species is here referred to the subgenus *Leodamas* because branchiae are present from the sixth or fifth setigerous segments. The thorax consists of about 20 segments. The prostomium is acutely pointed and has no eyes. Branchiae are simple and undivided through about eight segments and thereafter divided. At the thirteenth to fifteenth branchial pairs there are about three branches, and thereafter there is an increase to as many as nine filaments in palmate arrangement. In posterior segments the branching decreases so that branchiae are again simple and reduced.

Distribution.—*Scoloplos* (*Leodamas*) *latum* was first described off Pacific Panama in 322 fathoms, green mud; it is further reported from Akyab, Burma, in 250 fathoms (Fauvel, 1932a).

Scoloplos (Leodamas) fimbriatus, new species

Plate 34, figs. 1-5

Collections.—Corney Point (1) and Troubridge Beach (12), Yorke Peninsula, South Australia (taken by S. J. Edmonds).

All individuals are fragmented posteriorly, larger fragments consisting of the anterior end and some abdominal segments measuring about 30 mm long and 2-3 mm wide. The thorax consists of 24 to 29 or 30 segments. The transition to abdomen is complete in one segment. The change is most apparent because of the complete disappearance of

uncini and the presence of slenderer, longer parapodia in the abdomen. The prostomium is acutely pointed in front and has no visible eyes. Branchiae are first present from the seventh setigerous segment and increase in size, so that within two segments they are lanceolate or laterally compressed, and terminate in a slender filamentous tip (fig. 2). Branchiae are continued on all segments and are visibly fimbriated along their lateral margins. They are simple, lingulate at maximum development, and directed dorsally.

Thoracic neuropodia have conspicuous transverse, palisaded rows of curved uncini, without pointed setae. At maximum development in the middle thorax, there are about four vertical rows of uncini. The anteriormost row is longest and has the thickest, largest and most sharply curved uncini (fig. 3); those in more posterior rows are gradually slenderer and shorter and less sharply bent near the tip (fig. 4). All are smooth along the shaft and without terminal hood.

Abdominal notopodia have a long, slender postsetal lobe (fig. 2), a fascicle of long pointed setae, and two or three furcate setae; the fascicle is accompanied by a single aciculum which projects slightly from the parapodium. Abdominal neuropodia have a thick acicular lobe and a much shorter subacicular lobe (fig. 2); all setae are pointed and the single aciculum projects from the distal end of the parapodium. Seen in lateral view (fig. 5) the aciculum is slightly curved at its distal end and tapers to a blunt tip.

Posterior thoracic and anterior abdominal (fig. 2) segments are characterized by the presence of subpodial lobes in vertical series. They are first present on about the fifth last thoracic segment, where the neuropodial ridge has a short lobe at its midlength. A longer lobe is located at the ventral edge of the ridge; this resembles a ventral cirrus. In the following segment the neuropodial lobe is longer and there are two equally long slender subpodial lobes. On the last three thoracic segments there are three or four long, slender subpodial lobes. This pattern is continued through about fifteen abdominal segments, but diminishing so that the first three have three slender lobes in a row, the next five or six segments may have only two lobes, and the next six segments have single lobes resembling ventral cirri. Thereafter the lobes are absent.

One specimen has a posterior end with a pygidium; the body narrows posteriorly and terminates in a thickened rim with middorsal incision; a pair of long slender filaments is inserted at the dorsolateral edge. Such a fragment has branchiae present on the last body segment as a pair of small, slender filaments.

Scoloplos (*Leodamas*) *fimbriatus* approaches *S.* (*L.*) *johnstonei* Day in having smooth thoracic uncini. The two differ in that the first has about 30, the second about 23 thoracic segments; branchiae are first present from the seventh segment in the first and from the sixth in the second. Subpodial lobes are multiple in the first and limited to only two lobes on the last thoracic segments in the second species.

S. (*L.*) *fimbriatus* might have affinities with *Scoloplos novae-hollandiae* Kinberg (1866, p. 252, and 1910, p. 63, pl. 24, fig. 8) from Sydney, New South Wales. According to Augener (1922c, p. 41, fig. 9), who emended the original account, the latter has thoracic neuropodial setae of three kinds; some are short, smooth and slightly curved, others are long and capillary, while still others are transitional.

Distribution.—Scoloplos (*Leodamas*) *fimbriatus* is known only from southern and western ends of Yorke Peninsula, South Australia, in intertidal sands.

Alcandra robusta Kinberg, 1866

Plate 31, fig. 5

Alcandra robusta Kinberg, 1866, p. 251; Kinberg, 1910, pp. 62-63, pl. 24, fig. 6; Hartman, 1948b, p. 106.

This species is known only through its original find from off Brazil in 20 to 30 fathoms. The prostomium is pointed conical. The peristomium is a simple smooth ring. Branchiae are present from the fifth setigerous segment and simple on what remains of the type specimen (only thoracic segments). They were originally said to be both simple and divided (bifid). Neuropodia from the second segment have yellow uncini (fig. 5) accompanied by pointed setae. In so far as known, therefore, this species can be referred to *Scoloplos* (*Leodamas*) Kinberg. More specific designation is possible only by a comparison of collections from the type locality.

Genus **Scolaricia** Eisig, 1914
Type **S. typica** Eisig, 1914

This differs from *Scoloplos* (see above) in that abdominal neuropodia have modified setae called flails ("Geisselpfriemen" Eisig, 1914 and "soies en fléau" Fauvel, 1927), in addition to typical pointed setae. Only two species are known and both come from the Mediterranean sea (see list of species above).

Genus **Naineris** Blainville, 1828
Type **N. quadricuspida** (Fabricius) 1780

This is spelled also *Nainereis* Grube, 1850, *Naidonereis* Malmgren, 1867, and *Naidoneris* Webster and Benedict, 1887. It includes *Nais* Fabricius, 1780, *Anthostoma* Schmarda, 1861, *Lacydes* Kinberg, 1866, and questionably *Theodisca* Müller, 1858.

The prostomium is rounded in front. Branchiae are present from the second, or not before about the twenty-third setigerous segment. The thorax consists of 12 to 30 or more segments. Thoracic neuropodial setae may include uncini which are hooded or not, subuluncini, and pointed setae, or all setae may be pointed. Abdominal notopodia have pointed setae sometimes accompanied by furcate setae. Subpodial lobes and interramal cirri are absent. In all segments the branchial bases are widely separated middorsally.

Key to Species of *Naineris*

1. All thoracic setae slender and distally pointed . *N. setosa*
1. Some thoracic neuropodial setae uncinate or subuncinate . . 2
2. Thoracic neuropodial setae largely slender and pointed except for a small ventralmost fascicle of acicular uncini; branchiae present from third setigerous segment . . *N. mutilata*
2. Thoracic neuropodial setae otherwise; branchiae first present on a more posterior segment 3
3. Thoracic neuropodial postsetal lobe double (pl. 38, fig. 6) . . . . . *N. uncinata*
3. Thoracic neuropodial postsetal lobe simple (pl. 35, fig. 1) 4
4. Branchiae reduced in size and not present before about segment 20 to 23 and diminishing in size in posterior abdominal segments, becoming inconspicuous . . *N. nannobranchia*
4. Branchiae larger and not so reduced in abdominal segments 5
5. Thoracic neuropodia provided with uncini (pl. 39, fig. 1) but no subuluncini 6
5. Thoracic neuropodia with uncini and subuluncini (pl. 37, fig. 5) 9
6. Thoracic uncini smooth . . . . . *N. retusiceps*
6. Thoracic uncini ridged, spinous or ornamented along their free length 7

7. Prostomium truncate (pl. 40, fig. 1) at its anterior margin; thoracic neuropodial ridge with a short lobe at its superior edge 8
7. Prostomium more or less rounded in front; thoracic neuropodial ridge with a short lobe at its midlength . . . . . *N. quadricuspida*
8. Thorax with about 17 setigerous segments . *N. grubei*
8. Thorax with 28 segments followed by about ten transitional segments . . . . . *N. grubei australis*
8. Thorax with about 48 setigerous segments . *N. bicornis*
9. Furcate setae absent; transition from thorax to abdomen at setigerous segments 20 or 21; branchiae present from segment 8 or 9 . . . . . *N. jacutica*
9. Furcate setae present; transition from thorax to abdomen variable, from fourth or not before thirtieth segment . . . 10
10. Thoracic postsetal lobe of neuropodia a short restricted ridge (pl. 36, figs. 1, 2); some uncini more or less ridged (pl. 37, fig. 4) . . . . . *N. dendritica*
10. Thoracic postsetal lobe of neuropodia a prolonged foliaceous lobe (pl. 35, figs. 1, 2); uncini smooth (pl. 35, fig. 7) or nearly so . . . . . *N. laevigata*

Naineris hexaphyllum (Schmarda) from southern and western Africa (Augener, 1918, pp. 421-423, as *Scoloplos* (*Naidonereis*)) belongs to the group associated with *Naineris laevigata* (Grube) but is not clearly distinguishable as known at present. In its thoracic parapodial lobes it agrees most closely with *N. laevigata* (Grube) (see below).

Naineris laevigata (Grube) 1855

Plate 35, figs. 1-8

Aricia laevigata Grube, 1855, pp. 112-113, pl. 4, figs. 6-8.
Anthostoma ramosum Schmarda, 1861, p. 62, figs. a-c.
Lacydes havaicus Kinberg, 1866, p. 252.
Aricia armata Hansen, 1882, p. 18, pl. 5, figs. 28-32.
Aricia platycephala McIntosh, 1885, pp. 353-354, pl. 43, figs. 1-3, pl. 22a, figs. 16, 17.
Naidonereis laevigata Augener, 1925, pp. 33-34.
Scoloplos (*Naidonereis*) *laevigata* Augener, 1927, pp. 68-69.
Nainereis laevigata Augener, 1934, pp. 148-149; Monro, 1933d, p. 1045; Hartman, 1948b, pp. 103-104, pl. 15, figs. 1, 2.

Collections.—Many come from southern Florida, Galapagos Islands, Hawaiian Islands (collected by Dr. Robert Hiatt) and Peru (collected by Dr. Wolfgang Weyrauch)

There is considerable variation in the first appearance of branchiae. In some from southern Florida they are present from the fourth setigerous segment; and in some from the Galapagos Islands they are present first on the sixth, eighth or ninth segments and already long and filiform. On others they are absent from the first 11 segments, small on 20 or more segments, and rapidly increase in size only in abdominal segments. The transition from thorax to abdomen is also variable but generally occurs between segments 14 to 30, with an additional two segments transitional. In thoracic neuropodia the postsetal lobe is broadly foliaceous and prolonged at its superior edge (figs. 1, 2). Branchiae are laterally fimbriated.

Thoracic neurosetae include many pointed setae (fig. 4) in two or more anterior series, followed by uncini and subuluncini. The uncini (figs. 6, 7), numbering 5 to 12 in a row, are slenderer than or as heavy as subuluncini and located in more inferior positions. The lowermost are distally hooded (fig. 6); the uppermost are larger and without hood (fig. 7). Subuluncini (fig. 5) are located in the uppermost part of the fascicle behind the pointed setae. They resemble uncini in which the distal end is prolonged and spinous. Thoracic notopodia have slender pointed setae and slender embedded acicula, and in more posterior segments there may be a few furcate setae (fig. 8).

Abdominal notopodia have long pointed setae, one or two furcate setae (fig. 8), and three to five thick, yellow acicula more or less completely embedded or with their distal ends free (fig. 3). The furcate setae have tines of unequal length and a shaft spinous along one side (fig. 8).

Eisig (1914, pp. 450-488) referred a long list of names to this species, including *Anthostoma hexaphyllum* Schmarda, which is considered distinct by Monro (1930, p. 145) and Augener (1918, p. 421) (see also Key to Species above). *Aricia setosa* Verrill is a distinct species; *Naineris robusta* and *N. longa*, both by Moore from California, are here referred to *Naineris dendritica* (see below).

Distribution.—Naineris laevigata is known from cosmopolitan areas in warm seas in littoral zones. In the eastern Pacific Ocean it is known from the Galapagos Islands, Ecuador (Monro, 1933, p. 1045) and Peru (newly recorded herein). It is replaced by the nearly related *Naineris dendritica* in the northeastern Pacific Ocean (see below).

Naineris dendritica (Kinberg) 1867

Plate 36, figs. 1-3; plate 37, figs. 1-7

Anthostoma dendriticum Kinberg, 1867, p. 337.

Naineris robusta and *Naineris longa* Moore, 1909, pp. 262-267, pl. 8, figs. 34-42.

Nainereis hespera Chamberlin, 1919b, pp. 14-15.

Nainereis laevigata Berkeley and Berkeley, 1941, p. 41; Berkeley and Berkeley, 1942, p. 196; Hartman, 1944c, p. 257.

Naineris dendritica Hartman, 1948b, pp. 102-103.

Collections.—901-38 (1), 1204-40 (1), 1222-41 (12), 1228-41 (1), 1315-41 (1), 1370-41 (1), 1437-41 (6), 1443-41 (many), 1445-42 (1), 1446-42 (1), 1447-42 (1), 1449-42 (1), 1457-42 (4), 1459-42 (10), 1464-42 (3), 1468-42 (18), 1472-42 (1), 1474-42 (1), 1477-42 (3), 1487-42 (1), 1488-42 (5), 1490-42 (many), 1491-42 (10), 1492-42 (4), 1501-42 (1), also many others from the northeastern Pacific Ocean from Alaska south to southern California, chiefly from intertidal low littoral zones.

The prostomium is broadly rounded in front. The everted proboscis is much branched and extensive. Branchiae are first present from about segment 12 or rarely as early as 7 or not before segment 14 or 15; the first few pairs are small and they gradually increase in size so that by about segment 30 they meet across the middorsum or stand erect (pl. 36, fig. 2); they are simple and lightly fimbriated along their lateral margins.

Transition from thorax to abdomen is at about segment 20 or not before 30. Thoracic notopodial postsetal lobes are long and triangular; the corresponding neuropodial lobes are fleshy ridges in which the superiormost edge is slightly enlarged so as to resemble a small papilla (pl. 36, figs. 1, 2). This is in contrast with *N. laevigata* (see above) in which this lobe is more or less foliaceous and prolonged at its upper edge. Thoracic neuropodia at maximum development have two or more anterior rows of pointed setae; the anteriormost (pl. 37, fig. 7) are sharply bent and conspicuously denticulated along the cutting edge; those farther back (pl. 37, fig. 6) are transitional between the anteriormost and the subuluncini (pl. 37, fig. 5) which occur in the uppermost part of the fascicle. The posteriormost row has uncini in which the cutting edge is smooth (pl. 37, fig. 3) or transversely ridged (pl. 37, fig. 4), especially for those in the inferiormost position.

Variations in uncini and transitional setae are noted when comparing individuals from Alaska and Washington and south to southern California. Those from northern localities have pale yellow setae; the more southern ones have darker setae and the individuals are proportionately smaller.

Abdominal segments have parapodia (pl. 36, fig. 3) resembling those of *N. laevigata* (compare pl. 35, fig. 3). Notopodia have long pointed setae and a few furcate setae (pl. 37, figs. 1, 2) in which the tines are unequally long and the shaft is spinous. Neuropodia have shorter pointed setae and a transverse series of yellow acicula (pl. 37, fig. 3) extending a short distance from the parapodium.

Naineris dendritica is distinguishable from *N. laevigata* (see above) by characters which may be only subspecific or varietal. They concern mainly the details of postsetal lobes in thoracic neuropodia and microscopic details of the setae and uncini. Their separation is here maintained because of the differences in geographic range (see distribution below).

Distribution.—Naineris dendritica is limited to littoral zones of the northeastern Pacific Ocean from Alaska south to southern California. It is common especially in sandy muds supporting abundant plant growth.

Naineris jacutica Annenkova, 1931

Nainereis jacutica Annenkova, 1931, pp. 204-205, figs. 1-4.

This is said to measure about 85 mm long and it has a prostomial lobe that is semicircular. Branchiae are present from segment 8 or 9 and continue to the end of the body; the first are small but from segment 16 to 18 they are longer than their accompanying postsetal lobes. Transition from thorax to abdomen occurs at segments 20/21. In its details it agrees with *N. laevigata* (see above) except that furcate setae are said to be altogether absent.

Distribution.—Naineris jacutica is recorded from the Sea of Okhotsk and Bering Sea.

Naineris mutilata (Treadwell), 1931

Nainereis mutilata Treadwell, 1931, pp. 5-6, figs. 13-18.
Naineris mutilata Hartman, 1956.

The thorax consists of 29 setigerous segments, with the last two transitional. Branchiae are present from the third setigerous segment; the first few are small and they increase in size gradually in the thorax;

they continue to the end of the body. Thoracic neuropodia at maximum development have a broadly foliaceous postsetal lobe longest at its upper edge, much like that of *Naineris laevigata* (see above). They have setae that are almost all long and distally pointed, more or less sigmoid (S-shaped) along their length, and denticulated. In a small inferiormost position there are 8 to 12 much shorter, acicular uncini that are distally blunt and only slightly curved and smooth along their free length; the distal end has a closely fitting hyaline hood.

Abdominal notopodia have long pointed setae and furcate setae. Abdominal neuropodia have about 4 yellow, straight acicula that are distally blunt and slightly projecting from the neuropodial lobe, and a slender fascicle of long pointed setae.

The affinities of *N. mutilata* are with *N. setosa* (Verrill), in which thoracic neuropodia have only pointed setae.

Distribution.—*Naineris mutilata* is known only from Jamaica, West Indies.

Naineris uncinata, new species

Plate 38, figs. 1-8

Naineris sp., Hartman 1955, p. 177.

Collections.—908-38 (1); 1330-41 (1); 1398-41 (many); 1496-42 (1, holotype); 2128-52 (6); 2153-52 (3); 2229-53 (3); 2311-53 (5); 2445-53 (1); 2646-54 (1); 2853-54 (1); another from Alitak Bay, Alaska, shore (1).

Most individuals are fragmented in their posterior ends. Total length of larger ones is about 40 mm or less; width in the thorax is 1.5 to 1.8 mm. The prostomium (fig. 1) is broadly truncate and has no eyes (a juvenile individual from 2853-54, believed to be the same species, has a broadly rounded prostomium with a pair of eyespots near its posterior margin). Nuchal organs at the postectal margins of the prostomium are transversely elongated, papillar processes. The proboscis, everted in some, is spacious and somewhat lobed but not dendritically branched. The first segment is a smooth ring, wider but shorter than the prostomium.

Branchiae are first present from the fifth (fig. 1) or sixth segment; the first few pairs are small and erect; they enlarge gradually in thoracic segments, becoming larger and longer than their accompanying postsetal lobes in abdominal segments (figs. 7, 8). All are simple, lingulate and conspicuously fimbriated along their lateral margins.

Transition from thorax to abdomen is after segment 26 or at segments 17/18 (in 2128-52). Thoracic parapodia have thick, tufted fascicles of notopodial setae and longer series of neuropodial setae (fig. 6). The uncini are coated with a rust-colored extraneous substance but when cleared of it they are pale amber, as are the other setae. Thoracic notopodia have a long, slender postsetal lobe and long pointed setae. The corresponding neuropodia from the first segment have a postsetal ridge with a long papilla at the middle of the ridge. At the seventh segment there is a second lobe (fig. 6) and this is continued through thoracic segments. In transitional segments the lower one resembles a ventral cirrus (fig. 7). These lobes are absent in abdominal segments.

Thoracic neuropodia have pointed setae (fig. 3) and ridged uncini (fig. 4). The first one has 2 to 4 vertical rows of uncini, together totaling about 24, located at anterior and superior positions of the fascicle; about 15 long pointed setae are located in posterior and inferior rows. The second neuropodium is similar to the first but larger. After the third segment the uncini occupy most of the setal fascicle and may form six to ten vertical rows in conspicuous ranks, with a single posterior row of pointed setae. Uncini are sharply curved and have conspicuous transverse ridges at the outer edge (fig. 4). Seen from the ridged side they are distally truncate to excavate and cuspidate in their subdistal region.

Abdominal notopodia have a long, slender postsetal lobe, a fascicle of long pointed setae with a few furcate setae (fig. 8) and several embedded yellow acicula. The corresponding neuropodia have a smaller postsetal lobe (fig. 8), a more delicate fascicle of pointed setae and one or two yellow acicula that may project somewhat from the parapodium. The furcate setae are about as thick as the pointed setae with which they occur but are shorter, the two tines unequally long and the shaft slightly spinous (fig. 5).

Dorsal ciliated mounds are visible through most branchial segments as slight circular elevations somewhat in front of the branchial bases (figs. 1, 6, 7). They are widest apart in the thorax and approach medially in abdominal segments.

Naineris uncinata belongs to the group of species in which thoracic neuropodial setae consist of only pointed setae and uncini. It differs from others in that the neuropodial postsetal lobe is divided in thoracic segments. It is distinguished from nearly related forms in the key above.

Distribution.—The type collection comes from South Slough, Coos Bay, Oregon, in hard packed sand and eel grass; others are from California in littoral depths to 340 fathoms (Hartman, 1955, p. 128), and from southern Alaska, shore.

Naineris nannobranchia (Chamberlin) 1919

Nainereis nannobranchia Chamberlin, 1919c, pp. 260-261, pl. 2, fig. 10, pl. 3, fig. 1.

This species comes originally from Mendocino, California. The thorax consists of 26 segments. Branchiae are first present from segment 20 to 23 and small; they increase in size farther back but are unusually small and inconspicuous and absent in posterior segments. The prostomium is semicircular. Thoracic notopodia have a postsetal lobe that is large, subconical and diminishes in size posteriorly. Thoracic neuropodia have a postsetal lobe that is vertically elongate and broadly convex at the edge. In abdominal neuropodia the postsetal lobe is a small conical process. Thoracic neuropodia have setae of two kinds, including two anterior rows of nearly smooth uncini and subuluncini, and a ventroposterior fascicle of slender pointed setae. Length approaches 50 mm; width is about 3 mm; number of segments about 237.

Distribution.—This is known only from Mendocino, California.

Naineris grubei (Gravier) 1909

Scoloplos grubei Gravier, 1909, pp. 646-649, pl. 18, figs. 49-57.

This species is characterized by having 17 thoracic setigerous segments. Branchiae are present from the seventh and continue on all other segments; they are simple throughout. The prostomium is broadly truncate and has no eyes. The everted proboscis is dendritically branched. Thoracic neuropodia have postsetal lobes that are triangular and longest at the superior end. Thoracic neuropodial setae consist of long pointed and ridged uncini.

Distribution.—*Naineris grubei* comes from Peru and is more widely recorded from Ecuador and Chile (Augener, 1933c, p. 63).

Naineris grubei australis, new subspecies

Plate 39, figs. 1-4

Collections.—Port Noarlunga (1), Encounter Bay (1), both south of Adelaide and Troubridge, Yorke Peninsula (1), all from South Australia, collected by S. J. Edmonds.

Length of a posteriorly incomplete individual is 40 mm; width in the thorax or widest part of the body is about 3 mm. The thorax consists of 28 segments and is followed by a long transitional region comprising segments 29 to 38; thereafter the change to abdominal neuropodia is

complete. The prostomium is truncate at its frontal margin and has no eyes. Branchiae are present from the sixth segment and already so large as to extend distally as far as the postsetal notopodial lobe of the same segment. Farther back they increase in size and are densely fimbriated at their lateral margins (fig. 4). On each segment the two branchiae are widely separated middorsally and connected by a raised ciliated ridge.

Thoracic notopodia resemble those of the stem species. Neuropodia of the first segment have a short papillar lobe at the middle part of the postsetal ridge. By the seventh segment the lobe is about a third of the distance from the upper end of the ridge and by the tenth segment it is at the uppermost edge of the ridge and longer. Neuropodial setae are of two kinds; some are distally pointed (fig. 2), others are uncini. The pointed setae resemble those of notopodia. Uncini are partly smooth along the free ends and partly ridged at the outer edge (fig. 1); some have a hyaline hood at the distal end.

Abdominal notopodia have a long, slender, distally tapering postsetal lobe (fig. 4) and carry a fascicle of long, pointed setae. Furcate setae are absent. Abdominal neuropodia have a much shorter postsetal lobe broadly triangular at the base and prolonged distally from the superior part of the lobe. There are three to five yellow acicula in transverse series with the distal ends projecting from the parapodium. The largest and longest aciculum is uppermost and there is a gradual decrease in size and length going ventrally. The accompanying setae are long, slender and distally pointed.

Naineris grubei australis resembles the stem species in the shape of the prostomium, the early occurrence of branchiae and the kinds of setae and uncini. In the subspecies, branchiae are present from the sixth instead of seventh segment; the transition from thorax to abdomen is at segments 29 to 38 in the subspecies and at segment 17 in the stem species.

Distribution.—*Naineris grubei australis* has been taken only in southeastern Australia in the vicinity of Adelaide, South Australia.

Naineris bicornis Hartman, 1951

Plate 40, figs. 1-6

Naineris bicornis Hartman, 1951, pp. 72-74, pl. 19, figs. 1-6.

Collections.—This has been taken only from Florida in the Gulf of Mexico in intertidal sandy beaches.

Total length is about 30 mm, greatest width 5 mm and segments number over 100. The prostomium is truncate and slightly emarginate at its frontal margin (fig. 1); the everted proboscis is voluminous and somewhat lobed. Parapodia from the first segment have elongate postsetal lobes. Branchiae are present from the sixth setigerous segment and

increase in size farther back. The thorax is deeply depressed (fig. 2), and its transition to the abdomen is at segments 45 to 50.

Thoracic neuropodia have a long postsetal flange from the upper edge of which a triangular lobe projects (fig. 2). They have uncini with transverse serrations and a distal sheath (fig. 4), and pointed setae with sharply bent tip and transverse serrations (fig. 5). Abdominal notopodia have furcate setae (fig. 6) accompanying the pointed setae.

Distribution.—*Naineris bicornis* has been reported only from western Florida.

Naineris setosa (Verrill) 1900

Plate 41, figs. 1-6

Aricia setosa Verrill, 1900, pp. 651-653.

Naineris setosa Hartman, 1942a, p. 61, figs. 116-118; Hartman, 1951, pp. 67-70, pl. 17, figs. 1-6.

Collections.—Southwestern Florida (many), Puerto Rico (7), 2597-54 (1).

This differs from other species of the genus in lacking uncini and subuluncini. The prostomium is broadly truncate (fig. 1) and the everted proboscis is voluminous and multilobed (fig. 2). The thorax is somewhat depressed (fig. 3). Transition from thorax to abdomen occurs between segments 25 to 35. Branchiae are first present from the sixth (or fourth) setigerous segment; they are long and erect throughout the body (figs. 3, 4, 5) and widely separated across the middorsum. Thoracic neuropodia consist of a broad foliaceous lobe prolonged at its superior edge (fig. 3).

A subpodial lobe resembling a ventral cirrus (fig. 4) is present in anterior and middle abdominal segments; farther back it is absent (fig. 5). Furcate setae with a spinous shaft (fig. 6) accompany pointed setae in abdominal notopodia.

Distribution.—*Naineris setosa* was first described from Bermuda and has been found more extensively in the eastern end of the Gulf of Mexico and Puerto Rico; it is here newly recorded from off Acapulco, Mexico, in 13 fathoms.

Genus Califia, new genus
Type C. calida, new species

The prostomium is short and triangular. The first segment or peristomium is a smooth ring. The thoracic region is depressed near the middle. Transition from thorax to abdomen is abrupt with the change

most apparent because of the difference in neuropodia. Branchiae are simple and lanceolate and first present from about the eighth segment; they are continued back to or near the posterior end and widely separated from each other across the middorsum. Neuropodial setae of the first three segments differ from those farther back in having coarser shafts and brushy tips (pl. 42, fig. 2); all other thoracic setae are slender and distally pointed. Furcate setae are present in abdominal notopodia. Postsetal lobes of both notopodia and neuropodia are simple, longer to shorter slender lobes. Parapodia are lateral to dorsolateral in posterior segments. There are no interramal or ventral cirri, no subpodial or ventral fringe and no uncinate hooks or spines.

Califia differs from other orbiniids in having the first three setigerous segments modified and provided with special setae and parapodia directed laterally to dorsolaterally. A single species, *C. calida*, new species, is known.

Califia calida, new species

Plate 42, figs. 1-3

Orbiniid n.g. and sp. Hartman, 1955, p. 179.

Collections.—1995-50 (1); 2219-53 (1); 2230-53 (1); 2301-53 (1); 2324-53 (1-); 2343-53 (1); 2410-53 (2); 2411-53 (2); 2412-53 (1); 2428-53 (2); 2441-53 (2); 2628-54 (1); 2635-54 (1); 2723-54 (3); 2798-54 (2), all stations in San Pedro Basin, California, in 235 to 418 fathoms in green mud, especially associated with siliceous sponge.

All individuals are fragmented; total length is 80 to 100 mm with the greatest width, between segments 7 to 10, about 6.5 mm. The body tapers slightly farther back and more rapidly to the small prostomium. Abdominal fragments are readily identified in mixed collections by the presence of a conspicuous black mid-dorsal spot in the form of an anvil, located on a segmental depression between successive welt-like ridges continuous with the inner branchial bases. The greatly prolonged slender notopodial postsetal lobes and neuropodial bases of posterior segments are also very characteristic.

The prostomium is a short, equitriangular inconspicuous lobe without eyes. Nuchal organs are visible at the posterolateral margins and their depressions extend back on the peristomium. In some individuals a large, multibranched, epithelial proboscis is everted and conceals the ventral side of the first segment. The peristomium or first ring is about as long as the prostomium and two and one-half times as broad at its posterior end. The body widens rapidly in the first few segments, so that this region appears inflated.

The thorax consists of 13 or 14 setigerous segments with the transition abrupt thereafter; it is most noticeable through the change in neuropodial setal fascicles. The first three setigerous segments differ from those farther back especially for the presence of brush-tipped (fig. 2) setae with a thick stalk. The third parapodium has a slender postsetal notopodial lobe and a similar though thicker lobe in the neuropodium (fig. 1). The notopodial fascicle consists of many slender setae extending distally in fan-shaped series. The corresponding neuropodium has setae of two abruptly different kinds. Most have a brushy tip of which some are finer (fig. 2), others coarser (fig. 3); about eight others are slender and capillary, in a close tuft at the superior end of the series. The largest brush-tipped setae are behind and below the smaller ones, in a series of 14 to 20, and in line with the postsetal lobe; the anteriormost series number about 24 in a row. The shaft of the smaller ones is more strongly transversely ridged but otherwise similar.

Parapodia of more posterior thoracic segments have postsetal lobes that are very long, slender and similar to one another. Their setae are of a single kind, slender, distally pointed, with transverse serrations along the outer exposed part. Notopodial acicula are pale yellow and number several in a close sheath.

Branchiae are first present from the eighth setigerous segment; the first are small, slender and tapering; farther back they increase in size but are nowhere conspicuous. They are simple, entire lobes with an occasional one abnormally bifid; their lateral margins are inconspicuously fimbriated. In some individuals there is a diminution in size, so that in far posterior segments the branchiae are very small; in others they are long and slender, exceeding in thickness and length their accompanying notopodial postsetal lobe. Branchiae of a segment are widely separated middorsally; a fleshy welt-like ridge is continued across the dorsum between the branchial bases, but seemingly lacks fimbriae.

Thoracic neuropodia have a short to long postsetal lobe located at or near the midlength of the postsetal ridge. It is shortest in front and increases posteriorly to a long, tapering cirruslike lobe in both notopodia and neuropodia.

Abdominal neuropodia have a prolonged base extending far beyond the corresponding notopodia. The distal end is bifid, comprising a rounded presetal (or superior) part and a slenderer, equally long postsetal (or inferior) lobe. A single yellow aciculum extends to the end of the neuropodium or slightly emerges from the lower edge of the presetal lobe; one or two very slender capillary setae accompany the acicu-

lum. Abdominal notopodia have a very long, cirriform postsetal lobe exceeding in length the notopodial base. Setae include a slender fascicle of three to five pointed setae, one or two furcate setae in which the two tines are unequally long and the shaft smooth, and two or more delicate, yellow completely embedded acicula.

The ventral side of the body is smooth. There is no color except for the dark to black spots on the middorsum, and the dusky appearance of the prostomium and first few segments.

Distribution.—Califia calida is a deep-water species known only from the deeper parts of San Pedro area, California, associated with siliceous sponge. It is reported as orbiniid, new genus and species (Hartman, 1955, p. 179).

APISTOBRANCHIDAE Mesnil and Caullery, 1898

As Apistobranchiens Mesnil and Caullery, 1898, p. 147.

This small family, known for only three species in as many genera, is nearly allied to the Orbiniidae (above) and Paraonidae (below) and is considered transitional between them. It is distinguished for having parapodia with reduced notopodia (weakly biramous) or entirely uniramous. Only one species, *Ethocles typicus* Webster and Benedict, 1887, is known from the Western Hemisphere. The most recent study (Wesenberg-Lund, 1951, pp. 59-65) enumerates the characters and recognizes the genera named in the key below. The family was first distinguished from the Orbiniidae (as Ariciens) by Mesnil and Caullery (1898, pp. 147-149).

Key to Genera

1. Segments 5 to 12 with postsetal neuropodial lobes cirriform in shape . . . . . *Apistobranchus*
1. Segments 5 to 12 with fringed postsetal lobes 2
2. Segments 7 to 11 with fringed neuropodial postsetal lobes; first segment without a ventral lobe . . . . *Skardaria*
2. Segments 8 to 12 with fringed neuropodial postsetal lobes; first segment with a ventral lobe . . . . . *Ethocles*

A list of the genera and species with known localities follows.

Apistobranchus Levinsen, 1883, p. 114, with one species, *A. tullbergi* (Théel), 1879, pp. 45-48, first described from Nouvelle Zembla, European Arctic Ocean, and from western Europe in muddy bottoms (Eliason, 1916, pp. 6-9, figs. 1, 2 and Eliason, 1920, p. 39-40).

Ethocles Webster and Benedict, 1887, p. 733, with one species, *E. typicus* Webster and Benedict, 1887, pp. 733-35, pl. 6, figs. 77-85, from New England in soft bottoms.

Skardaria Wesenberg-Lund, 1951, p. 59, with one species *S. fragmentata* Wesenberg-Lund, 1951, pp. 59-65, figs. 1-4, from Iceland.

PARAONIDAE Cerruti, 1909

Includes Levinseniens Mesnil and Caullery, 1898.

Historical

Members of the Paraonidae are best known through studies by Mesnil and Caullery (1898, pp. 126-150) and Cerruti (1909, pp. 459-512). The former recognized the affinities of the paraonids with the Orbiniidae and Apistobranchidae (see above) and erected a new family, Levinseniens, for a species that had been earlier placed in the Spionidae. The studies of Cerruti are notable for reviewing previous works and presenting copies of most earlier illustrations. A comprehensive anatomical description is given for *Aricidea jeffreysii, sensu* Cerruti. This species and three others, *Cirrophorus branchiatus* Ehlers, *Paraonis* (*Paraonides*) *neapolitana* Cerruti, and *P.* (*Paraonis*) *paucibranchiata*, are recorded from the Mediterranean Sea; *Paraonis* (*Paraonis*) *fulgens* (Levinsen) and *Levinsenia gracilis* (Tauber) are reviewed. Fauvel (1927a, p. 72) added *P.* (*Paraonis*) *tenera* Grube and *P.* (*Paraonides*) *lyra* Southern to the list of species for France.

The oldest species, *P. tenera* Grube, 1872, comes from the Mediterranean Sea. *Aricidea jeffreysii* (McIntosh) 1879, as *?Scolecolepis*, originated from Davis Strait, Greenland, in 20 fathoms. Whether this is the same as the one so called from southern Europe is still uncertain. The identity has been questioned by Fauvel (1936a, pp. 65-66), who studied specimens from Morocco.

Cerruti (1909, p. 493) regarded *Aricidea nolani* Webster and Benedict, 1887, from Maine as identical with *A. jeffreysii* (but see below). Fauvel (1927a, p. 70) accepted Cerruti's classification but in the key to genera and species *Paraonis* and *Paraonides* are given in reversed order. More recent studies have been concerned mainly with the addition to specific ranks (see list below).

Family Characteristics

Most members of Paraonidae are small to very small, threadlike forms; the largest measure about 40 mm long and most are between 10 and 20 mm long and small species are 8 mm long or less. Segments are numerous, indefinite in number, and range to 150 (Hartman, 1944d, pp. 314-317). Their resemblance to the Orbiniidae and Apistobranchidae is emphasized by the presence of dorsally directed, laterally fimbriated branchiae. In the Paraonidae, however, the branchiae are not present before the fourth or fifth segment and are absent from a long to short posterior end of the body. In the Apistobranchidae the branchiae are present from the first parapodium and in the Orbiniidae the branchiae are present to the end of the body. Resemblance to the Spionidae is suggested by the shape of the prostomium and by the hooded neuropodial uncini. In *Cirrophorus* resemblance to some Cirratulidae is noted in the presence of heavy acicular spines in some parapodia.

The body consists of a prostomium that is clearly visible, a prebranchial region of three to many segments, a branchial region of 8 to 60 or more segments, and a long postbranchial region. The anal end or pygidium usually has a pair of lateral and a midventral process. The prostomium is semicircular to depressed conical or truncate in front; in some species it narrows posteriorly, in others it widens. Paired eyespots are present at the sides or they are absent. A pair of nuchal organs resembling semicircular slits is sometimes conspicuous at the sides of the prostomium. A median antenna is present (*Aricidea*) or absent (*Paraonis*); it is simple and cirriform or long to short, or clavate to short and papillar; it is rarely branched in its terminal part.

The proboscis is an eversible epithelial pouch, not known to be branched or lobed. The first or second visible segment has biramous parapodia provided with setae. In the prebranchial region both rami have long slender capillary setae. The notopodial postsetal lobe (called also dorsal cirrus) may be prolonged and triangular or cirriform or inconspicuous. The corresponding neuropodial lobe (called also ventral cirrus) may be similar but is broader at the base and shorter or absent.

The branchial region is usually wider than the rest of the body and sometimes broadly depressed; its parapodia are larger and its setae stronger and more numerous than those in other segments. Notopodia have distally pointed setae sometimes accompanied by furcate (lyre) setae; its postsetal lobes may be long and cirriform to foliose or divided.

Neuropodia have palisaded rows of long, distally pointed setae that may be sigmoid (S-shaped) and somewhat limbate (winged) in their distal part. The neuropodial postsetal lobe may be short to long; it may be expanded or inflated at the base. Branchiae are simple, cylindrical to broadly flattened and laterally fimbriated; they arise above the notopodium and are directed upward. Their shape, number and distribution are of specific importance.

Postbranchial segments are slenderer than those in front; they are usually cylindrical in cross section or appear moniliform. Their notopodia have only slender pointed setae sometimes accompanied by furcate setae or acicular spines. A long to short filiform postsetal lobe is present or absent. Neuropodia have slender distally pointed setae, sometimes accompanied by uncini which may be acicular or distally bidentate, or hooked; the distal end may be covered with a hyaline hood that is rounded or pointed.

Genital papillae have been described for *Paraonis* (*Paraonis*) *gracilis* (Monro, 1930, pp. 151-152), located in segments 30 to 60, a little below and in front of the parapodium. The posterior end tapers to a pygidial ring provided with a pair of ventrolateral processes, sometimes accompanied by a shorter to longer midventral one; or it may be somewhat subspherical or the pygidium may be an unadorned collarlike ring.

Anatomical details have been given by Mesnil and Caullery, 1898, pp. 133-136.

Nothing is known of their reproduction (Thorson, 1946, p. 103). The large size of ova (see *Paraonis gracilis oculata*, below) suggests that there are no pelagic larvae.

Systematic Discussion

Original generic, subgeneric, specific and subspecific names are listed alphabetically with citation unless discussed below. They are:

Aonides fulgens Levinsen, 1883, pp. 101-103. Denmark. Referred to *Paraonis* (*Paraonis*) *fulgens* (Levinsen), see Fauvel, 1927a, p. 71, fig. 24 g-l.

Aonides gracilis Tauber, 1879, p. 115. Denmark. Referred to *Paraonis* (*Paraonis*) *gracilis*, see Cerruti, 1909, p. 504.

Aricidea Webster, 1879, p. 255, erected for *A. fragilis* Webster, see below.

Aricidea (*Aedicira*), new subgenus, erected for *Aricidea pacifica* Hartman, see below.

Aricidea (*Aedicira*) *belgicae* (Fauvel) 1936, as *Paraonis belgicae*. Antarctic regions, see below.

Aricidea (*Aedicira*) *pacifica* Hartman, 1944d, p. 316-17, pl. 27, figs. 8, 9. California, see below.

Aricidea ?(*Aedicira*) *ramosa* (Annenkova) 1934. Arctic regions, see below.

Aricidea ?(*Aedicira*) *suecica*, *sensu* Wesenberg-Lund, 1950. North Atlantic Ocean, abyssal, see below.

Aricidea alata Treadwell, 1901, p. 202, figs. 58-60. Puerto Rico. Referred to *Laonice cirrata* (Sars), see Hartman, 1941, p. 294.

Aricidea antennata Annenkova, 1934, p. 658, fig. 2, 3b. Sea of Okhotsk. Referred to *Aricidea uschakovi*, see Annenkova, 1937, p. 173.

Aricidea (*Cirrophorus*) Ehlers, 1908, erected for *Cirrophorus branchiatus* Ehlers, see below.

Aricidea (*Cirrophorus*) *aciculata*, new species, see below.

Aricidea (*Cirrophorus*) *branchiata* Ehlers, 1908, pp. 124-126, pl. 17, figs. 5-9. Southern South Africa in 117 meters, see below.

Aricidea (*Cirrophorus*) *furcata*, new species, see below.

Aricidea (*Cirrophorus*) *lyriformis* (Annenkova) 1934. White Sea and Tartar Strait in 135 to 240 meters, as *Paraonis* (*Paraonides*) *lyriformis* Annenkova, see below.

Aricidea fauveli, new name for *Aricidea jeffreysii*, *sensu* Fauvel, 1936, see below.

Aricidea fragilis Webster, 1879, pp. 255-257, pl. 9, figs. 127-132. Virginia, see below.

Aricidea fragilis Fauvel, 1936, pp. 65-66, figs. 6, 7, Morocco. Referred to *Aricidea fauveli*, see below.

Aricidea heteroseta Hartman, 1948a, p. 33-36, fig. 9. Alaska. Referred to *Aricidea suecica*, see below.

Aricidea jeffreysii (McIntosh) 1879, as *Scolecolepis* (?) *jeffreysii* McIntosh. Greenland, see below.

Aricidea jeffreysii, *sensu* Cerruti, 1909, p. 469. Mediterranean Sea, see below.

Aricidea jeffreysii, *sensu* Fauvel, 1927a, p. 75, fig. 25 a-e. Western Europe. Referred to *Aricidea* ?*fauveli*, see below.

Aricidea longicornuta Berkeley and Berkeley, 1950, pp. 53-55, fig. 2. Western Canada. Referred to *Aricidea uschakovi*, see below.

Aricidea lopezi Berkeley and Berkeley, 1956, p. 542, figs. 1-3. Lopez Island, Washington, in 21.6 meters, mud, see below.

Aricidea nolani Webster and Benedict, 1887, pp. 740-41, pl. 8, figs. 97, 98. Maine. Incompletely known, see chart below.

Aricidea pacifica Hartman, 1944d, pp. 316-317, pl. 27, figs. 8, 9. California. Referred to *Aricidea* (*Aedicira*) *pacifica*, see below.

Aricidea quadrilobata Webster and Benedict, 1887, pp. 739-740, pl. 7, figs. 93-96. Maine. Incompletely known, see below.

Aricidea ramosa Annenkova, 1934, pp. 657-658, fig. 3A. Arctic Siberia. Referred to *Aricidea* ?(*Aedicira*) *ramosa*, see below.

Aricidea suecica Eliason, 1920, pp. 52-55, figs. 14, 15. Denmark, see below.

Aricidea near *suecica* Eliason, 1920. California, see below.

Aricidea uschakovi Zachs, 1925, pp. 1-3. Kola Fjord, Russian Arctic Ocean, see below.

Cirrophorus Ehlers, 1908, p. 124, erected for *C. branchiatus* Ehlers. Referred to *Aricidea* (*Cirrophorus*), see below.

Levinsenia Mesnil, 1897, p. 93, and Mesnil and Caullery, 1898, p. 127. Erected for *Aonides fulgens* Levinsen and referred to *Paraonis* (*Paraonis*) Grube, 1878, see Cerruti, 1909, p. 495.

Paraonis Grube, 1872, p. 58, erected for *P. tenera* Grube. Redefined by Cerruti, 1909, p. 498, for *Aonides gracilis* Tauber, 1879, see below.

Paraonis belgicae Fauvel, 1936b, pp. 29-31, fig. 3. Antarctic Ocean. Referred to *Aricidea* (*Aedicira*) *belgicae*, see below.

Paraonis dubia (Augener) 1914, pp. 31-32. Southwestern Australia, as *Scoloplos* (*Naidonereis*) *dubius*, see Augener, 1923, p. 72, and below.

Paraonis filiformis Hartman, 1953, p. 39, fig. 12b-c. South Georgia, Antarctic regions, in 75 to 310 meters. Referred to *Paraonis gracilis*, see below.

Paraonis fulgens (Levinsen) 1883, as *Aonides fulgens*. Denmark, see Fauvel, 1927a, p. 71, fig. 24 g-l.

Paraonis gracilis (Tauber) 1879, as *Aonides gracilis*. North Atlantic Ocean, see below.

Paraonis gracilis oculata, new subspecies. California, see below.

Paraonis ivanovi Annenkova, 1934, p. 656, fig. 1A. Northern Bering Sea in 1500 to 2000 meters, see below.

Paraonis multibranchiata, new species, California, see below.

Paraonis (*Paraonides*) Cerruti, 1909, p. 493, erected for *P.* (*P.*) *neapolitana* Cerruti, 1909, see Fauvel, 1927a, p. 73, fig. 25 h, i, and below.

Paraonis (*Paraonides*) *gracilis* Monro, 1930, pp. 150-152, fig. 58. South Georgia. Possibly *Paraonis gracilis*, see below.

Paraonis (*Paraonides*) *lyra* Southern, 1914, p. 94-5, fig. 22. Ireland. See Fauvel, 1927a, p. 72, fig. 24 a-f.

Paraonis (*Paraonides*) *neapolitana* Cerruti, 1909, pp. 493-495, pl. 18, figs. 7, 19-21. Gulf of Naples in 5 meters.

Paraonis paucibranchiata Cerruti, 1909, pp. 498-500, pl. 18, figs. 8, 27. Mediterranean Sea.

Paraonis tenera Grube, 1873. Adriatic Sea. Incompletely known, see Fauvel, 1927a, p. 72.

Scolecolepis (?) *jeffreysii* McIntosh, 1879, pp. 506-507, figs. 13, 14. Davis Strait, Greenland, in 20 fathoms. Referred to *Aricidea jeffreysii*, see below.

Scoloplos (*Naidonereis*) *dubius* Augener, 1914, pp. 31-32, pl. 1, fig. 5, text-fig. 3. Sharks Bay, southwestern Australia. Referred to *Paraonis dubia*, see Augener, 1923, pp. 72-75, fig. 25.

In addition, *Heterospio* Ehlers (1874, pp. 296-297), erected for *H. longissima* Ehlers from the northeastern Atlantic Ocean in 426 fathoms, shows affinities with the paraonids rather than with the spionids; however the branchial processes are said to be present from the first segment, as in members of Apistobranchidae.

Key to Genera and Subgenera

1. Prostomium with a median antenna 2
1. Prostomium without a median antenna 3
2. Modified setae (pl. 43, fig. 3) present in posterior neuropodia . . . . . *Aricidea, sensu stricto*
2. Modified setae (pl. 43, fig. 4) present in posterior notopodia . . . . . *Aricidea* (*Cirrophorus*)
2. Modified setae absent . . . . *Aricidea* (*Aedicira*)
3. Abdominal neuropodia with modified setae (pl. 44, fig. 3) . . . . . *Paraonis, sensu stricto*
3. Abdominal notopodia with modified setae . . . . . *Paraonis* (*Paraonides*)

Genus **Aricidea** Webster, 1879, **sensu stricto**
Type **A. fragilis** Webster, 1870

The prostomium has a median antenna; a pair of eyespots is present or absent. Branchiae are present from the fourth or a later setigerous segment and number 15 to 60 or more pairs; they are absent from posterior segments. Parapodia are present from the first or second visible

segment. Neuropodia of abdominal segments have modified setae that are pseudoarticulate, acicular, sigmoid or slightly curved; their distal ends are uncovered or hooded.

Key to Species

1. Modified setae of posterior neuropodia distally pseudoarticulate (pl. 43, fig. 3) . . . . . *A. fragilis*
1. Modified setae otherwise 2
2. Modified setae with a distal hood (pl. 43, figs. 1, 2) . . 3
2. Modified setae without a hood 4
3. Hyaline hoods of setae distally rounded (pl. 43, fig. 2) . . . . . *A. jeffreysii, sensu* Cerruti
3. Hyaline hoods of setae distally pointed (pl. 43, fig. 1) . . . . . *A. fauveli* and *A. lopezi*
4. Modified setae in part subuluncinate, in part uncinate (pl. 43, fig. 5) . . . . . *A. uschakovi*
4. Modified setae entirely uncinate (pl. 43, fig. 7) 5
5. Modified setae in a series all about equally thick *A. suecica*
5. Modified setae in a series varying from thickest above to slenderest below . . . . . *A.* near *suecica*

CHART SHOWING DIAGNOSTIC CHARACTERISTICS OF SPECIES OF *Aricidea, sensu stricto*

Name of Species	Number of branchial pairs	Number of prebranchial setigers	Character of modified setae	Other unique characteristics
Aricidea fragilis	50-60	3	pseudoarticulate	
Aricidea fauveli and *A. lopezi*	18-25-31	3	acicular with pointed hood	
Aricidea jeffreysii, sensu McIntosh	13	?	?	
Aricidea jeffreysii, sensu Cerruti	12-18	3	acicular with rounded hood	
Aricidea nolani	13-20	3	?	first setae from second segment
Aricidea quadrilobata	9	3	?	first segment with 4 short lobes
Aricidea ramosa	13-18	3	?	prostomial antenna palmately divided
Aricidea suecica	15-19	3	sigmoid acicular	prostomium with eyes
Aricidea near *suecica*	15-30	3	sigmoid acicular	prostomium without eyes
Aricidea uschakovi	23-27	3	subuluncini and uncinl	prostomial antenna very long

Aricidea fragilis Webster, 1879

Plate 43, fig. 3

Aricidea fragilis Webster, 1879, pp. 255-257, pl. 9, figs. 127-132; Hartman, 1944d, pp. 315-316, pl. 27, figs. 4, 5; Hartman, 1945, pp. 8, 30, pl. 6, fig. 3.

Collections.—North Carolina, along shore (more than 50).

Individuals measure about 40 mm long and are attenuated in their posterior part. The prostomium is depressed equitriangular, rounded in front and has a pair of small eyespots; the median antenna is cirriform; nuchal organs are slitlike at the posterior ectal margin. Branchiae are first present from the fourth setigerous segment and number 50 to 60 pairs. Parapodia of branchial segments have a long cirriform notopodial postsetal lobe with a basal enlargement; the corresponding neuropodial postsetal lobe (or ventral cirrus) is largest in branchial segments and disappears gradually in postbranchial segments.

Setae in all anterior segments are long, slender and distally pointed. Median and posterior abdominal notopodia have a long, slender and threadlike postsetal lobe extending distally as far as the shortest accompanying setae, and a slender setal fascicle consisting of about 12 very slender capillary setae. The corresponding neuropodium has a long low postsetal ridge and a full, fan-shaped fascicle of 30 to 40 setae in which the longest are uppermost and there is gradual diminution farther down. In median and posterior segments these neuropodial setae are pseudoarticulate, with a distal, slenderer and tapering part weakly separable from a longer shaft (fig. 3). Breakage is most frequent at this region and may result in a setae that appears distally bifid, with the side opposite the cutting edge resembling a distal arista. There is a visible pubescence on the outer side of the seta at the pseudoarticulate region. The anal end terminates in a collarlike segment with three cirriform processes.

Aricidea fragilis, sensu Fauvel (1936, p. 65), from Morocco, is believed to be a different species because the modified neuropodial setae are hooked and have a terminal hood; it is here renamed *Aricidea fauveli* (see below). *Aricidea fragilis* McIntosh (1885, pp. 354-355), from off New York in 1340 fathoms, is very doubtfully the same because of its abyssal occurrence.

Distribution.—*Aricidea fragilis* Webster as defined herein is believed to occur only in intertidal sandy shores of the eastern United States.

Aricidea fauveli, new name

Plate 43, fig. 1

Aricidea fragilis Fauvel, 1936, pp. 65-66, figs. 6, 7. *Not* Webster, 1879.

This differs from *Aricidea fragilis* (see above) in that posterior neuropodial setae are curved acicular with the tip covered by a pointed hyaline hood (fig. 1). Branchiae are first present from the fourth setigerous segment and number 18 to 31 pairs. *Aricidea jeffreysii, sensu* Fauvel (1927a, p. 75, fig. 25 a-e) from France is perhaps the same (see Fauvel, 1936a, p. 65, for synonymy).

Distribution.—Morocco and possibly other parts of the Mediterranean Sea.

Aricidea lopezi Berkeley and Berkeley, 1956

Aricidea lopezi Berkeley and Berkeley, 1956, p. 542, figs. 1-3.

According to its description, this has three prebranchial setigerous segments; branchiae number 17 or 18 pairs, and posterior neuropodial setae are distally knobbed and covered with a long, pointed hood. In these respects it approaches *A. fauveli* (above) from the Mediterranean Sea. If identical, the specific name, *lopezi*, has priority.

Distribution.—*Aricidea lopezi* Berkeley and Berkeley is known only from Lopez Island, Washington, in 21.6 meters, in mud.

Aricidea suecica Eliason, 1920

Aricidea suecica Eliason, 1920, pp. 52-55, figs. 14, 15.
Aricidea heteroseta Hartman, 1948a, pp. 33-36, fig. 9.

According to the original account, total length is 8 to 14 mm, width is 0.4 to 0.5 mm. The prostomium is cordate and has a short clavate median antenna and a pair of eyespots. The first 3 segments have no branchiae; they have small postsetal lobes and minute neuropodial postsetal lobes (or ventral cirri). Branchiae are present from the fourth segment and are continued on 10 to 15 or 19 to 24 segments, with the higher number on larger specimens. The notopodial postsetal lobe is more conspicuous in branchial than in prebranchial segments and has a basal enlargement; there are no visible postsetal lobes in neuropodia. Parapodia in anterior and branchial segments have only slender, distally pointed setae. Postbranchial neuropodia have curved acicular setae with a distal arista. Farther back the distal arista is absent and the setae are curved in their distal part.

Aricidea suecica, reported from west of Greenland in 1096 to 2258 meters, Jan Mayen, Norway, in 699 meters, and off the Faroe Islands, England, in 887 meters by Wesenberg-Lund (1950b, pp. 32-33, fig. 35, and 1953, p. 160), differ from the original specimens in that the prostomium is broadly equitriangular and lacks eyes; the prostomial antenna is short and conical and branchiae number 17 to 28 pairs; setae are said to be entirely capillary. These specimens by diagnosis would thus go to the subgenus *Aedicira* (see below).

Aricidea heteroseta Hartman (1948a, p. 33, fig. 9) from Lazy Bay, Alaska, is here referred to *A. suecica* Eliason from western Europe. Modified setae are similarly sigmoid acicular and have a distal arista, as shown by Eliason (1920, fig. 15). *Aricidea jeffreysii* Berkeley and Berkeley (1950, p. 55) from western Canada may be the same, according to this interpretation, since posterior modified setae have no terminal hood.

Distribution.—*Aricidea suecica* Eliason is recorded from Denmark in 12 to 28 meters, from southern Alaska in shallow water, and possibly western Canada and Soviet Arctic localities (Annenkova, 1946, pp. 185-188). Southward (1955) reported it from the British Isles.

Aricidea near **suecica** Eliason, 1920

Plate 43, fig. 7

Aricidea jeffreysi Hartman, 1955, pp. 50, 169. *Not* McIntosh, 1879. *Aricidea* sp. Hartman, 1955, pp. 60, 73, 77, 170.

Collections.—1149-40 (2); 1229-41 (1); 1321-41 (1); 1990-50 (20); 2030-51 (4); 2035-51 (24); 2113-52 (1); 2114-52 (53); 2116-52 (2); 2120-52 (about 90); 2125-52 (1); 2128-52 (7); 2152-52 (16); 2175-52 (4); 2176-52 (6); 2227-53 (9); 2228-53 (10); 2230-53 (8); 2232-53 (11); 2233-53 (1); 2307-53 (1); 2311-53 (1); 2337-53 (3); 2338-53 (1); 2389-53 (2); 2403-53 (1); 2411-53 (4); 2412-53 (12); 2445-53 (1); 2507-53 (1); 2646-54 (7); 2723-54 (2); 2788-54 (4); 2836-54 (3); 2839-54 (2); Gulf of California near La Paz, Mexico (2, collected by Jens Knudsen).

The individuals listed under Collections are easily separable into two groups. Thus in a large lot from 2120-52, there are about 30 specimens in which the prostomial antenna is short and clavate or only a fraction of the prostomial length; the other 60 are smaller and have an antenna that reaches back as far as the fifth branchial segments. In other respects they are the same. Both forms have a long, cirriform notopodial postsetal lobe in postbranchial segments. Neuropodia have transverse series

of curved yellow acicular hooks that number 4 to 7 in a series; the largest are uppermost and the others gradually diminish in size. These hooks are accompanied by about twice as many long, slender capillary setae in which the longest are uppermost, the shortest lowermost. The approximate proportionate thickness of hooks and setae is shown in fig. 7.

Branchiae are first present from the fourth setigerous segment and number 15 to 30 pairs; they are large and erect over the dorsum. Each is thick or somewhat compressed and tapers to a slender distal filament. The first three segments have full spreading fascicles of long pointed setae directed outward and back in flowing tufts.

The notopodial postsetal lobe in postbranchial segments is slender and cirriform; it increases in length posteriorly so that it is as long as the shortest setae; on the last few segments it resembles the long pygidial processes. The anal ring is a thick flange with a larger midventral cirriform process and a pair of slightly smaller though similar lateral ones.

Two specimens from the lower end of the Gulf of California, Mexico, taken from a soft shallow bottom, differ somewhat from those from San Pedro Basin, California. The body is conspicuously marked with brown segmental stripes (preserved) most conspicuous in the immediate postbranchial region and less intense in anterior segments; similar brown pigment is irregularly present on the prostomium and the rest of the body. The prostomium is depressed conical and has no eyes. Branchiae are present from the fourth segment and number only 14 pairs. Posterior abdominal neuropodia have transverse series of acicular setae that are sharply bent in their distal end or slightly sickle-shaped; the lowermost are shortest and a little thicker than the longest uppermost in a series. The posterior or pygidial region is missing. They were associated with other annelids unlike those in San Pedro Basin and may thus represent a different species.

Individuals identified as near *Aricidea suecica* Eliason, from California, differ from those in European collections in having branchiae present on a larger number of segments; the prostomium has no eyes; the proportions of posterior neuropodial hooks are somewhat different. Whether these differences are more than variations is considered doubtful.

Distribution.—Aricidea near *suecica* has been found to be most abundant in San Pedro areas, California, in soft shallow depths (Hartman, 1955, p. 170). It is doubtfully recorded from the southern end of the Gulf of California, Mexico.

Aricidea uschakovi Zachs, 1925

Plate 43, fig. 5

Aricidea uschakovi Zachs, 1925, pp. 1-3; Annenkova, 1937, p. 173.
Aricidea antennata Annenkova, 1934, p. 658, figs. 2, 3.
Aricidea longicornuta Berkeley and Berkeley, 1950, pp. 53-55, fig. 2; Berkeley and Berkeley, 1952, p. 38, figs. 68, 69.
Aricidea sp. Hartman, 1955, p. 170.

Collections.—1668-49 (1); 2117-52 (3); 2120-52 (20); 2152-52 (8); 2228-53 (1); 2232-53 (6); 2294-53 (1); 2311-53 (2); 2337-53 (1); 2445-53 (1); 2749-54 (6).

This is characterized especially by the broad, truncate prostomium, the long median prostomial antenna and the deeply bifurcated notopodial lobe of branchial segments. The first three segments are prebranchial; they have well developed postsetal lobes in notopodia and neuropodia; thereafter the neuropodial lobe diminishes in size. Branchiae number 23 to 27 pairs; the more posterior ones have long and filiform tips.

The individuals listed under Collections, above, differ from the original accounts indicated in the synonymy above, in that neuropodia of posterior segments have setae of three instead of a single kind. These setae are arranged in single transverse series. The uppermost 4 to 8 are slender, long capillary setae; farther down are about as many thicker ones terminating distally in a long straight arista; these are followed in the middle part of the fascicle by about 8 to 12 subuluncinate setae in which the shaft is thicker, subdistally curved or sigmoid and the distal end is slender; the 3 or 4 ventralmost setae are short, sigmoid, blunt and uncinate (fig. 5). Unless looked for, these setae are easily overlooked because they are largely embedded in the parapodial tissue and pale yellow in color. Furthermore, preserved specimens often lack the posterior end in which these setae occur. Except for these setae, the specimens agree fully with accounts of *Aricidea uschakovi* Zachs as defined by Annenkova, and with *A. longicornuta* Berkeley and Berkeley.

Distribution.—*Aricidea uschakovi* was first described from Kola Fjord, northern Russia, then recorded from the North Japan Sea in 115 to 230 meters (Annenkova, 1934 and 1937), western Canada in 75 to 230 fathoms (Berkeley and Berkeley, 1950); the present records are from southern California in 12 to 293 fathoms.

Aricidea jeffreysii (McIntosh) 1879

Scolecolepis (?) *jeffreysii* McIntosh, 1879, pp. 506-507, figs. 13, 14.

This species comes originally from Davis Strait, western Greenland, in 20 fathoms from shelly sand. It was briefly described and diagnosed as follows: Branchiae present from the fourth setigerous segment, after which they are large on 8 segments, diminish to the fifteenth, and are absent after the eighteenth one, thus numbering 15 pairs. Postbranchial segments have a long filiform postsetal notopodial lobe (McIntosh, 1879, fig. 14); other characteristics were not defined.

Aricidea jeffreysii, sensu Cerruti (1909, pp. 469-493, pls. 18, 19), is based on collections from the Gulf of Naples, Mediterranean Sea, and is thus perhaps not the same species. In posterior neuropodia these individuals have uncini with a rounded hood (pl. 43, fig. 2). Southern (1914, pp. 93-94) and Fauvel (1927a, p. 75, fig. 25 a-e) have added to the descriptions, based perhaps on other species; Berkeley and Berkeley (1952, pp. 39-40, figs. 70-73) have reported it from western Canada (see also above). It seems possible that these various accounts refer to more than one species. Their identity with McIntosh's species seems doubtful.

Genus Aricidea (Cirrophorus) Ehlers, 1908
Type A. (Cirrophorus) branchiata Ehlers, 1908

This subgenus differs from *Aricidea, sensu stricto* (see above) in having modified setae in notopodia instead of neuropodia; they are acicular or furcate in shape. Four species are described.

Key to Species of *Aricidea* (*Cirrophorus*)

1. Modified notopodial setae heavy, acicular (pl. 43, fig. 4) . . 2
1. Modified notopodial setae furcate (pl. 43, fig. 6) . . . 3
2. Posterior notopodia with long, digitiform postsetal lobe; branchiae numbering about 25 pairs . *A.* (*C.*) *branchiata*
2. Posterior notopodia with inconspicuous postsetal lobe (pl. 43, fig. 4); branchiae numbering 15 pairs and broad and much larger than their accompanying postsetal lobe *A.* (*C.*) *aciculata*
3. Branchiae first present from fourth setigerous segment and numbering about 33 pairs . . . . *A.* (*C.*) *furcata*
3. Branchiae first present from fifth setigerous segment and numbering 15 to 23 pairs . . . . *A.* (*C.*) *lyriformis*

CHART SHOWING DIAGNOSTIC CHARACTERISTICS OF SPECIES OF *Aricidea* (*Cirrophorus*)

Name of Species	Number of branchial pairs	Number of prebranchial setigers	Character of modified setae	Other unique characteristics
Aricidea (*C.*) *aciculata*	15	4	heavy acicular	branchiae large and broad
Aricidea (*C.*) *branchiata*	25	4	heavy acicular	a long cirriform postsetal lobe in posterior segments
Aricidea (*C.*) *furcata*	33	3	furcate	body is brown or speckled
Aricidea (*C.*) *lyriformis*	15-23	4	furcate	early occurrence of furcate setae in fifth setiger

Aricidea (Cirrophorus) branchiata Ehlers, 1908

Cirrophorus branchiatus Ehlers, 1908, pp. 124-126, pl. 17, figs. 5-9.

The prostomium is depressed conical and without eyes. The median antenna is short and cirriform, its length less than half that of the prostomium. The first 4 segments are prebranchial. Branchiae are present on about the next 25 segments; they are short, cylindrical and resemble in appearance the corresponding notopodial postsetal lobes. Neuropodia of abdominal segments have heavy acicular spines that project from the end of the parapodial lobe.

Distribution.—*Aricidea* (*Cirrophorus*) *branchiata* comes from Agulhas Bank, southern Africa, in 117 meters in gray sand. Southward (1955) recorded it from the British Isles, and Berkeley and Berkeley (1956) from Washington.

Aricidea (Cirrophorus) aciculata, new species

Plate 43, fig. 4

Aricidea sp. Hartman, 1955, pp. 103, 110, 116.
Aricidea ?*pacifica* Hartman, 1955, p. 97.

Collections.—2231-53 (3); 2294-53 (2); 2389-53 (5); 2414-53 (3).

Total length is about 10 mm; width in the branchial region is 0.3 mm; segments number 61 or more. The prostomium is depressed conical, without eyes and with a short cirriform antenna. Branchiae are present

from the fifth setigerous segment and number 15 pairs; they are simple, lingulate, moderately large and directed over the dorsum. Abdominal segments are moniliform and broader than long, with the greatest diameter near the middle where the acicular spines project from the sides of the body. The notopodial postsetal lobe is a short digitate process (fig. 4) and greatly surpassed in length by the acicular lobe; it differs in this respect from the corresponding part in the genotype, *A.* (*Cirriphorus*) *branchiata,* in which the postsetal lobe is greatly prolonged. The projecting acicular spines are yellow, thick and subcylindrical along the shaft. The anal end is unknown.

Distribution.—Aricidea (*Cirrophorus*) *aciculata* has been taken only in San Pedro area, California, in 115 to 177 fathoms.

Aricidea (Cirrophorus) furcata, new species

Plate 43, fig. 6

Collections.—2113-52 (2); 2114-52 (1); 2152-52 (23, type collection); 2153-52 (1); 2228-53 (1); 2311-53 (2); 2342-53 (1); 2414-53 (1).

The body in life and preserved is rust colored or reddish brown or speckled with brown, especially in the branchial region. Total length is about 10 mm and width about 1 mm. Segments number 50 or more. Branchiae are present from the fourth setigerous segment and number 29 to 33 pairs. The prostomium is broadly depressed conical; it has a short clavate antenna; eyes are absent. Nuchal organs are crescent shaped slits at the sides near the posterior margin of the prostomium.

The first branchial pair is short and much smaller than the others; the last 6 pairs diminish in size but are larger than the first pair. In these segments the postsetal lobe is a small, digitate simple lobe; it is pale in contrast with the darker body; it diminishes in size in the last several branchial segments and can be seen in abdominal segments only as a very small triangular lobe, present to the end.

Setae in anterior and branchial segments are slender and distally pointed. In abdominal segments the notopodial fascicles are much smaller than neuropodial ones; the first have 3 or 4 very long slender setae and 2 or 3 accompanying furcate setae (fig. 6) in which the two tines are unequally long and one has serrations. Corresponding neuropodia have fuller, longer spreading bundles of long, slender setae.

Aricidea (*Cirrophorus*) *furcata* differs from *A.* (*C.*) *lyriformis*

(Annenkova) (see below) in having branchiae present from the fourth instead of fifth segment; they number 29 to 33, instead of 15 to 23 pairs.

Distribution.—Aricidea (*Cirrophorus*) *furcata* has been recovered only in soft bottoms of San Pedro area, California.

Aricidea (Cirrophorus) lyriformis (Annenkova) 1934

Paraonis (*Paraonides*) *lyriformis* Annenkova, 1934, pp. 656-657, fig. 1B.

Aricidea (*Cirrophorus*) *lyriformis* Annenkova, 1937, p. 172.

This species was originally described from the White Sea in 230 to 240 meters. A median prostomial antenna was thought to be absent and it was thus referred to *Paraonis*. As collections made later in the Tartar Strait revealed the presence of an antenna, the generic change was necessitated (Annenkova, 1937, p. 172).

Distribution.—Aricidea (*Cirrophorus*) *lyriformis* (Annenkova) is known only from the White Sea and Tartar Strait in deep water.

Genus Aricidea (Aedicira) new subgenus
Type Aricidea (Aedicira) pacifica Hartman, 1944

The prostomium is broadest at its anterior end and weakly convex to emarginate at its frontal margin. Setae are all slender and distally pointed; there are no modified spines. Branchiae are present from the fourth setigerous segment and number 12 to 60 or more pairs. The subgeneric name is coined from the letters of the generic one.

Key to Species

1. Prostomial antenna branched . . . . ?*A.* (*A.*) *ramosa*
1. Prostomial antenna undivided 2
2. Branchiae numbering about 60 pairs and tapering distally to a long slender tip . . . . . *A.* (*A.*) *pacifica*
2. Branchiae numbering 13 to 21 pairs and terminating in an abruptly slenderer short tip . . . *A.* (*A.*) *belgicae*

In addition *Aricidea suecica, sensu* Wesenberg-Lund (1950b, pp. 32-33) from west of Greenland and in 1096 meters, off Jan Mayen, Norway, in 699 meters, and from between the Faroes and Shetland Islands, England, in 887 meters, seems to belong to this subgenus since it is said to have only capillary setae throughout.

CHART SHOWING DIAGNOSTIC CHARACTERISTICS OF SPECIES OF *Aricidea* (*Aedicira*)

Name of Species	Number of branchial pairs	Number of prebranchial segments	Unique characteristic
A. (*Aedicira*) *belgicae*	13-21	3	branchiae broad with abruptly narrowed tip, setae present from first segment
A. (*Aedicira*) *pacifica*	to 60	3	anterior prostomial margin excavate; notopodial lobes long and cirriform
A. ?(*Aecidira*) *ramosa*	16	3	prostomial antennae divided
A. ?(*Aedicira*) *suecica*, *sensu* Wesenberg-Lund, 1950	17-28	3	prostomium without eyes

Aricidea (Aedicira) pacifica Hartman, 1944

Aricidea pacifica Hartman, 1944d, pp. 316-317, pl. 27, figs. 8, 9.

Collections.—1450-42 (2); Newport Bay, December, 1941 (5) and December, 1943 (2) all from low intertidal eel grass beds near the mouth of Newport Bay, California, associated with rocks, mud, sand and a richly diversified fauna.

The prostomium is truncate, broader in front, and has a median concavity; it narrows posteriorly. Branchiae are first present on the fourth setigerous segment and number about 60 pairs. In the posterior branchial region the branchiae are very long, attenuate and have slender filamentous tips.

In prebranchial segments all setae are slender and capillary. In branchial segments the neuropodia have full fascicles of palisaded rows of setae that emerge from neuropodia in stiff series and are directed obliquely back. Each seta has a broad blade and terminates in an abruptly long, slender pointed tip, somewhat resembling a subuluncinus of the Orbiniidae but without surface sculpturing. Abdominal segments have setae of a single kind, all slender, capillary and in full, flowing fascicles, those in a bundle appearing white in mass. Each is very slender and hair-like. There are no modified hooks.

A. (*Aedicira*) *pacifica* grossly resembles *Aricidea fragilis* (see above) because of the large number of branchiae. In the first the prostomium is truncate and excavate at its anterior margin; in the second it is bluntly conical or rounded in front. The first has only pointed setae in the abdomen, the second has modified bifid hooks in posterior neuropodia.

Distribution.—*Aricidea* (*Aedicira*) *pacifica* is known only from Newport Bay, California, in low intertidal zones, associated with a mixed bottom covered with eel grasses.

Aricidea (Aedicira) belgicae (Fauvel) 1936

Paraonis belgicae Fauvel, 1936b, pp. 29-31, fig. 3.
Aricidea belgicae Monro, 1939b, p. 127, fig. 16 a-b; Hartman, 1953, p. 39.

Length to 15 mm; width 1 mm or less; segments number 50-75 or more. Branchiae are present from the fourth setigerous segment and number 9 to 21 pairs; they are broad and end in an abruptly slender, cirriform tip. In branchial segments the notopodial postsetal lobe is long and filiform; the corresponding neuropodial lobe is short and broad. The prostomial antenna is as long as the prostomium or surpasses it.

Distribution.—*Aricidea* (*Aedicira*) *belgicae* comes from Antarctic regions in 20 to 310 meters and off Uruguay in 80 meters (Hartman, 1953).

Aricidea ?(Aedicira) ramosa Annenkova, 1934

Aricidea ramosa Annenkova, 1934, pp. 657-658, fig. 3A; Annenkova, 1937, p. 172.

Collections.—2172-52 (fragment).

The body is long and slender and consists of 40 to 60 segments. The branchial region is broadly depressed and the posterior or abdominal region is slender and cylindrical. The prostomium is broadly conical, has a sensory palpode at its frontal margin and is without eyes. The nuchal organs near the posterior lateral margins are darkly pigmented. The prostomial antenna is palmately divided and has 4 to 6 distal lobes of about equal size.

Branchiae are first present from the fourth segment and number 16 pairs; each is flattened and ends in a slender tip. Notopodial postsetal lobes in anterior segments are short; in abdominal segments they are longer. Neuropodia have no postsetal lobes. In the prebranchial region the setae of both rami are similar in form and length, each being somewhat sigmoid and limbate. From the fourth or fifth segment the notopodial setae are longer, slenderer and not limbate; the neuropodial setae remain unchanged. There are no known modified hooks; the species is thus referred to subgenus *Aedicira* but with a doubt, since posteriormost segments are unknown.

An individual from station 2172-52 measures 2.34 mm long for 25 segments (the posterior end is missing). The prostomial antenna is palmately lobed with 4 terminal, similar lobes. Branchiae number only 18 pairs. This individual is questionably referred to *Aricidea ramosa* because of the resemblance in other respects. The character of posterior parapodia and setae is unknown.

Distribution.—Aricidea ?(*Aedicira*) *ramosa* comes originally from Bay of Peter the Great in 44 to 2400 meters; the present record is from the eastern wall of Catalina Basin, California, in 1034 meters.

Genus **Paraonis** Grube, 1878

The prostomium is semicircular or conical and more or less depressed; it has or lacks eyes; a median antenna is absent. The first (rarely the second) segment is the first setigerous one. Branchiae are present from the fourth or not before the eleventh to nineteenth segment; they number 3 to 36 or more pairs. The posterior abranchiate region of the body is usually cylindrical, has poorly marked segmental grooves and inconspicuous parapodia. Notopodia have only slender hairlike setae; neuropodia have hairlike setae in anterior segments; in the abdominal region some have modified setae which may be acicular or uncinate, with or without a terminal sheath or hood.

The genus is conveniently divided into two lesser groups, *Paraonis, sensu stricto* in which posterior neuropodia have modified setae, and *Paraonis* (*Paraonides*) in which posterior notopodia have setae of characteristic form.

Paraonis, sensu stricto Cerruti, 1909, was erected for *Paraonis tenera* Grube (1878), even though this species is very incompletely known (Fauvel, 1927a, p. 72). The genotype is more acceptably *P. gracilis* (Tauber) 1879, which has been considered close to, if not the same as, *P. tenera* Grube.

Key to Species of *Paraonis, sensu stricto*

1. Setae first present from the second visible segment . *P. dubia*
1. Setae first present from the first segment 2
2. Modified neuropodial setae distally hooded 5
2. Modified neuropodial setae without distal hood . . . 3
3. Posterior neuropodial hooks terminating in an acute process with a sheath (Fauvel, 1927a, fig. 24k) . . *P. fulgens*
3. Posterior neuropodial hooks without a distal process . . 4
4. Prostomium without eyes 6
4. Prostomium with eyes (pl. 44, fig. 1) . *P. gracilis oculata*
5. Branchiae numbering only 4 pairs . . *P. paucibranchiata*
5. Branchiae numbering about 16 pairs . . . *P. ivanovi*
6. Branchiae number 28 to 36 pairs and are very long . . . . . *P. multibranchiata*
6. Branchiae number 3 to 12 pairs . . . . . *P. gracilis*

CHART SHOWING DIAGNOSTIC CHARACTERISTICS OF SPECIES OF *Paraonis, sensu stricto*

Name of Species	Number of branchial pairs	Number of prebranchial setigers	Character of modified setae	Other unique characteristics
Paraonis dubia	not known	4	curved acicular	prostomium with eyes; setae from second segment
Paraonis fulgens	16-25	3	uncinate, distally anchylosed	branchiae broad and foliose
Paraonis gracilis	3-12	5 or 6 to 10 to 18	curved acicular	
Paraonis gracilis oculata	8-11-13	5 or 6	curved acicular	prostomium with eyes
Paraonis ivanovi	16	4	hooded curved acicular	
Paraonis multibranchiata	28-36	5	curved acicular	branchiae threadlike
Paraonis paucibranchiata	4	3	hooded curved acicular	
Paraonis tenera	7	3	acicular	(not distinguishable from *P. gracilis*)

Paraonis gracilis (Tauber) 1879

Plate 44, figs. 4, 5

Aonides gracilis Tauber, 1879, p. 115.
Levinsenia gracilis Mesnil and Caullery, 1898, p. 136-137, pl. 6, fig. 10.
Paraonis (*Paraonis*) *gracilis* Cerruti, 1909, pp. 468, 498, 504.
Paraonis gracilis Eliason, 1920, pp. 55-56, fig. 16 a-e; Wesenberg-Lund, 1950b, p. 32, fig. 34; Wesenberg-Lund, 1953, p. 59-60; Southward, 1955, p. 264.
?*Paraonis* (*Paraonides*) *gracilis* Monro, 1930, pp. 150-152, fig. 58.
Aonides gracilis Day, 1934, p. 60.
Paraonis filiformis Hartman, 1953, pp. 39-40, fig. 12 b, c.

Collection.—Long Island Sound, New York, from soft bottoms in shallow water (4, collected by Howard Sanders in 1954).

Individuals from Long Island Sound are uniformly slender and immature. They measure at most about 20 mm long and 0.15 to 0.2 mm wide. The body is moniliform in the branchial region and cylindrical farther back where segmental grooves are obscure, parapodia greatly reduced and visible chiefly because of the projecting setal fascicles. The longitudinal muscles are conspicuously visible through the body wall, especially as seen in transmitted light.

The prostomium is a depressed, long conical lobe with a palpode (fig. 4) at its frontal margin; eyes are not visible. The first five segments are prebranchial; they have laterally directed setae in biramous arrangement. The next 11 or 12 segments have large, simple, lingulate branchiae directed upward; the middle ones are largest and longest; all are well developed and fimbriated along their lateral margins. Parapodial lobes are inconspicuous. The proboscis, everted in some individuals, is a large globular sack exceeding the body in width.

Setae in prebranchial and branchial segments are all long, slender and distally pointed. In postbranchial segments the neuropodia have series of curved or sigmoid hooks without a distal hood; they number one, two or three in a transverse row and are accompanied by one or more capillary setae. The hooks have a thickened shoulder where the seta emerges from the body wall.

In individuals from western Europe the length is said to be 15 to 20 mm, width 0.5 to 0.8 mm, and segments number 50 to 100 (Eliason, 1920). Branchiae are present from the sixth or seventh segment and number 12 to 14 pairs. Notopodia and neuropodia are inconspicuous. Notopodial setae are all slender and hairlike. Anterior neuropodia have

only long pointed setae. Neuropodia have acicular setae first present after several postbranchial segments; they are accompanied by longer slenderer capillary setae (fig. 5). At maximum development, in posterior segments they number about six in a transverse row. Genital papillae have been observed between segments 30 to 60, located in front of the parapodial bases (Monro, 1930, fig. 58).

Paraonis filiformis Hartman (1953, pp. 39-40), from South Georgia, is here referred to *P. gracilis* since there seems to be agreement in all respects except that the prostomial lobe is subspherical (fig. 4) rather than conical, and the neuropodial setae are flattened (fig. 5). *Paraonis* (*Paraonides*) *gracilis* Monro (1930, pp. 150-152), also from South Georgia, differs only in that the first segment is shown without parapodia; this agrees with the account of *Paraonis dubia* (Augener, 1914).

Eliason (1920, pp. 55-56) has recorded a high degree of variation in the first occurrence of branchiae, noting that they are first present on segment six or seven or not before segment 11 to 19.

Distribution.—If the numerous records indicated above belong to a single species, it may be concluded that *Paraonis gracilis* ranges along both shores of the northern Atlantic Ocean, Greenland (Wesenberg-Lund, 1950), southern Africa (Day, 1934), and Antarctic regions.

Paraonis gracilis oculata, new subspecies

Plate 44, figs. 1-3

Paraonis n.sp. Hartman, 1955, p. 179.

Collections.—2017-51 (1); 2026-51 (1); 2035-51 (3); 2107-52 (7); 2114-52 (9); 2116-52 (4); 2117-52 (4); 2125-52 (1); 2126-52 (1); 2142-52 (2); 2152-52 (4); 2153-52 (1); 2175-52 (3); 2176-52 (2); 2193-52 (1); 2202-53 (1); 2227-53 (9); 2228-53 (2); 2233-53 (3); 2294-53 (many); 2301-53 (3); 2307-53 (92+); 2311-53 (1); 2324-51 (1); 2337-53 (1); 2338-53 (1); 2389-53 (2); 2403-53 (2+); 2410-53 (1 or more); 2414-53 (3); 2418-53 (several); 2445-53 (5); 2498-53 (1); 2625-53 (1); 2749-53 (several); 2835-54 (1); 2837-54 (6); 2839-54 (8); 2859-54 (2+).

Total length is about 17 mm; width is 0.26 mm in the thorax and less in other regions; number of segments is 80 or more. The body is very slender, threadlike and resembles the tentacular filament of a cirratulid with which it is sometimes associated. The prostomium is depressed conical in shape and has a pair of eyespots (fig. 1). In some (holotype in 2307-53) there are six prebranchial, eight to eleven branchial and many abdominal segments. These numbers are variable, one

individual (2017-51), measuring less than 17 mm long, consisting of eight prebranchial, 20 branchial and 52 postbranchial, or a total of about 80 segments. Other individuals have from five to eight prebranchial segments. As they come from the same general locality and show great resemblance in other respects, they are regarded as the same species.

Postbranchial segments are smooth and cylindrical and segmental furrows are hardly visible. After the middle region the segments are shorter and have raised parapodial ridges; in far posterior segments the postsetal lobes are visible as slender, filamentous processes (fig. 2). Setae in anterior segments are all slender and capillary. In far posterior neuropodia the setae are replaced by curved acicular spines (fig. 3) numbering to four in a transverse row, in which the uppermost one is longest and others are gradually shorter. They alternate with an equal number of fine and slender capillary setae that are directed obliquely outward.

The posterior end of the body terminates in a large midventral lobe and a pair of slender filamentous processes (fig. 2). Some individuals are ovigerous; one (2202-53) has one or two oblong ova in a segment, each nearly as long as the segment is wide and so arranged that the longitudinal axis of the ovum is in line with that of the animal.

Paraonis gracilis oculata differs from the stem species in having, instead of lacking, prostomial eyes. Other characters are suggested in comparing isolated individuals, including especially the shape of the prostomial lobe, the number of prebranchial and branchial segments and the comparative sizes of posterior neuropodial uncini. However, these features may be highly variable.

Distribution.—This species is abundant in soft bottoms of San Pedro areas, California, especially in shallower depths, and is frequently associated with other annelids, especially species of *Aricidea*, spionids and smaller cirratulids. Its known distribution is plotted on the chart (above).

Paraonis multibranchiata, new species

Collections.—3504-55 (2); 3731-55 (15); 3733-55 (1).

Total length is up to 30 mm; width varies from 0.3 to 0.5 mm in the middle prebranchial, or widest region, of the body. Segments number about 75. The prostomium is similar to that of *P. gracilis* (Pl. 44, fig. 4); its anterior third is triangular and slightly set off from a posterior inflated part; there are no visible eyes. Setae are present from the first postoral ring. The prebranchial region has 5 segments with biramous parapodia in lateral position. Their notopodia and neuropodia have

simple, distally pointed, slightly limbate setae in spreading fascicles. The next 28 to 36 branchial segments are narrower and more depressed; their parapodia resemble those in front and they are provided with setae of like kind, but in less conspicuous bundles.

Branchiae are simple, cirriform to threadlike; the first few are short and they increase in length, becoming long and threadlike, and appearing tangled. Their corresponding segments are at first short, annulate and crowded, then longer. Those of the postbranchial region are long and cylindrical, about twice as long as wide.

Notopodia of the postbranchial region are inconspicuous and papillar; they have 3 or 4 slender capillary setae in an inconspicuous fascicle. The corresponding neuropodia have larger bundles of curved, acicular setae alternating with an equal number of slender, longer pointed setae; they number about five sets in a bundle. The acicular setae are distally blunt, without a hood; the uppermost in a series are longest but all are about equally thick. The posterior end of the body terminates in a dorsal anal pore, followed by a small triangular lobe with a pair of very slender, short cirri, about as shown in Pl. 44, fig. 2.

P. multibranchiata differs from other species of the genus in having 28 to 36, instead of 3 to 20, pairs of branchiae; it is known to occur only in deep, instead of shallow, water.

Distribution.—This is known only from Santa Barbara Channel Basin, California, in 260 to 305 fathoms.

Paraonis ivanovi Annenkova, 1934

Paraonis ivanovi Annenkova, 1934, p. 656, fig. 1A.

The prostomium is conical and has no eyes; nuchal organs are in the shape of a horseshoe. Branchiae are first present from the fifth setigerous segment and number 16 pairs; they are lancet-shaped. Notopodial postsetal lobes of anterior segments are short; those of abdominal segments are long and slender. Setae of notopodia and neuropodia are simple and of similar form throughout except in neuropodia of abdominal segments, where there are hooded uncini, up to 3 in a transverse row.

Distribution.—*Paraonis ivanovi* is known only from north of Bering Sea, south of Krusenstern Island, in 1500 to 2000 meters.

?**Paraonis dubia** (Augener) 1914

Scoloplos (*Naidonereis*) *dubius* Augener, 1914, pp. 31-32, pl. 1, fig. 5, text-fig. 3.

Paraonis dubia Augener, 1923, pp. 72-75, fig. 25.

The body measures about 6 mm long, 0.5 mm wide and consists of about 73 segments. The prostomium has a pair of eyespots. The first segment is a smooth ring. Branchiae are present from the fifth setigerous segment and were originally presumed to be present on all segments (as in Orbiniidae), later corrected but not clarified (Augener, 1923, p. 72-75). Monro (1930, p. 150) questionably referred the species to his *Paraonis* (*Paraonides*) *gracilis*, but the large number of branchiae contradicts this view. Furthermore, posterior neuropodia were originally shown with projecting acicular spines (Augener, 1914, text-fig. 3), recalling those of *Scoloplos* (*Leodamas*) in the Orbiniidae.

Augener (1923, pp. 72-75) redescribed the species and recorded a maximum length of 12.5 mm for 35 segments; buccal segment apodous; pygidium with a large midventral and a pair of smaller lateral processes; branchiae cylindrical and present from eighth setigerous segment.

Distribution.—This species is recorded from Antarctic regions and southwestern Australia.

Genus **Paraonis (Paraonides)** Cerruti, 1909
Type **Paraonis (Paraonides) neapolitana** Cerruti, 1909

This subgenus differs from *Paraonis sensu stricto* in that neuropodia have no modified setae. Postbranchial notopodia have setae of characteristic form. In the genotype they are distally pointed and limbate (winged). In others there are furcate (lyrate) setae in addition to slender pointed setae.

Key to Species of *Paraonis* (*Paraonides*)

Modified setae distally pointed and limbate *P.* (*P.*) *neapolitana*
Modified setae furcate . . . . . *P.* (*P.*) *lyra*

The genotype, *Paraonis* (*Paraonides*) *neapolitana* Cerruti (1909), is known only from Europe (see Fauvel, 1927a, p. 73).

Paraonis (Paraonides) lyra Southern, 1914

Paraonis (*Paraonides*) *lyra* Southern, 1914, pp. 94-95, fig. 22 a-g; Eliason, 1920, pp. 56-57; Fauvel, 1927a, pp. 72-73, fig. 24 a-f.

Collections.—2033-51 (1); 2053-51 (8); 2059-51 (3); A 32-39 (1).

The individuals examined are very small. A complete one with 70 segments measures 7.5 mm long and about 0.16 mm across. Southern (1914), for specimens from Ireland, recorded a length of 12 to 20 mm

and 90 to 105 segments. The setae in abdominal segments are long, very slender and resemble those of epitokous stages. The prostomium is a plain rounded lobe a little longer than wide, without antenna or eyes. Branchiae are first present from the fourth setigerous segment and number 10 pairs. (Southern reported 8, 11 to 14 pairs). The thoracic notopodial lobe is long, digitiform, about a third to a half as long as its accompanying branchia but slenderer. The notopodial lobe is continued in abdominal segments but diminishes in size; it can be distinguished beyond the middle of the body. Setae are entirely slender and capillary except that posterior notopodia have lyre setae, numbering one or two in a group and accompanied by long slender setae. The posterior end terminates in a pygidium with 3 cirriform processes.

The individuals from the San Pedro Basin, California, agree with those described from Europe (Southern, 1914, Eliason, 1920) except that they are smaller. Another from north of Coche Island, Venezuela, in 13 fms, mud (A 32-39), has branchiae present from the fourth setigerous segment and they number 11 pairs. This individual measures about 12 mm long and nearly 2 mm across, but in other respects it resembles the smaller ones from the Pacific Ocean.

Distribution.—Ireland (Southern, 1914), western Europe (Eliason, 1920), France (Fauvel, 1927); San Pedro area, California, in 11 to 220 fathoms. (See chart of distribution).

LONGOSOMIDAE Hartman, 1944

This family is known for a single species. It may have its affinities with members of the Paraonidae (see above) but the recent discovery of large paired palpi, resembling those of spioniform annelids, allies it to disomid and magelonid families as well. The prostomium is a small, depressed, triangular lobe without appendages. A pair of long, large, longitudinally grooved palpi is attached in transverse slits between the prostomium and peristomium in dorsolateral positions. The body is divided into an anterior region of nine short setigerous segments and an abdomen with greatly prolonged cylindrical segments. The eversible proboscis is an unarmed epithelial pouch. Long cirriform branchiae are limited to one pair to each of the thoracic segments. Parapodia are biramous and have weakly developed lobes. Setae are entirely simple and consist of at least three kinds. All segments have limbate, distally pointed ones; the first neuropodium has modified recurved hooks (Hartman, 1944, pl. 27, fig. 3a); and abdominal parapodia have subuluncinate setae (pl. 43, fig. 8) in anterior series accompanying limbate setae.

Longosoma catalinensis Hartman, 1944

Plate 43, fig. 8

Longosoma catalinensis Hartman, 1944d, p. 322, pl. 27, figs. 1-3.

Collection.—2153-52 (3); 4759-56 (20); 4761-56 (11).

A pair of conspicuous long palpi, seldom seen attached, have their insertion in the groove between the prostomium and peristomium. The details of the anterior end and neuropodial setae of the first segment have been shown (Hartman, 1944, pl. 27, figs. 1-3). The modified setae of abdominal segments are shown here (fig. 8). Length of the largest posteriorly incomplete individual is 25 mm, with the thorax measuring only about 5 mm long; the specimen has 9 thoracic and 4 abdominal segments.

Abdominal parapodia consist of low ridges nearly encircling the body. The setae are in a double transverse row, with the posterior series all slender and distally pointed. The anterior series are fewer in number, broader in their distal parts, and terminating in a slender arista that is continuous with the shaft; they resemble subuluncini. A posterior end, perhaps of this species, is present in the collection; it consists of segments that rapidly shorten and a pygidium with two pairs of short papillar cirri.

Distribution.—*Longosoma catalinensis* is known only from shallow depths in outer or exposed areas of southern California; it is associated with other polychaetes, *Axiothella rubrocincta* (Johnson) and *Nephtys ferruginea* Hartman, and a cumacean, probably *Diastylopsis tenuis* Zimmer, in very fine sand and silt, in temperatures of about 14.9° C.

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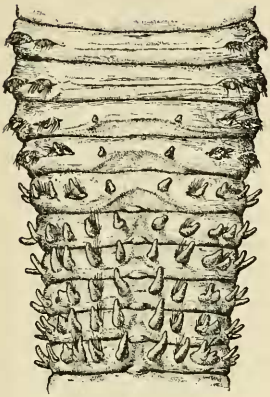
PLATE 20

Orbinia cuvieri

1. Thoracic segments 3 to 12, in dorsal view, x11.
2. Median abdominal parapodium in anterior view, x105.
3. Thoracic neuropodial uncinus seen from the front, x442.
4. Thoracic neuropodial uncinus with maximum development of ridges, seen from the side, x494.
5. Abdominal notopodial furcate seta, x1383.



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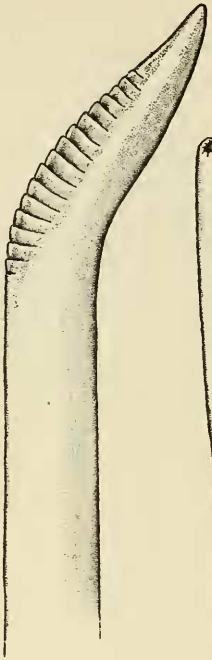

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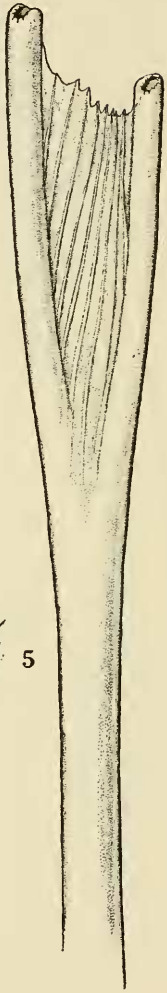

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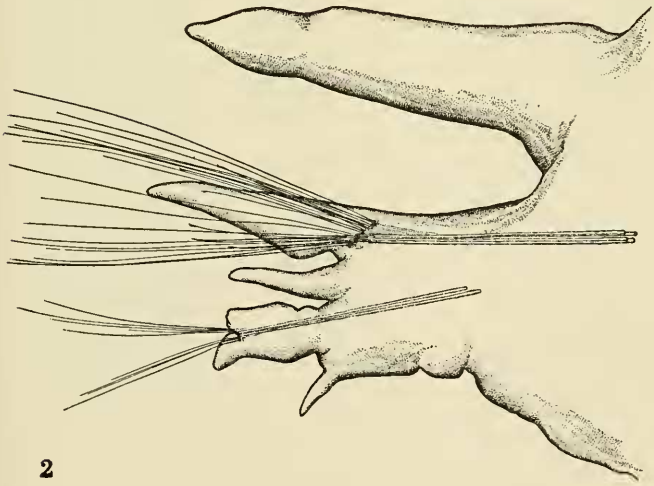

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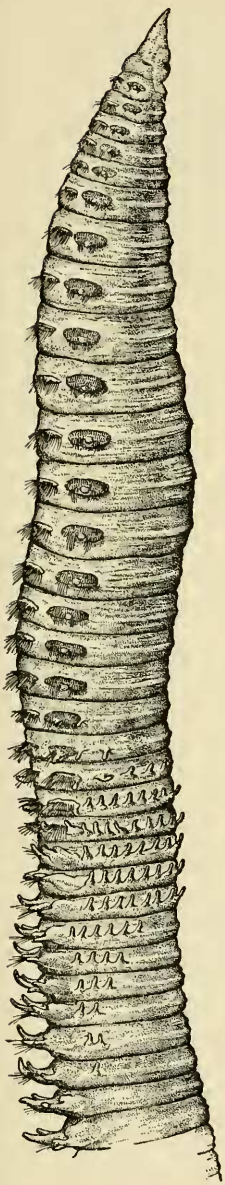
PLATE 21

Orbinia johnsoni

1. Thorax and first few abdominal segments in right lateral view, x9.7.
2. Thoracic neuropodial seta seen from the side, x670.
3. Anterior end including first three setigerous segments, in dorsal view, x29.
4. Cross section of 35th segment in anterior view, x35.



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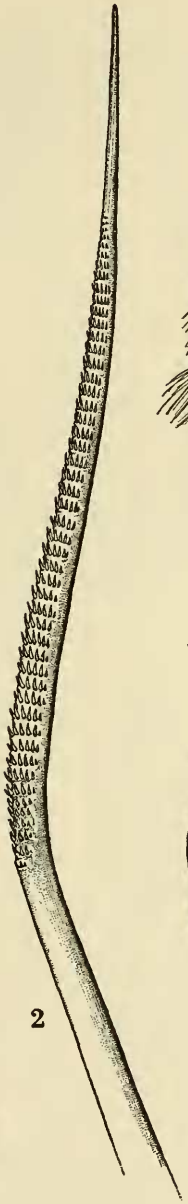

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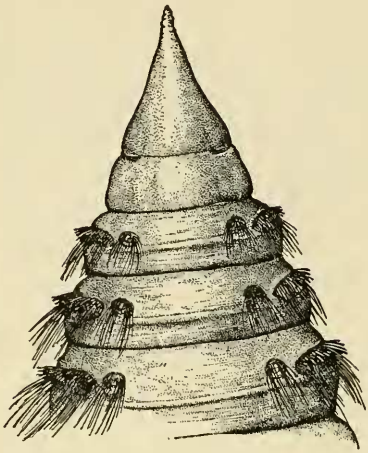

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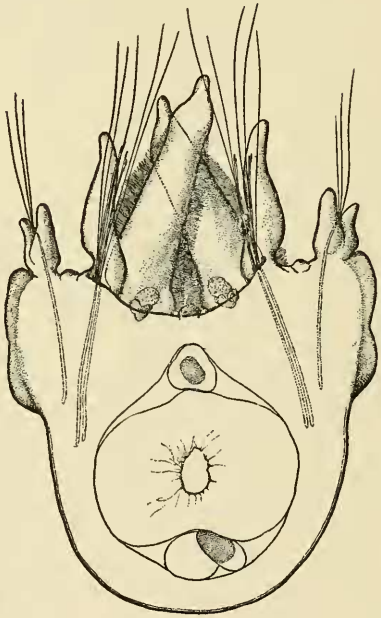

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PLATE 22

Orbinia johnsoni

1. Sixtieth parapodium in anterior view, x28.
2. Posterior end showing pygidial appendages and last few segments, x35.
3. Portion of a thoracic neuroseta at base of spinous region, x2205.
4. Portion of thoracic notoseta at base of spinous region, x2500.
5. Thoracic uncinus seen from the front, x941.
6. Thoracic uncinus seen from the side, x941.
7. Abdominal furcate seta seen from the side, x1177.
8. Abdominal furcate seta in nearly frontal view, x1177.

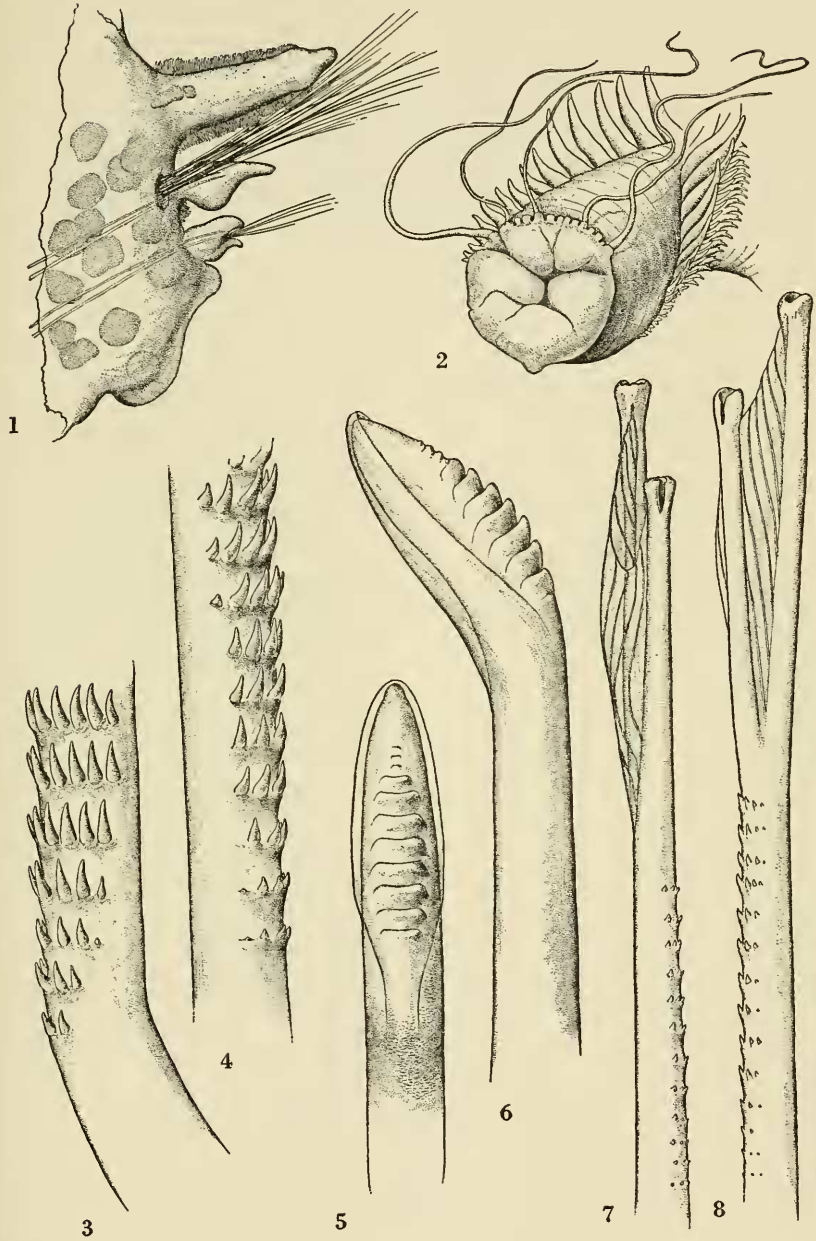
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PLATE 23

Phylo felix

1. Anterior end seen from the left side, proboscis slightly everted, x14.
2. Fifteenth parapodium seen from the front, showing underlying epithelial gland, x42.
3. Median abdominal parapodium in anterior view, x42.
4. Superiormost modified spine from posterior thoracic segment in 3/4 view, x85.
5. Cross section of modified spine near base of speared tip, x338.
6. Thoracic neuropodial uncinus from near front of series, with maximum development or ridges, seen from the side, x113.
7. Furcate seta from abdominal notopodium, x864.

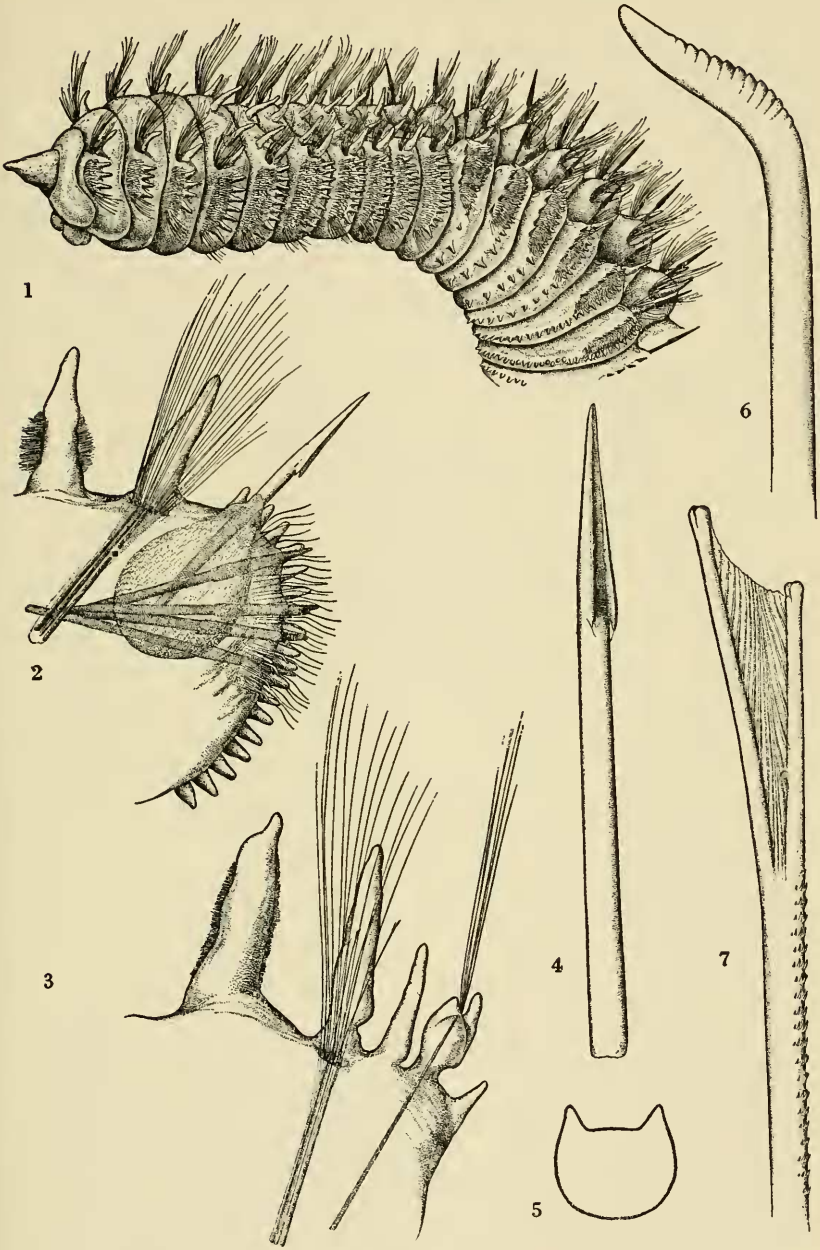
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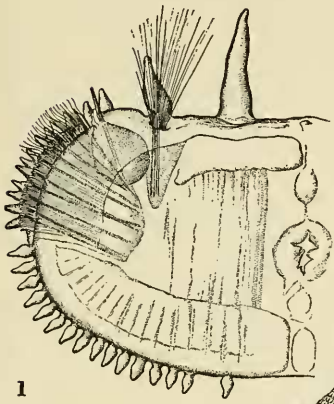
PLATE 24

Phylo ornatus

1. Cross section through the body showing a parapodium from the posterior thoracic region, in anterior view, x16.
2. Setal portions of a posterior thoracic parapodium, showing parts of the glandular pouch and acicular spines, in anterior view, x36.
3. A postmedian parapodium, in anterior view, x16.
4. A pointed geniculate seta from a posterior thoracic neuropodium, seen from the side, x332.
5. Distal portion of a pointed geniculate seta, beyond the spinous region, seen from the side, x1323.
6. Portion of spinous region of pointed geniculate seta, at maximum development of spines, seen from the front, x1323.
7. Portion of spinous region of pointed geniculate seta, at maximum development of spines, seen from the back, x1323.
8. Pointed geniculate seta at maximum development of spines, in cross section, x1323.
9. Ridged uncinus from anterior thoracic region, seen from the side, x367.
10. Furcate seta from abdominal notopodium, x1006.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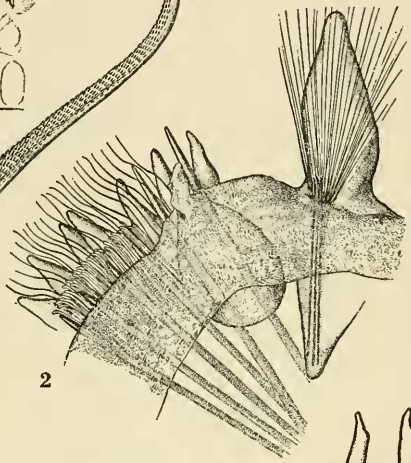
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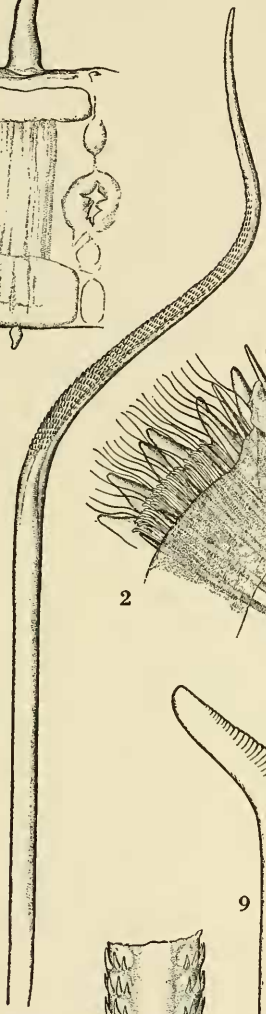
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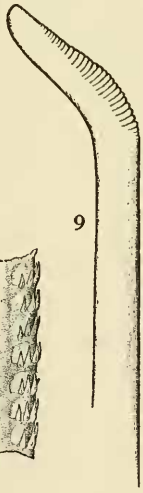
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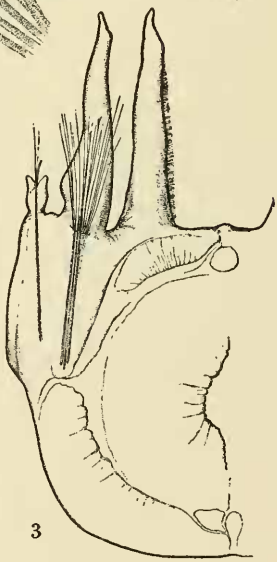
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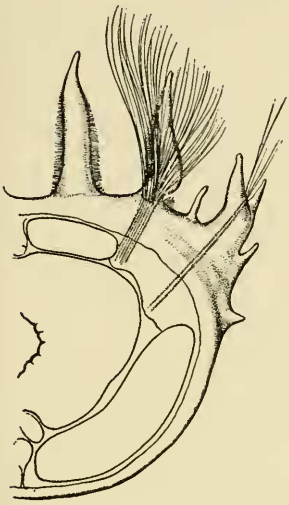
PLATE 25

Haploscoloplos fragilis

1. Twenty-second parapodium in anterior view, x46.
2. Sixty-ninth parapodium in anterior view, x40.
3. A far posterior parapodium in posterior view, x52.

Haploscoloplos robustus

4. Twenty-eighth parapodium in anterior view, x40.
5. Seventy-eighth parapodium in anterior view, x32.
6. A far posterior parapodium in posterior view, x60.



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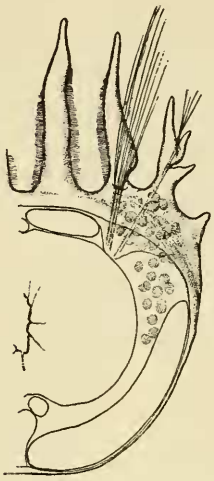

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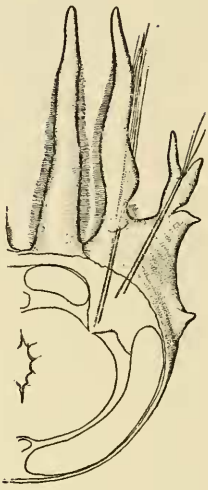

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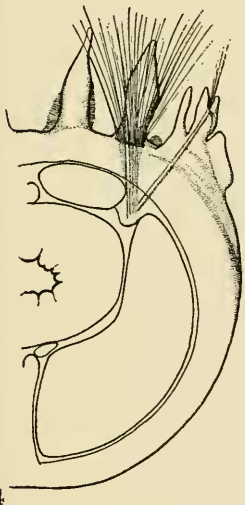

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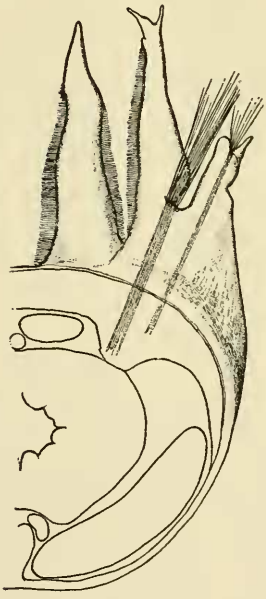

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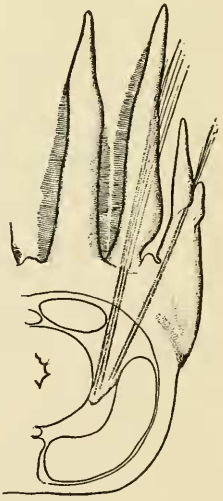

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PLATE 26

Haploscoloplos elongatus

1. Fourteenth parapodium in posterior view, x17.
2. Twentieth parapodium in posterior view, x28.
3. Far posterior parapodium in anterior view, x24.
4. Thoracic neuropodial seta in lateral view, x585.
5. Thoracic neuropodial seta in front view, x585.
6. Enlarged section of same thoracic seta in side view, showing arrangement of spinelets, x1755.
7. Enlarged section of same thoracic seta, showing arrangement of spinelets in front view, x1755.
8. Furcate seta from abdominal notopodium, x765.
9. Cross section of thoracic neuropodial seta through base of spinelets, x1755.
10. Part of abdominal notopodial seta in partial 3/4 view, x1006.
11. Cross section of abdominal notoseta through base of spinelets, x1530.

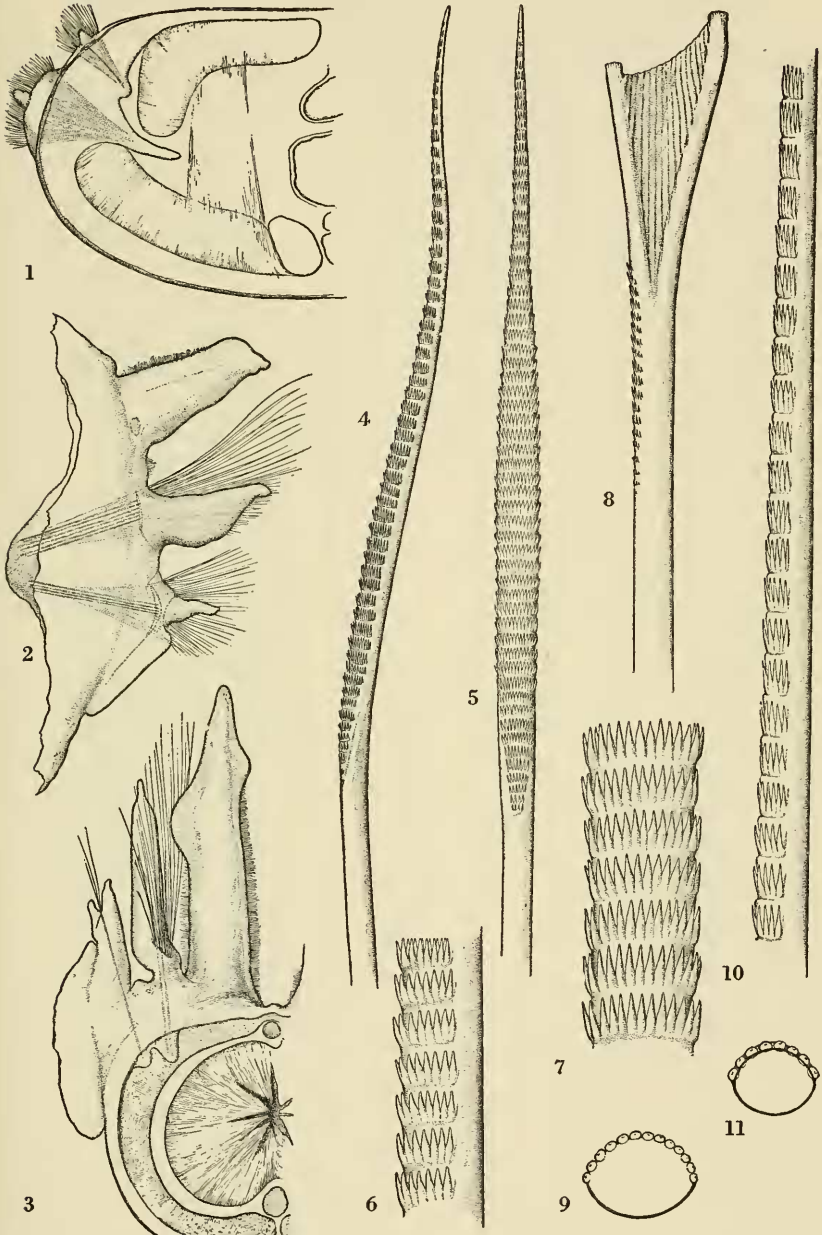
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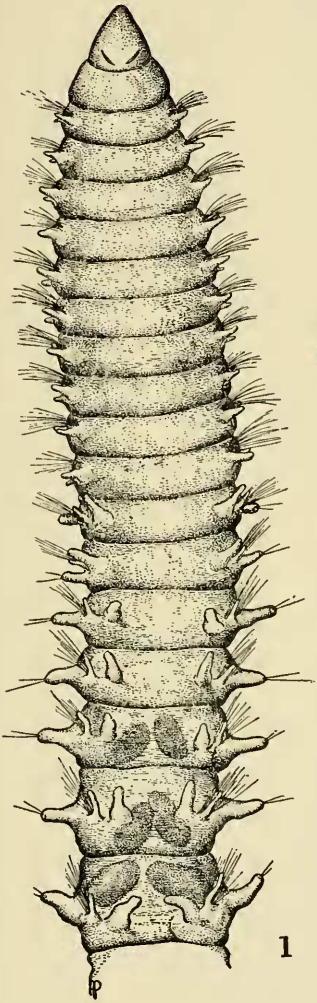
PLATE 27

Haploscoloplos kerguelensis minutus

1. Anterior end, including thorax and seven abdominal segments, in dorsal view, x39.
2. Middle thoracic parapodium, seen from behind, x167.
3. Abdominal parapodium and branchia, seen from behind, x167.



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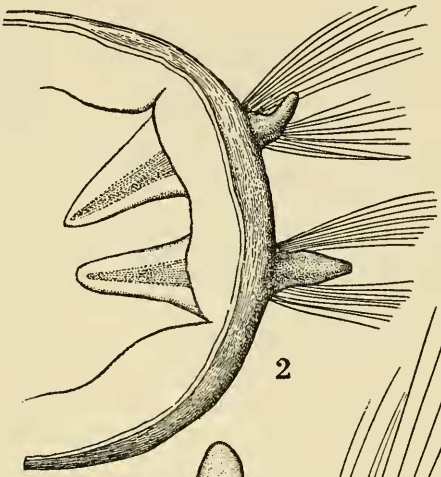

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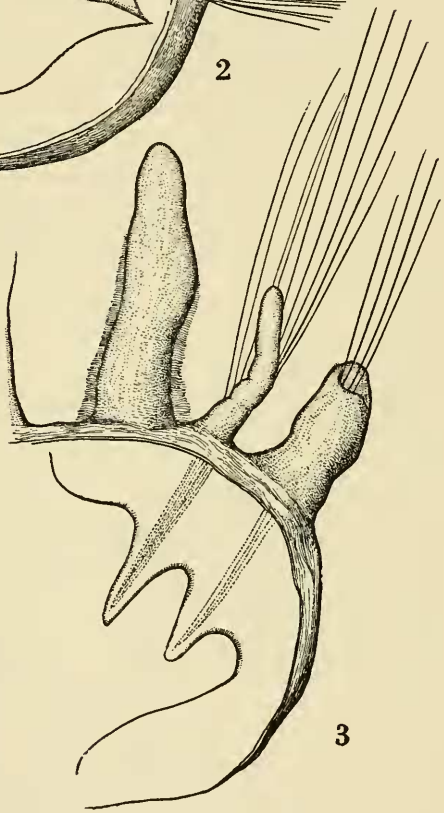

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PLATE 28

Haploscoloplos panamensis

1. A far posterior parapodium, in anterior view, x62.
2. Seventeenth thoracic parapodium, in posterior view, x112.
3. Furcate abdominal notopodial seta, x3160.

Haploscoloplos sp., from Greenland

4. Fiftieth abdominal parapodium, in posterior view, x125.
5. Tenth thoracic parapodium, in posterior view, x125.
6. Furcate abdominal notopodial seta, x3160.

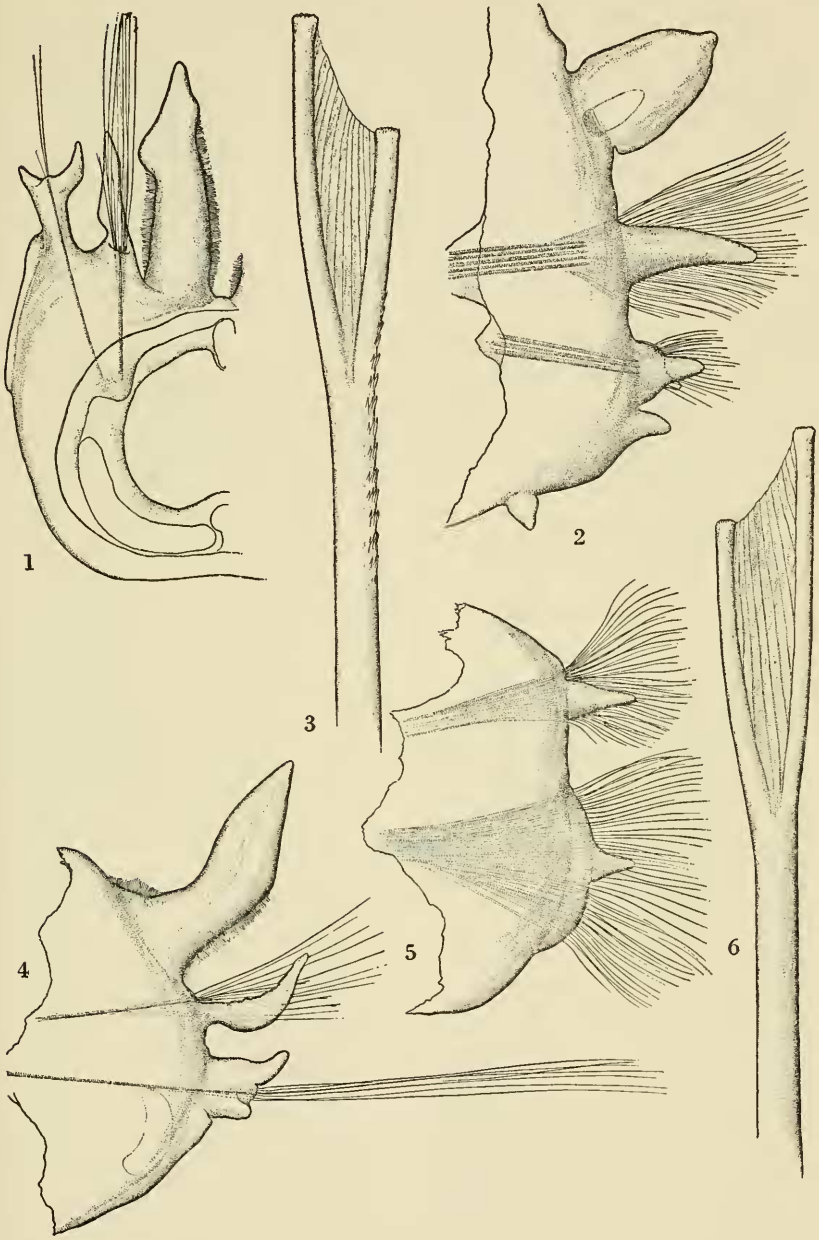
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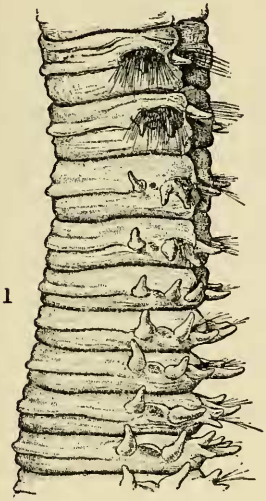
PLATE 29

Scoloplos armiger

1. Transitional region, segments 16 to 24, in left lateral view, x20.
2. Twelfth thoracic parapodium, in anterior view, x55.
3. Twenth-fifth parapodium, in posterior view, x55.
4. A far posterior parapodium, in anterior view, x55.
5. Abdominal notopodial furcate seta, x1225.
6. Thoracic neuropodial uncinus with maximum development of ridges, seen from the side, x550.
7. Thoracic neuropodial uncinus, seen from the front, x550.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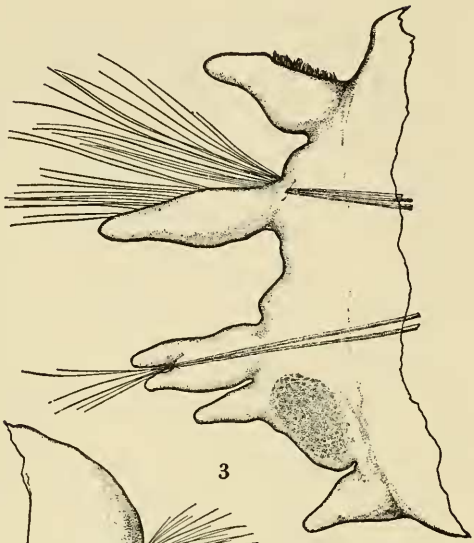
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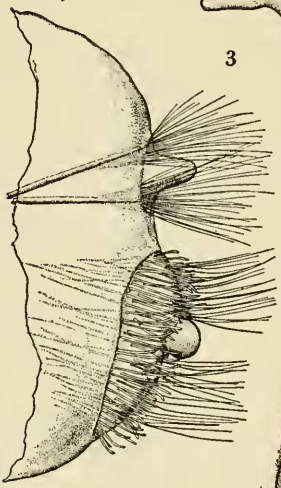
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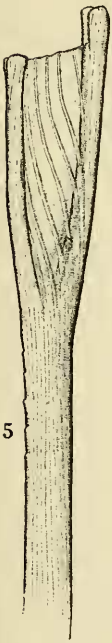
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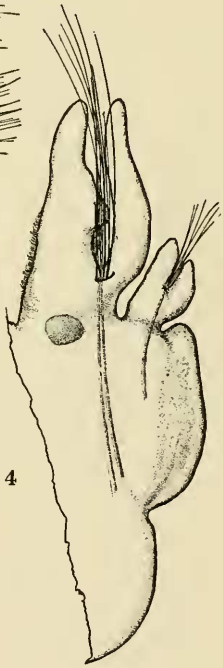
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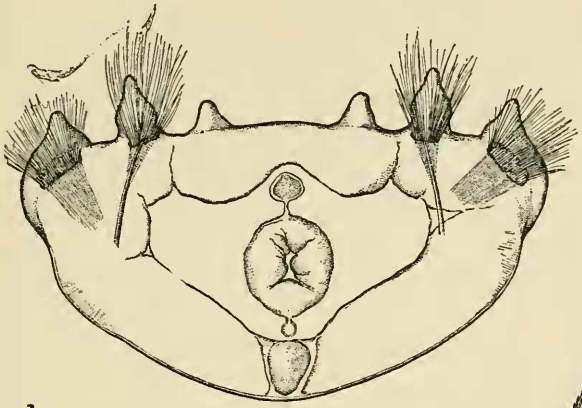
PLATE 30

Scoloplos acmeceps

1. Cross section of 18th segment, in anterior view, showing relations of branchiae, notopodia and neuropodia, x29.
2. A far posterior parapodium, in anterior view, x45.
3. Thoracic neuropodial seta in three-quarter view, x528.
4. Cross section of thoracic neuropodial seta in spinous region at maximum development, showing position of spines, x528.
5. Abdominal notopodial furcate seta, x1200.
6. Thoracic neuropodial uncinus with maximum development of ridges, seen from the side, x660.
7. Thoracic neuropodial uncinus, seen from the front, x660.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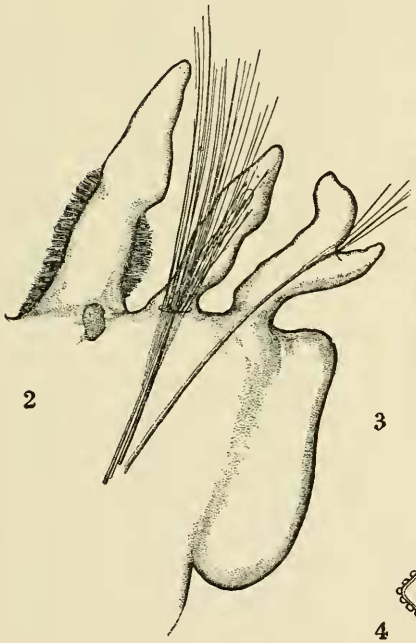
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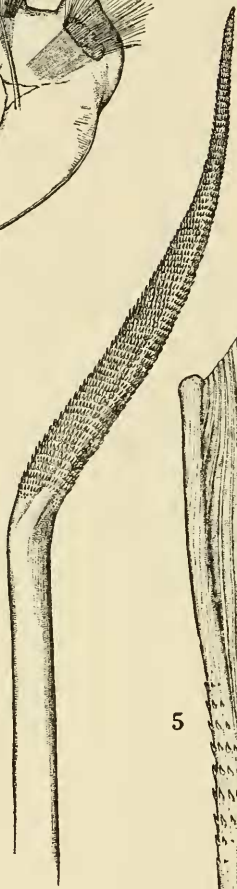
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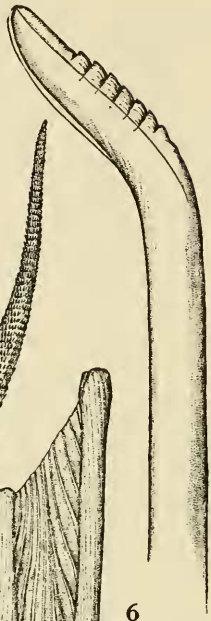
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PLATE 31

Scoloplos (*Leodamas*) *verax* (from holotype)

1. Abdominal parapodium, in anterior view, x51.
2. Neuroaciculum from abdominal segment, x231.
3. Thoracic neuropodial uncinus from tenth foot, x231.
4. Furcate seta from an abdominal notopodium, x971.5.

Alcandra robusta (from holotype)

5. Thoracic uncinus from eighth neuropodium, in side view, x231.

Scoloplos (*Leodamas*) *ohlini*

6. Furcate seta from eighteenth thoracic notopodium, x1094.
7. Thoracic neuropodial uncinus from eighteenth foot, x231.
8. Neuroaciculum from 42nd segment, x231.

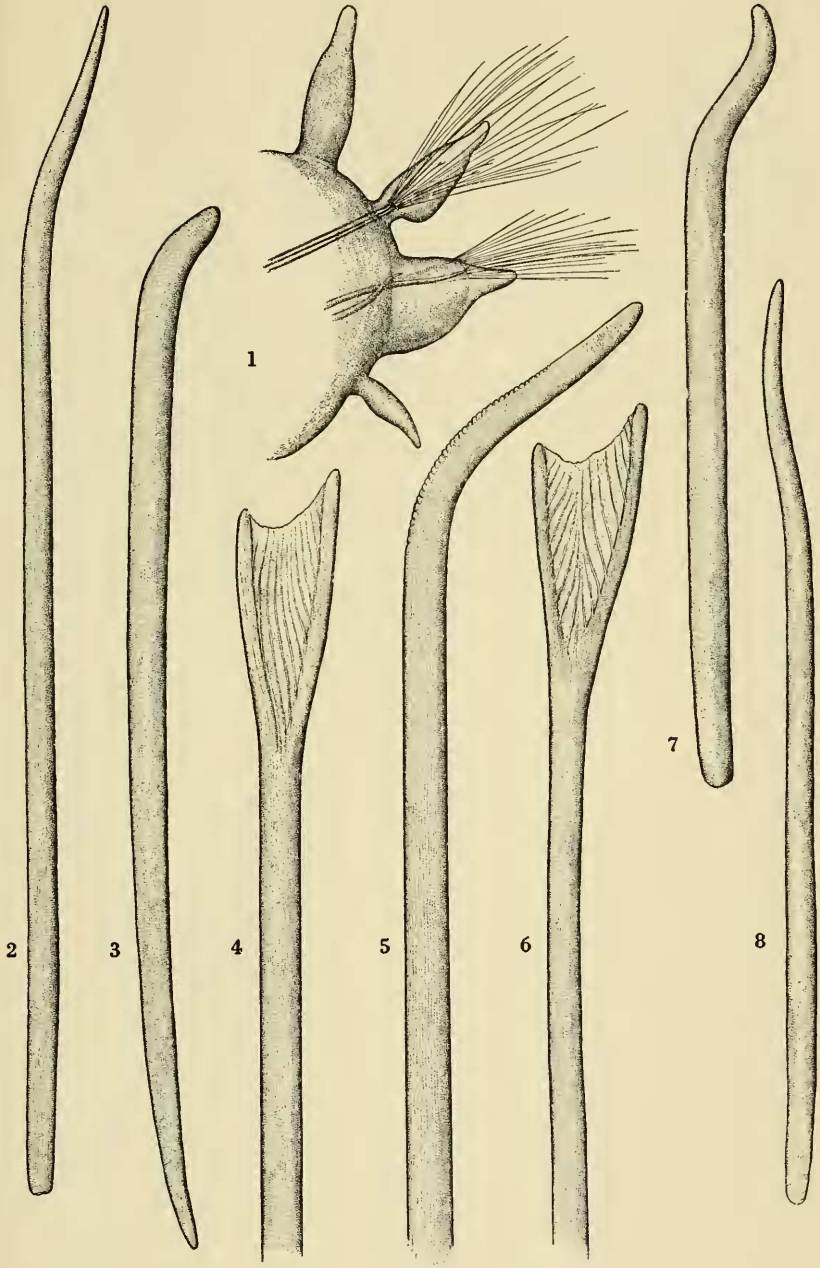
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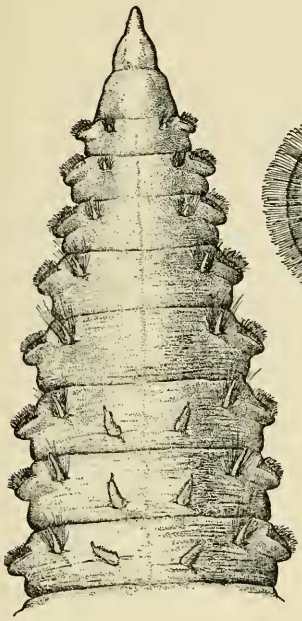
PLATE 32

Scoloplos (*Leodamas*) *rubra*

1. Anterior end in dorsal view, x40.
2. A far posterior parapodium, in anterior view, x83.
3. Cross section of twelfth segment, in anterior view, x63.
4. Thoracic neuropodial uncinus with maximum development of ridges, x1316.
5. Abdominal neuropodial aciculum, x425.
6. Abdominal notopodial furcate seta, x2353.



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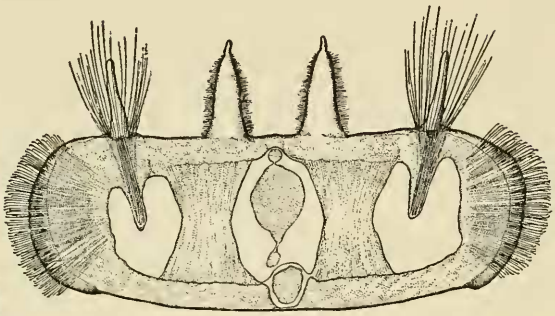

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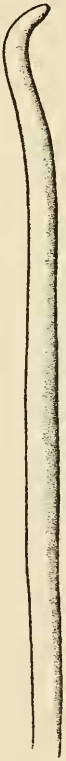

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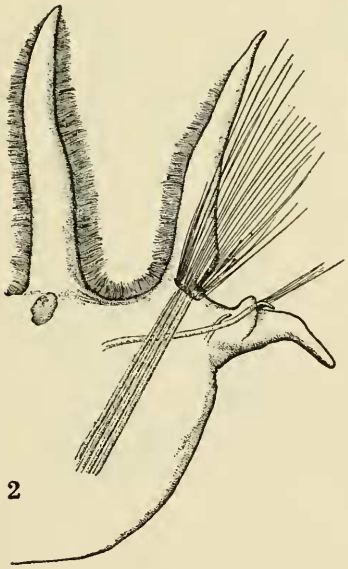

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PLATE 33

Scoloplos (*Leodamas*) *dendrobranchus*

1. Twelfth thoracic parapodium in posterior view showing the relations of the postsetal lobes and setae, x112.
2. A far posterior abdominal parapodium showing the dendritically branched branchia and the relations of parapodial lobes and setae, x67.
3. An abdominal aciculum from a far posterior segment, x670.

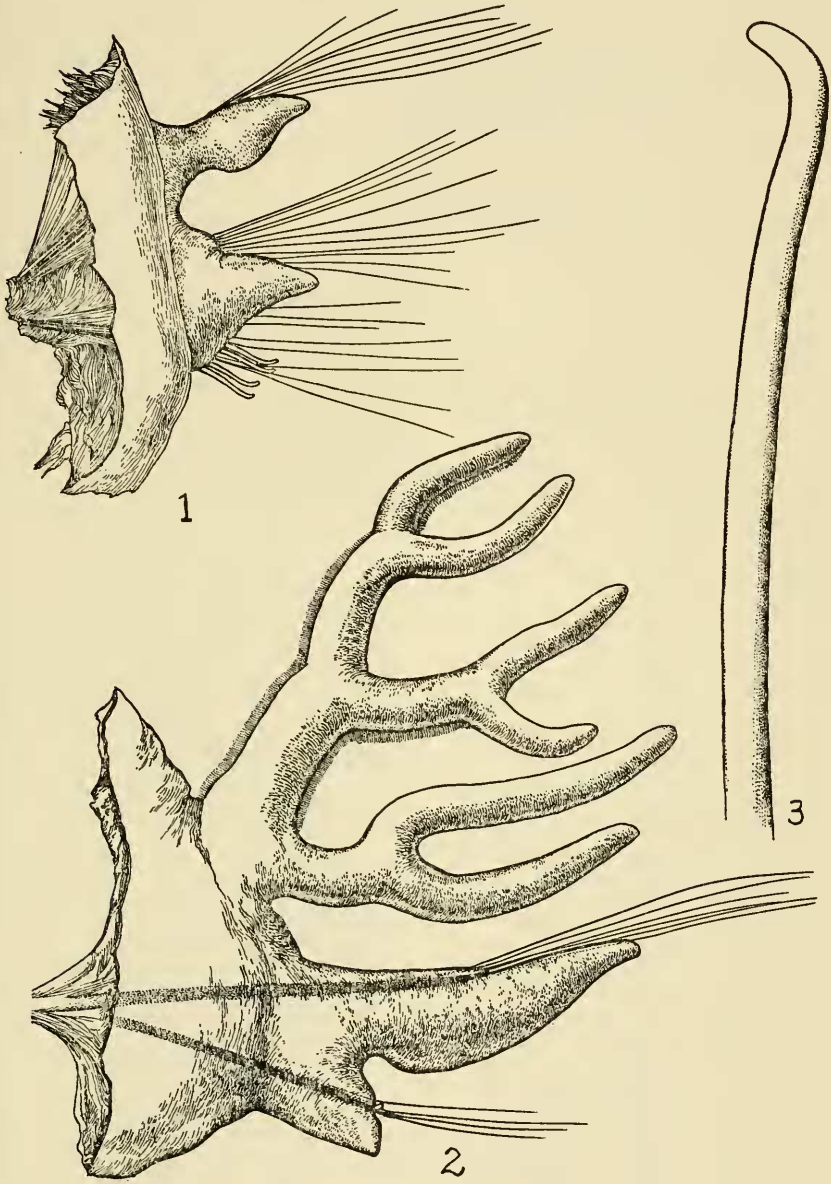
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PLATE 34

Scoloplos (*Leodamas*) *fimbriatus*

1. A transitional parapodium in posterior view, x125.
2. An abdominal parapodium showing branchiae and relations of parapodial lobes, in anterior view, x227.
3. An abdominal aciculum seen from the side, x380.
4. Uppermost thoracic uncinus seen from the side, x500.
5. Lowermost thoracic uncinus seen from the side, x500.

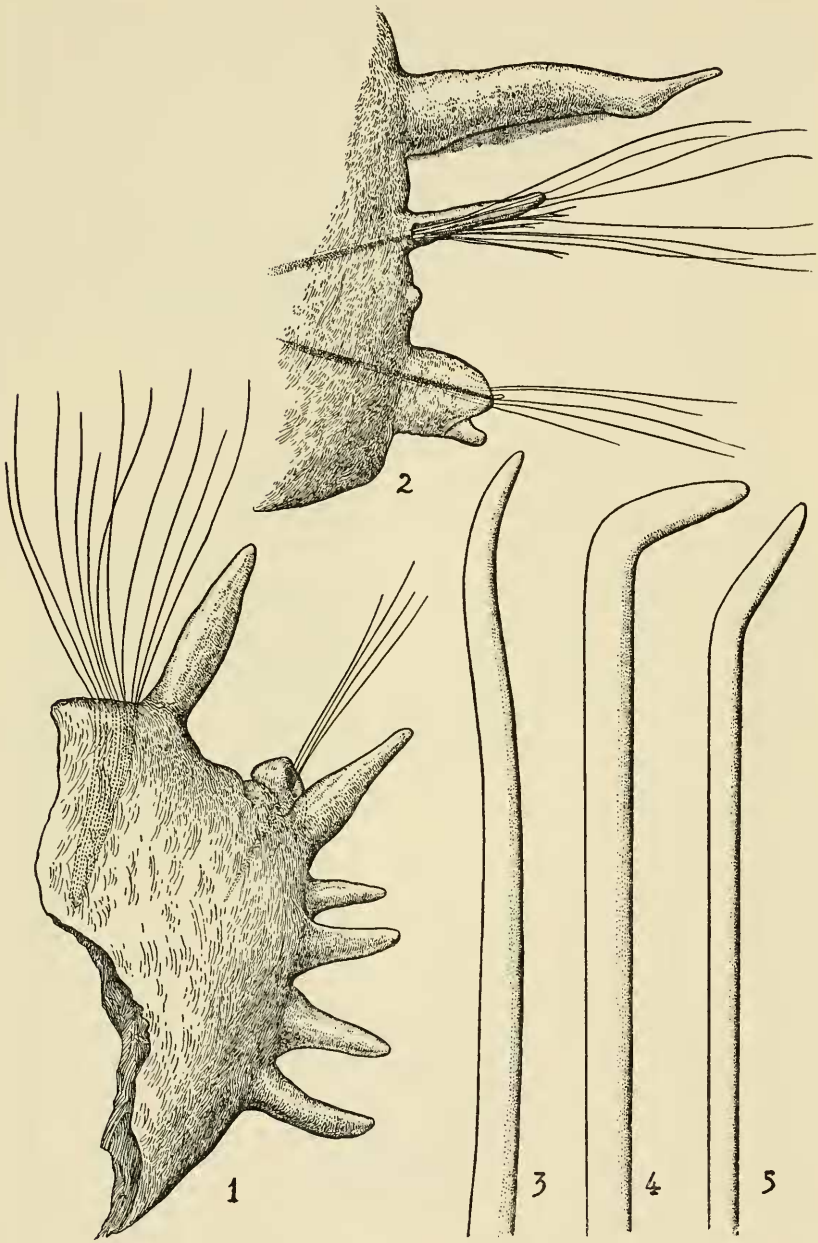
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PLATE 35

Naineris laevigata

1. Fourteenth thoracic segment in posterior view, x28.
2. Transitional thoracic segment in posterior view, x28.
3. Abdominal segment from median region, in posterior view, x28.
4. Pointed thoracic neuropodial seta seen from the side, x1050.
5. Superior subuluncinus, from thoracic neuropodium, x1575.
6. Inferiormost hooded uncinus from thoracic neuropodium, x1575.
7. Posterior uncinus without a hood from thoracic neuropodium, x1050.
8. Furcate seta from abdominal notopodium, x1600.

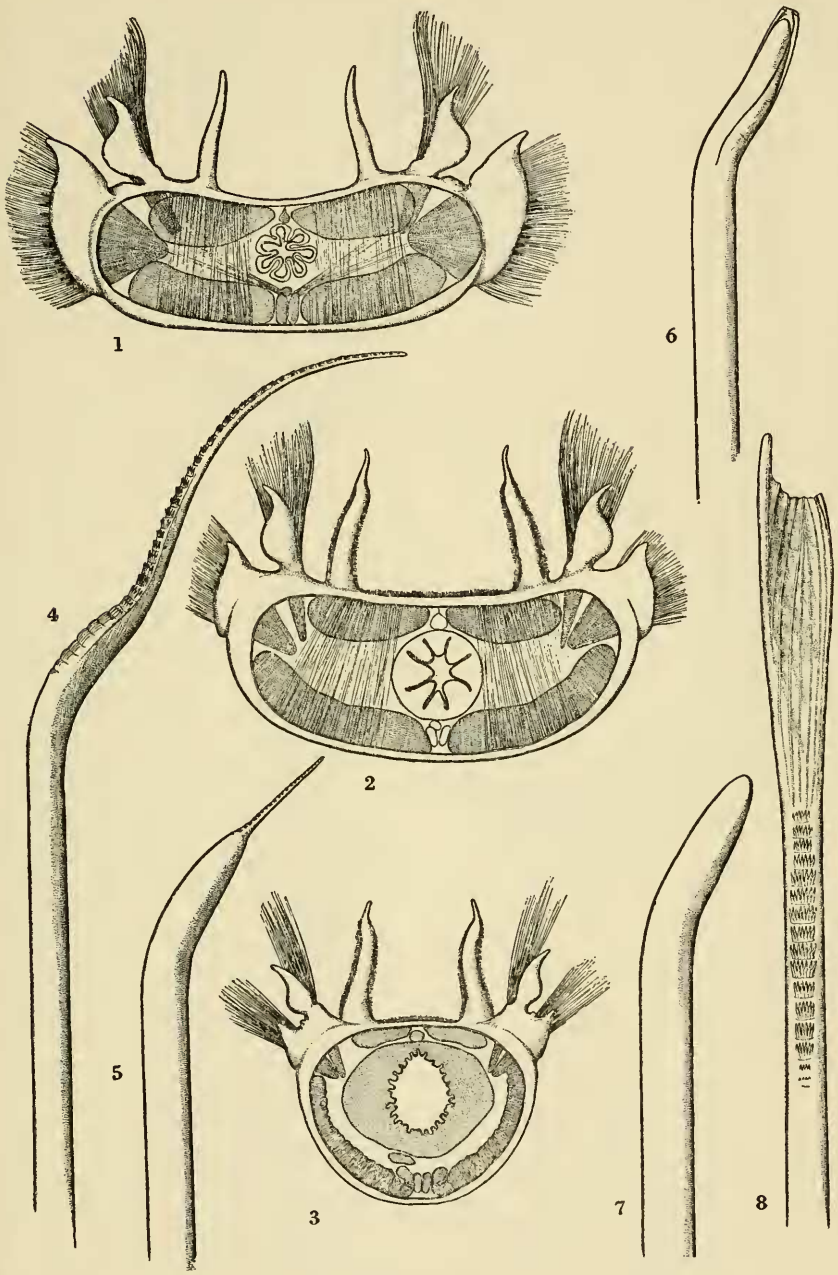
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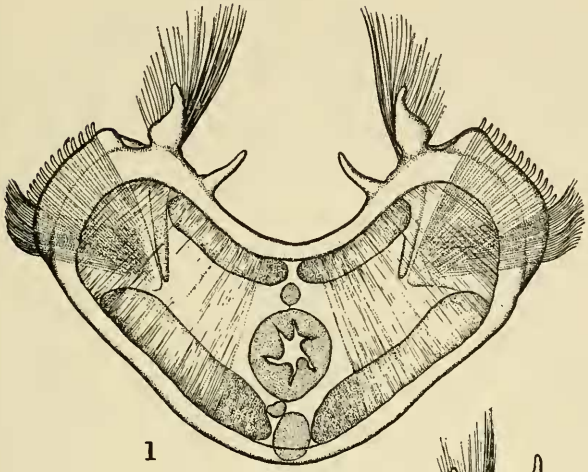
PLATE 36

Naineris dendritica

1. Twelfth segment in posterior view, x14.
2. Twenty-seventh segment in posterior view, x14.
3. A far posterior segment in posterior view, x14.



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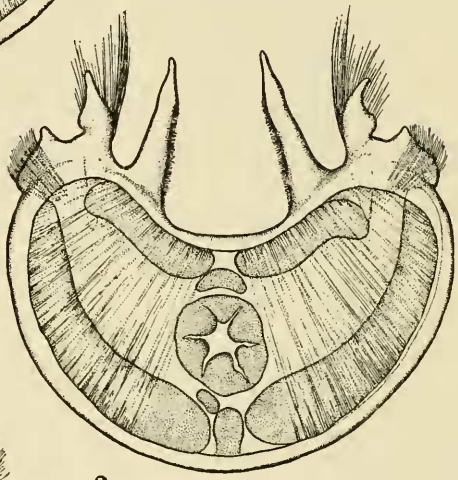

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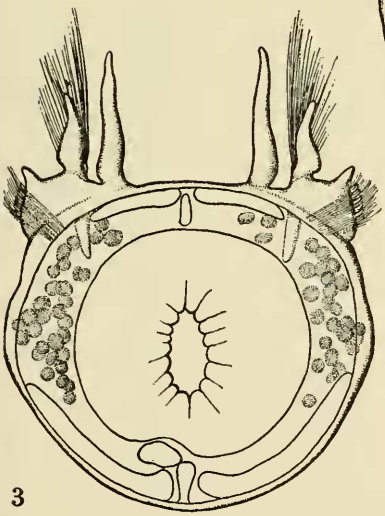

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PLATE 37

Naineris dendritica

1. Furcate seta from abdominal notopodium, in front view, x986.
2. A furcate seta from abdominal notopodium in side view, x986.
3. Thoracic uncinus from posterior row, x263.
4. Ridged thoracic uncinus from inferior posterior position, x445.
5. Embedded superiormost thoracic seta, transitional between uncinus and pointed seta, x445.
6. Thoracic neuropodial seta from middle of fascicle, x445.
7. Thoracic neuropodial seta from anteriormost row, x310.

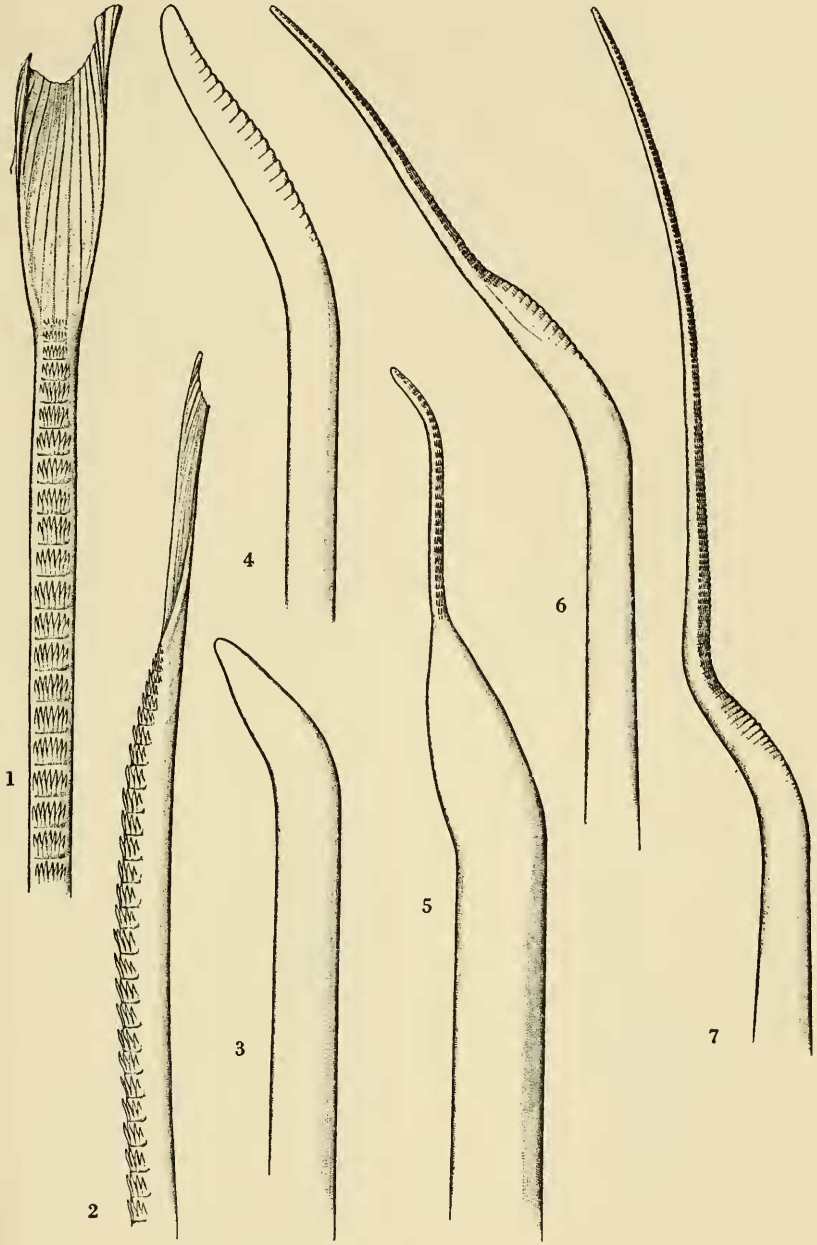
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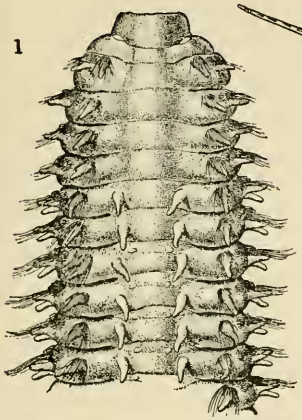
PLATE 38

Naineris uncinata

1. Anterior end in dorsal view, x16.
2. Portion of pointed thoracic neuropodial seta showing spinous region in side view, x1530.
3. Pointed thoracic neuropodial seta from thirteenth parapodium in side view, x177.
4. Thoracic uncinus from thirteenth parapodium in side view, x189.
5. Furcate abdominal notopodial seta in front view, x706.
6. Thirteenth thoracic segment in posterior view, x25.
7. Twenth-seventh segment (transitional) in posterior view, x39.
8. Posterior abdominal segment in anterior view, some ova indicated, x28.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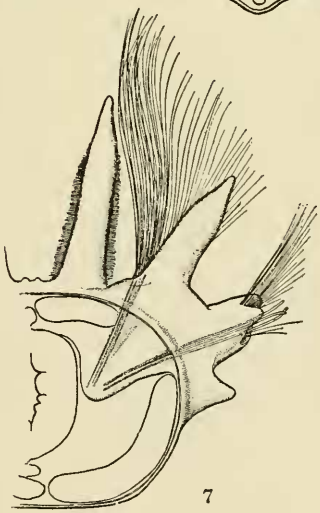
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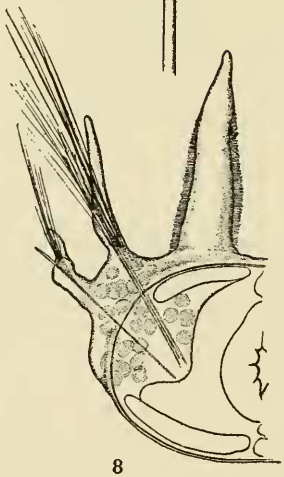
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PLATE 39

Naineris grubei australis

1. Thoracic neuropodial ridged uncinus seen from the side, x880.
2. Thoracic neuropodial pointed seta seen from the side, x880.
3. Cross section of thoracic pointed seta, showing arrangement of overlapping platelets, x3340.
4. Parapodium from anterior abdominal region showing postsetal lobes and branchia, in posterior view, x50.

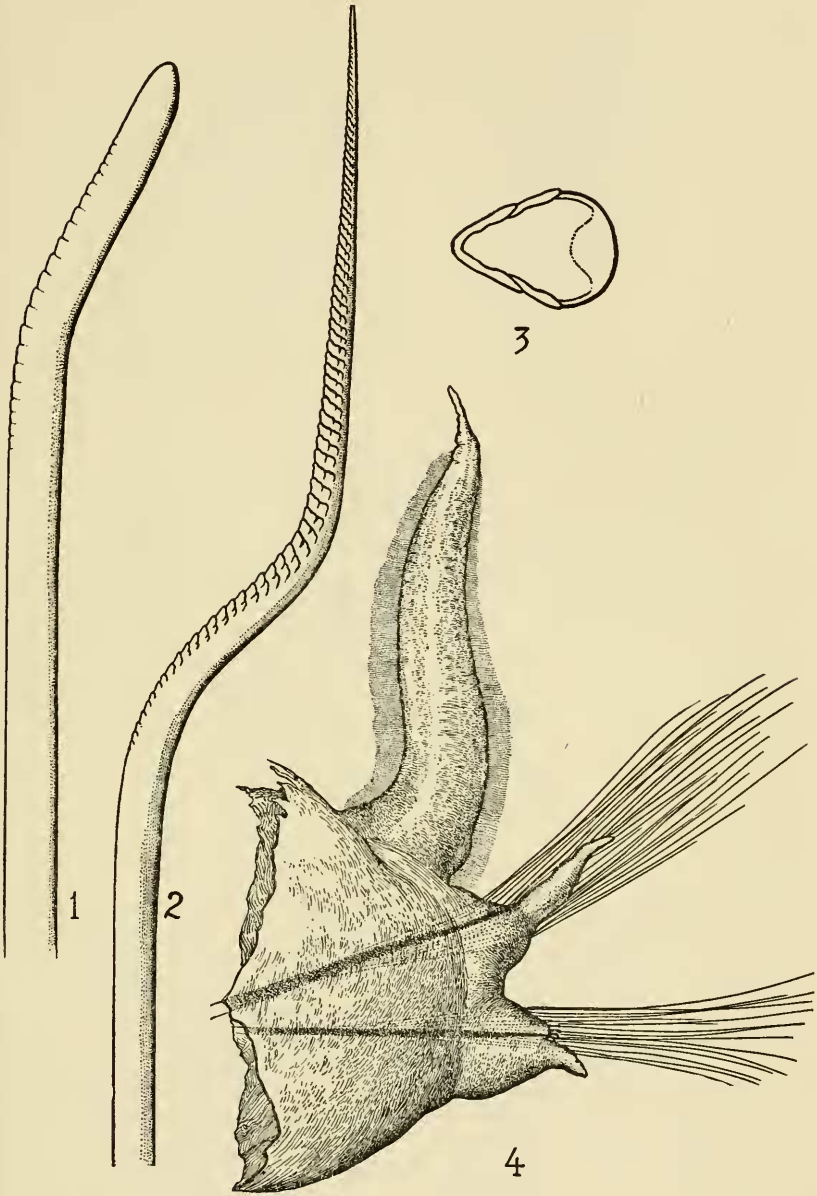
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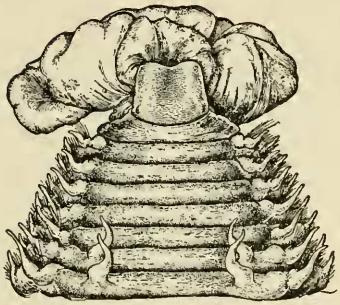
PLATE 40

Naineris bicornis

1. Anterior end with proboscis everted, in dorsal view, x16.
2. Segment twenty-seven, showing arrangement of parapodial parts, in posterior view, x16.
3. Cross section of an abdominal segment showing parapodial lobes and branchiae seen from behind, x22.4.
4. Thoracic uncinus from neuropodium twenty-seven, with transverse serrations and enclosing sheath, x676.
5. Thoracic pointed seta from neuropodium twenty-seven, with transverse serrations, x676.
6. Furcate seta from abdominal notopodium, with transversely serrated shaft, x676.



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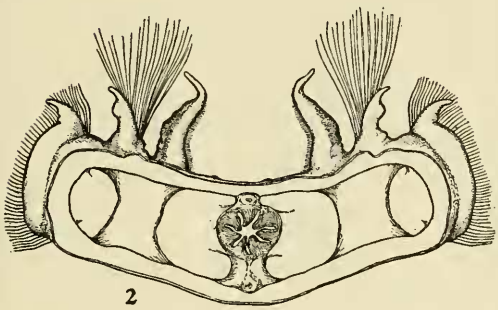

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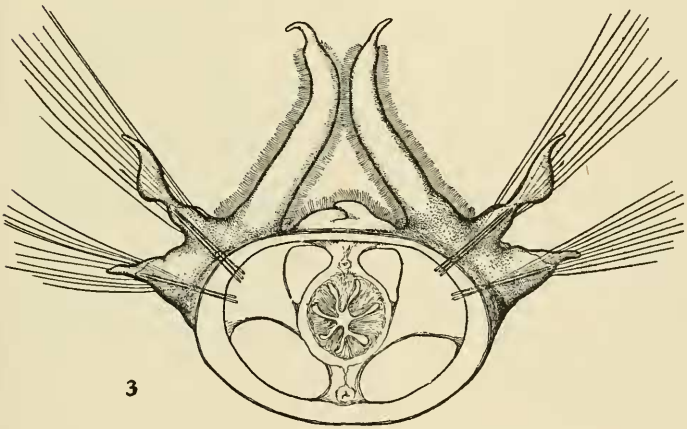

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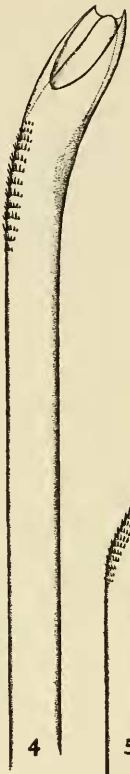

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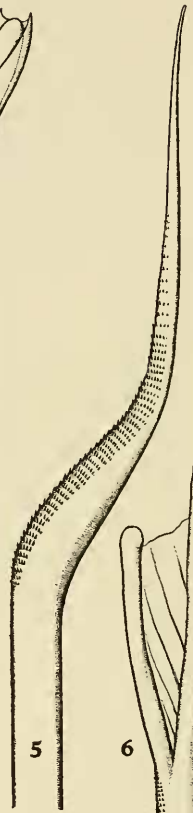

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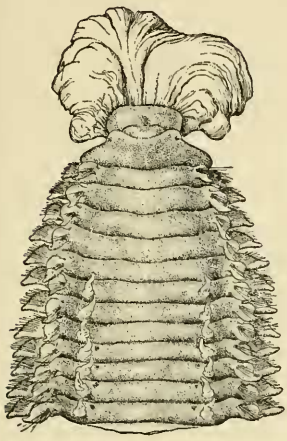
PLATE 41

Naineris setosa

1. Anterior end in dorsal view with everted proboscis, x7.7.
2. Anterior end in ventral view with everted proboscis, x7.7.
3. Twelfth thoracic segment in cross section, showing postsetal lobes and branchiae in anterior view, x11.
4. Median abdominal segment in cross section, showing parapodial lobes, branchiae and subpodial lobes, in anterior view, x16.
5. A far posterior segment in cross section, showing parapodial lobes and branchiae, in anterior view, x21.
6. A furcate seta from an abdominal notopodium, showing spinous shaft and distal tines, x701.



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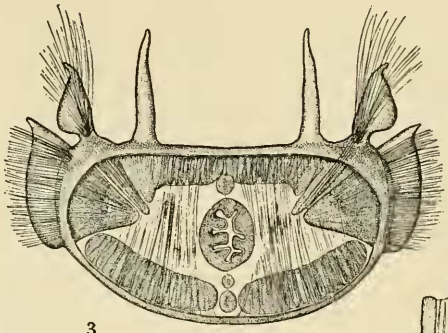

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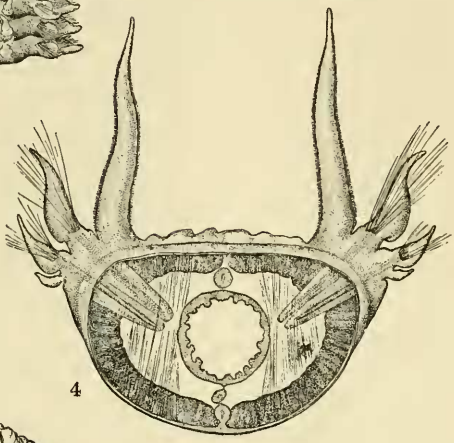

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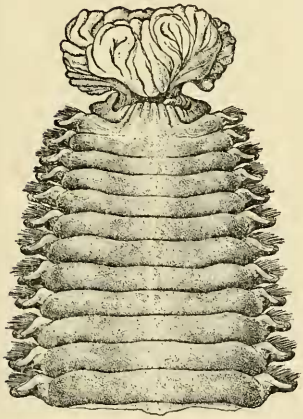

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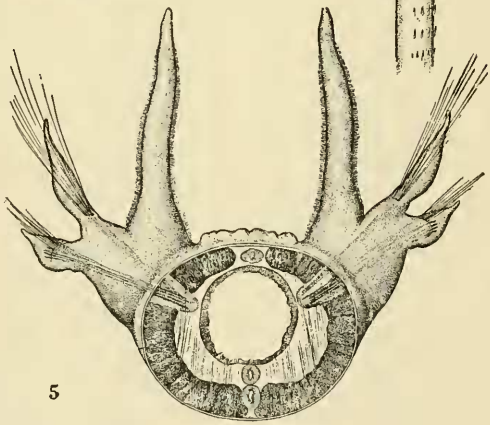

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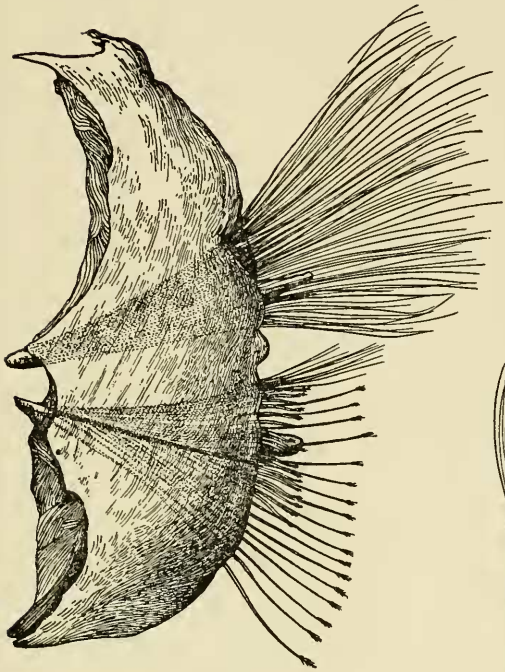
PLATE 42

Califia calida

1. Third parapodium in anterior view, showing postsetal lobes and setal fascicles, x23.
2. A brush-topped seta from anterior series in third parapodium, x525.
3. A brush-topped seta from posterior series in third neuropodium, x410.



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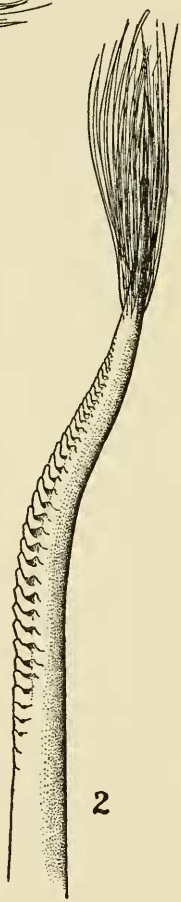

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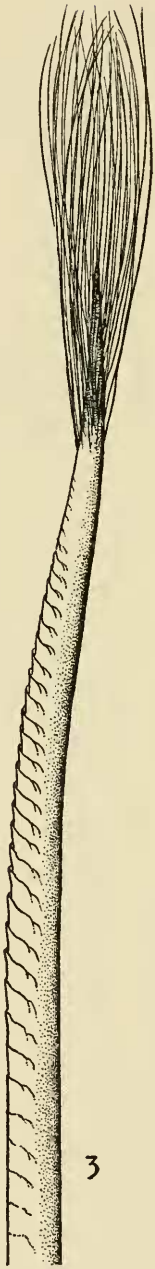

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PLATE 43

1. *Aricidea fauveli*, modified seta from a far posterior neuropodium, with pointed hood, x700. (after Fauvel)
2. *Aricidea jeffreysii, sensu* Monticelli, modified seta from a far posterior neuropodium with rounded hood, enlarged. (after Cerruti)
3. *Aricidea fragilis*, modified seta from a far posterior neuropodium showing pseudoarticulation, tip and base not shown, x1425.
4. *Aricidea* (*Cirrophorus*) *aciculata*, an abdominal neuropodium showing acicular notopodial seta with accompanying slender capillary setae, x160.
5. *Aricidea uschakovi* (from California), two neuropodial setae from a median abdominal segment in full lateral view, x1155.
6. *Aricidea* (*Cirrophorus*) *furcata*, a notopodial furcate seta from an abdominal segment, x2675.
7. *Aricidea*, near *suecica*, a neuropodial, curved seta with accompanying capillary seta from a far posterior segment, x430.
8. *Longosoma catalinensis*, a subuluncinate seta with an accompanying capillary seta from an abdominal segment, x355.

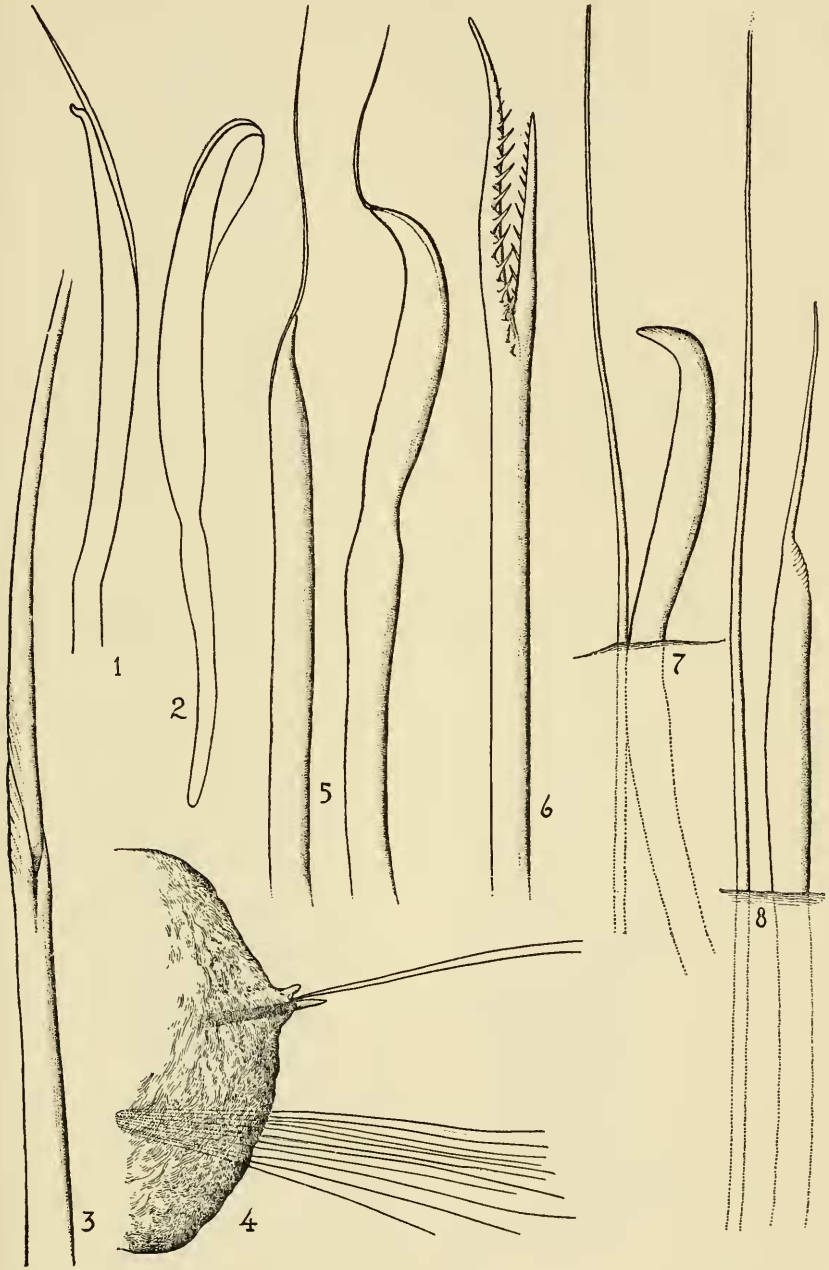
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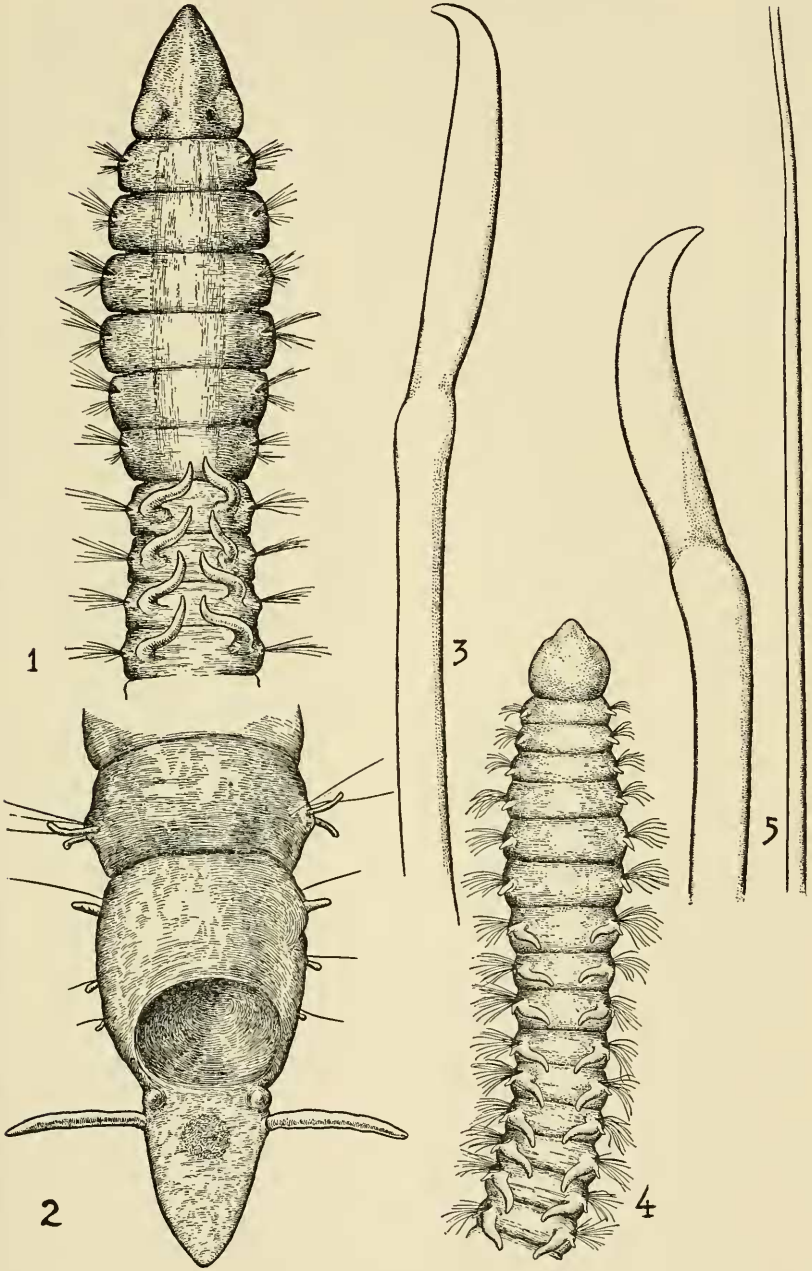
PLATE 44

Paraonis gracilis oculata

1. Anterior end showing prostomium, six prebranchial and four branchial segments, in dorsal view, x109.
2. Posterior end showing pygidial processes and last two setigerous segments with setae and postsetal lobes, in dorsal view, x220.
3. A modified neuropodial seta from a median abdominal segment, seen from the side, x100.

Paraonis gracilis

4. Anterior end showing prostomium, branchiae from seventh segment and laterally projecting setae, x48.
5. Abdominal neuropodial modified seta with accompanying capillary setae (tip not shown), x127.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