

# REDESCRIPTION OF SOME SPECIES OF *CHONE* KRÖYER AND *EUCHONE* MALMGREN, AND THREE NEW SPECIES (SABELLIDAE, POLYCHAETA)<sup>1</sup>

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## ABSTRACT

Generic diagnoses are given for *Chone* (syn. *Megachone*) and *Euchone*. Redescriptions and additions to the descriptions, in part based on study of the types, are provided for some species, *Chone aurantiaca* (new combination), *C. dumeri* (syn. *C. bimaculata*), *C. ecaudata* (syn. *C. minuta*), *C. eniwetokensis* (new combination), *C. gracilis*, *C. infundibuliformis* (syn. *C. teres*), *C. magna*, *C. mollis*, *C. paucibranchiata*, *Euchone alicaudata*, *E. analis*, *E. capensis*, *E. elegans*, *E. papillosa*, and *E. rubrocincta*. Three new species, *Chone albocincta*, *Chone veleronis*, and *Euchone velifera* are described. The number of lobes of the collar is rejected for the Sabellidae as a character on the generic level; the diagnostic value of the palmate membrane is discussed.

The sabellid polychaetes are filter feeders which usually live in permanent tubes. Two genera, *Chone* Kröyer and *Euchone* Malmgren, which occur worldwide, are treated here taxonomically. The length of species of *Chone* ranges from 2.5 mm to almost 10 cm, that of species of *Euchone* from a few millimeters to a few centimeters. Some species are quite common on sandy or muddy bottoms (cf. McIntosh, 1916; Hartman, 1944b; Kühlmorgen-Hille, 1963); at least some species are eaten by fishes (McIntosh, 1916; Berkeley and Berkeley, 1954).

The study was initiated because of difficulties in identifying large species of *Chone* in the Synoptic Collection of the Friday Harbor Laboratories, University of Washington. This led to reexaminations of some types and other specimens primarily from the North Pacific and North Atlantic Oceans. The results are an emendation of the generic diagnosis of *Chone*, including the placement of *Megachone* Johnson in *Chone*, the redescription or improvement of the knowledge of some previously known species, and the

erection of three new species. Because material of several large species of *Euchone* was at hand, additions to their descriptions are also included, the generic diagnosis is emended, and a new species is described.

Of general taxonomic interest is the discovery of a new species of *Euchone*, *E. velifera*, which has a ventrally deeply incised collar with an additional pair of lateral notches (Figure 12a). A collar that is ventrally moderately incised is known also for *E. papillosa* (Sars) and *E. capensis* Day (Figure 11n). The species otherwise agree fully with the characters of *Euchone*. Similarly, *Chone trilobata* Gallardo has deep lateral notches in its collar but otherwise is typical. Especially the occurrence of bilobed collars in species of *Euchone*, a genus uniquely characterized by the anal depression, provides further evidence in support of Johansson's (1927) strong criticism of the attempt by Bush (1904) to make the collar a character of major importance in distinguishing genera among the Sabellidae. Consequently, genera like *Pseudopotamilla* Bush, separated from *Potamilla* Malmgren only by differences in the collar, should not be maintained. In view of the fact that not all *Euchone* species have a palmate membrane, the question is dis-

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cussed (p. 461) whether the character should be used in the generic diagnosis for the closely related *Chone*.

The observations on some primitive characters in Sabellidae by Banse (1970), especially in regard to the abdominal uncini, are supported by the observations on the species discussed below. To those characters may be added the glandular girdle on the second setiger which is common to all species of *Chone* and *Euchone* and is found also in the sabellid genera *Jasmineira* Langerhans and *Myxicola* Koch. It is considered to be a phylogenetically primitive character not only because of the position of *Chone* and *Euchone* within the family but also because similar girdles occur in other families (e.g., Southern, 1914, for Terebellidae).

## METHODS

Because the form of the uncini can vary considerably within the abdomen, the shape of the setae in the anterior abdominal setigers is stressed in the following descriptions. The accessory teeth above the main fang of an uncinus are arranged in several vertical "columns" appearing in side view as horizontal (not strictly so) "rows." The nomenclature for the abdominal segments in *Euchone* follows Banse (1970). The procedure for staining with methyl green introduced by Hofsommer (1913) is described in the same article.

The following abbreviations are used: AHF for Allan Hancock Foundation, University of Southern California, Los Angeles, Calif.; FHL for Friday Harbor Laboratories, University of Washington, Friday Harbor, Wash.; MCZ for Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; NMI for National Museum of Ireland, Dublin; PMNH for Peabody Museum of Natural History, New Haven, Conn.; SMNH for Swedish State Museum of Natural History, Stockholm; SEP for Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Mass.; UCT for University of Cape Town; USNM for U.S. National Museum of Natural History, Washington, D.C.; ZMC for Zoological Museum of the University of Copen-

hagen; and ZMO for Zoological Museum, University of Oslo. When not noted otherwise, the specimens are in my collection.

## SPECIAL PART

### *CHONE* KRÖYER, 1856 EMENDED

*CHONE* Kröyer, 1856, p. 13.- Sars, 1862, p. 119.- Malmgren, 1866, p. 404.- Langerhans, 1881, p. 111.- Saint-Joseph, 1894, p. 250.- Bush, 1904, p. 189.- Hofsommer, 1913, p. 332.- McIntosh, 1923, p. 287.- Fauvel, 1927, p. 334.- Berkeley and Berkeley, 1952, p. 122.- Ushakov, 1955, p. 417.- Day, 1967, p. 776.

*PARACHONIA* Kinberg, 1867, p. 355.

*MEGACHONE* Johnson, 1901, p. 430.

*METACHONE* Bush, 1904, p. 190, 216.

*Type species: Chone infundibuliformis* Kröyer (cf. Bush, 1904).

*Diagnosis:* Sabellidae with semicircular branchial lobes united by palmate membrane. Col- lar conspicuous. Postsetal girdle of glands on second setiger. Ventral shields sometimes present. Ends of abdomen of typical sabellid form. Three types of thoracic notosetae: upper, anterior ones limbate, sometimes in two series of different length; lower, anterior ones narrowly limbate (bayonet-type); and lower, posterior ones spatulate or subspatulate. Thoracic neuropodial uncini long-handled, acicular. Abdominal notopodial uncini avicular, with square or rounded bases; abdominal neurosetae limbate.

*Remarks:* The emended diagnosis comprises the same species as previously (cf. Hartman, 1959, 1965, and below), although it contains as new characters the postsetal girdle of glands, the ventral shields, the bayonet-like setae, and the qualification "or subspatulate setae." The usual occurrence of ventral nude filaments in the branchial crown, the occasional presence of otocysts, and the diagnostic characters pertaining to the family are omitted. There are usually eight thoracic setigers; very rarely a specimen deviates from this number.

*Parachonia* has been included in *Chone* by Johannson (1927), *Metachone* by Fauvel (1927; see also Hartman, 1942b).

The type species of *Megachone* Johnson, *M. aurantiaca*, is redescribed below, based in part on the holotype. Contrary to the statement by Johnson (1901), the species does have ordinary spatulate setae in the thoracic notopodia and thus agrees in every respect with *Chone*.

The diagnosis as given has one weakness: The original reason of Kröyer (1856) in creating *Chone* was the funnel-like appearance of the lophophores, or branchial crown, caused by the palmate membrane. This membrane is not of so unique value as a generic character as originally thought. Sars (1862) was the first to point out that the membrane occurs also in other genera. More important is that it may be present or absent in the closely related *Euchone* (Banse, 1970). If the palmate membrane were considered also in *Chone* as a specific character, *Dialychone* Claparède would become a synonym of *Chone* (cf. Fauvel, 1927). For the practical need of identification, however, considerable difficulties would result. For example, a large species of *Oriopsis* Caullery and Mesnil (cf. *O. rivularis* Annenkova, with bayonet-type thoracic notosetae) would externally be distinguishable from *Chone* only by the absence of the postsetal glandular girdle on the second setiger. Anatomically, *Oriopsis* would, of course, be quite different because it belongs to the thoracogoneate Fabriciinae (Zenkevitch, 1925) with their unique gonoducts. Because eggs may occur in thoracic segments also in abdominogoneate sabellids (cf. *Euchone hancocki* Banse), identification without anatomical study may sometimes not be possible. In view of these problems it seems wise to define *Chone* as above until intensive anatomical studies of representatives of the various subgroups of Fabriciinae have been made. These may yield a more natural and hence more convincing system than is available now.

Among most species of *Chone*, the collar has a very narrow dorsal gap. *C. trilobata* has a collar with deep lateral notches. The bayonet-type setae (also called basal or geniculate setae) were described in some species by previous authors

(cf. Fauvel, 1927; Eliason, 1962) but seem to be present in all members of the genus. The lower posterior thoracic notosetae are sometimes subspatulate, as in *C. filicaudata* Southern and *C. eniwetokensis* (Reish).

The abdominal uncini with square bases and few teeth, thought to be typical for *Chone* (cf. Figure 1k) are found in many species only in anterior abdominal segments, as is the case also in *Euchone* (Banse, 1970). The uncini of posterior setigers can have instead small rounded bases and a high crown of accessory teeth (cf. Figure 6i). Such uncini occur similarly in other genera of Sabellidae and in related families and are thus phylogenetically more primitive than the typical hooks of *Chone*. Further, they can be present in the same tori together with typical ones, as in *C. ecaudata* Moore and *C. albocincta* new species (cf. *Euchone elegans*). Their position shows that ontogenetically they have been formed first. Also this points to the primitiveness of the posterior uncini. Likewise Okuda (1946) has shown in a developmental study of *C. ecaudata* (see below) that the abdominal uncini first formed are of the primitive type and similar to those found, for example, in *Oriopsis*; initially they occur even in the thorax.

In spite of the clarification of diagnostic characters, very little can yet be said about the relations among species of *Chone*. Certainly, species with ventral shields are more primitive than those with fully glandularized epidermes because reasonably primitive Sabellidae should have shields. Significantly, the typical abdominal uncini with square bases seem to be present throughout the abdomen only among *Chone* species having a fully glandularized epidermis (possibly also in *C. eniwetokensis*, according to Reish, 1968).

### *CHONE INFUNDIBULIFORMIS* KRÖYER

Figure 1

*CHONE INFUNDIBULIFORMIS* Kröyer, 1856, p. 33.- Malmgren, 1866, p. 404; 1867, p. 214.- Hofsommer, 1913, p. 332.- McIntosh, 1916, p. 35, 39.- Imajima, 1961, p. 98.- Hartmann-Schröder, 1971, p. 520. See also p. 465.

*CHONE TERES* Bush, 1904, p. 215.- Hartman, 1942b, p. 87; 1959, p. 539.  
 not *CHONE TERES*.- Okuda, 1934, p. 236; 1946, p. 171.- Imajima and Hartman, 1964, p. 365 (for these three references see *C. ecaudata*).- Chlebovich, 1961, p. 231 (see Remarks).

*Diagnosis:* A large *Chone* species without ventral shields. Branchial basis as long as level collar. About 20 pairs of radioles, connected for two-thirds to three-fourths of length by palmate membrane, with free ends very short and broad. First bundle of setae of normal size, inserted more dorsally than following notosetae.

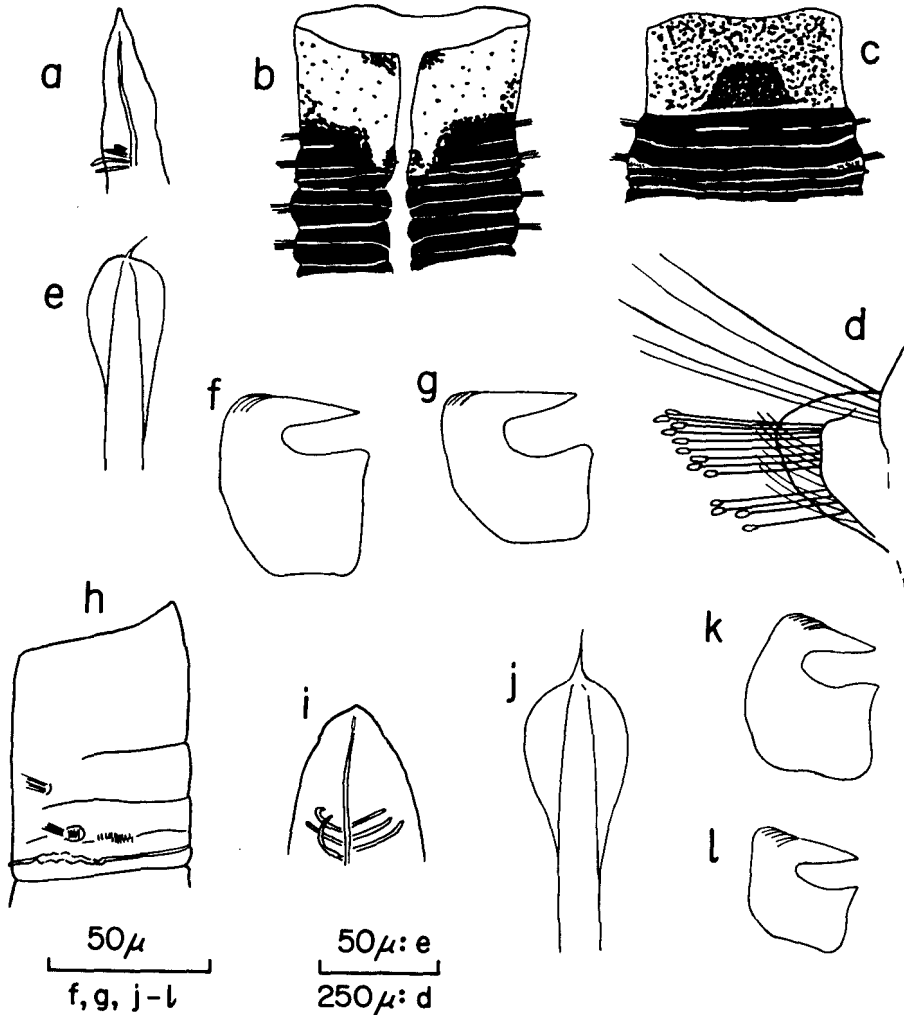


FIGURE 1.—*Chone infundibuliformis*; a from Godhavn; b-g from Egedesminde; h-l from holotype of *C. teres*: a, end of dorso-median radiole; b, c, dorsal and ventral staining pattern of anterior end of trunk; d, anterior view of third thoracic notopodium. Setae schematic, most upper limbate setae omitted from this segment; f, g, uncini from third and approximately 45th abdominal setigers; h, slightly schematic side view of anterior end, branchial crown omitted; i, end of fully developed radiole; j, spatulate seta from sixth setiger; k, l, abdominal uncini from third and approximately 70th abdominal setigers.

Broad notopodial lips in thorax. Spatulate setae with pointed tips. Abdominal uncini uniform, with straight crests; small crowns with some small teeth in several columns; rostra not extending beyond bases.

*Material studied:* Egedesminde and Godhavn, west coast of Greenland (SMNH 6861; 6862), and Safehavn and Hornsund, Spitsbergen (SMNH 6863; 6864 in part). The material of Malmgren (1866), 8 specimens.

Greenland, locality unknown. Collected by C. Lütken in the last century, USNM 372, 2 specimens.

Dutch Harbor, Alaska, holotype of *Chone teres*. PMNH 2761 (previous number: 5-2).

*Additions to the Description:* Since the type material from "the Greenlandic sea" is lost (letter by Dr. J. B. Kirkegaard, ZMC, 27 Feb. 1970), excellently preserved Arctic specimens of Malmgren (1866) are used for additions to the description of the species. The features of the especially suitable specimen from Egedesminde are stressed on the assumption that Krøyer's material was collected also off the west coast of Greenland where most of the traffic went during that time.

The trunks of the smallest specimens are a little less than 2 cm long, are about 1 mm wide, and have about 50 abdominal segments. Large specimens have 70 to 80 abdominal segments and are, when fixed in their tubes, up to 6 or 7 cm long (total) and about 3 mm wide. About 1½ cm of the length of the large animals is contributed by the branchial crown. The radioles number up to 15 or 16 pairs (up to 22 according to Krøyer, 1856). In addition to the radioles, about half a dozen pairs of inconspicuous nude ventral filaments are present; the longest ones are almost a fifth of the length of the branchial crown. The palmate membrane extends to two-thirds or three-quarters of the length of the radioles and continues as broad flanges on the radioles. The ends of the radioles are broad and short (Figure 1a); however, the most ventral pinnated radioles have relatively longer nude tips which are twice as long as shown in

the figure and sometimes have an additional short filiform end.

The collar extends dorsally to the end of the second setiger (Figure 1b). Thus the furrow separating the first and second setigers does not reach the fecal groove. This character is easily made out. On the ventral side (Figure 1c), the first (buccal) segment is not distinctly separated from the collar in unstained animals. The body is essentially rounded and entirely covered by glandular tissue, i.e., no ventral shields are present. The glandularization is conspicuous even in unstained specimens. The segments appear as biannulate in the thorax and through the 40th to 50th abdominal setiger which is most of the abdomen, by length. Dorsally in the thorax after the second setiger, the intrasegmental furrows bend posteriorly before joining the fecal groove. This seems characteristic for the species; Hofsummer (1913), however, stated that the furrows bend forward. The postsetal glandular ring on the second setiger, usually appearing in *C. infundibuliformis* as a sunken fine line, is present (contrary to Ushakov, 1955).

The first bundle of thoracic setae originates slightly dorsad to the level of the notosetae of the following segments. In these segments notopodial lips are conspicuous (Figure 1d) when not withdrawn. Limbate and spatulate thoracic setae were figured by Malmgren (1866, Plate 28, Figure 87B, B<sup>1</sup>, B<sup>2</sup>). Whereas Malmgren depicted spatulate setae with and without pointed tips, I have found only setae with pointed tips (Figure 1e; animals from the four localities of Malmgren's material); these, of course, are often broken off. In the juvenile specimens, the tips are relatively twice as long as shown here. Bayonet-type setae have already been observed by Fauvel (1927) for the species. The thoracic uncini are arranged in irregular double rows except in juveniles; therefore, the oldest (i.e., the dorsal) upper parts of the tori of the adults have only single rows. The abdominal uncini have beaks which do not extend beyond the bases of the uncini (Figures 1f and 1g; checked also at 80th setiger, about 10 segments before the pygidium). The tips of the accessory teeth lie on the continuation of the rostra. In the anterior segments, these teeth seem to be of uniform size,

whereas posteriorly one larger accessory tooth can sometimes be distinguished. Several columns of teeth are present both anteriorly and posteriorly. The long and short limbate abdominal neurosetae are much finer posteriorly than anteriorly.

When treated with methyl green, the thorax and the anterior part of the abdomen stain uniformly. This holds also for the first segment which is visible only ventrally (Figure 1c). The collar shows a variable pattern, not related to locality or size of specimens. It can be either almost fully stained—nearly as intensive as the trunk—or be almost devoid of stain-accepting cells so that the anterior border of the first setiger is indicated only by a midventral white line. The intrasegmental furrow on the first setiger can be weakly indicated or not visible. Stain-accepting cells (and hence, presumably, the glandularization of the body surface) are not fully developed in juveniles. The cells are present in conspicuous concentrations only along the inter- and intrasegmental furrows leaving free areas between them, especially dorsally in the thorax.

The holotype of *Chone teres* was inspected, and the following additions to the description may be made; slight differences from typical *C. infundibuliformis* will be pointed out. The common base of the branchiae is hidden below in the collar which is relatively large (Figure 1h). The collar ends dorsally at the posterior border of the second setiger. The radioles are of unequal length, as if some were regenerating. The longest ones have very broad ends (Figure 1i). Segments are clearly biannulate through approximately the 35th abdominal segment; posterior to this region, staining helps to recognize the intrasegmental furrows. The anterior border of the first setiger is visible only ventrally and laterally (Figure 1h). The intrasegmental furrow of this segment is indicated merely by yellowish color after staining of the animal with methyl green. The anterior border and the intrasegmental furrow of the second setiger do not reach the fecal groove. The glandular girdle is irregularly broadened laterally. On the following thoracic segments, the intrasegmental furrows bend rearward dorsad of the

notosetae and the intersegmental furrows bend forward before joining the fecal groove.

The setal bundle of the first setiger is only slightly smaller than those of the following segments but is situated in a slightly more dorsal position than that of the second setiger. As already stated by Bush (1904), geniculate setae are present in the remaining segments; the spatulate setae have pointed tips (Figure 1j). Thoracic uncini are arranged in irregular double rows in some parapodia. Abdominal uncini are nearly identical anteriorly and posteriorly (Figures 1k and 1l). Their crests are almost straight (less so posteriorly). Several rows of small accessory teeth are arranged in several columns. The rostra do not surpass the bases of the uncini; the cavities below the rostra are not rounded in side view as in Greenlandic, *C. infundibuliformis* (Figure 1f).

Upon staining, the thorax does not accept the dye dorsally as readily as laterally and ventrally; similarly, the ventral epidermis of the abdomen retains the dye longer than that of the dorsal side. In the abdomen the tissues along the inter- and intrasegmental furrows stain more strongly than the fields between them so that most segments appear to bear three whitish rings rather than one, the intrasegmental furrow. Yet, I have the impression that the epidermis is fully glandularized.

*Remarks:* *Chone teres* is considered a synonym of *C. infundibuliformis* although the abdominal uncini are slightly different and the ventral side in *C. teres* accepts stain relatively more than the dorsal side. Noteworthy is the shortness of the branchial crown which contributes approximately one-fifth of total length in Greenlandic specimens preserved in their tubes, but one-eighth in *C. teres*. All other specific characters agree. When more material from Alaska becomes available, special attention should be paid to the mentioned deviating characters to check the justification of placing *C. teres* in synonymy.

The record of *C. teres* by Chlebovich (1961) is not included among the synonyms of *C. infundibuliformis* because he lists *C. cincta* Zachs, as described by Ushakov (1955), among his

synonyms. The figure of the tips of the radioles of *C. cincta* by Ushakov (1955, Figure 159 K) clearly shows a feature very different from *C. infundibuliformis*; it may be noted that Zachs (1933), while describing *C. cincta*, observed that the gills are like those of *C. infundibuliformis*.

The number of records for the long-known *C. infundibuliformis* is very large. Lists by McIntosh (1923), Pettibone (1954), and Hartman (1969) may be consulted, but it must be noted that most of the records cannot be evaluated under the viewpoints presented here without the specimens of the various authors. Therefore, the list of synonyms on p. 461 has been kept short.

Regarding the distribution and synonymy of *C. infundibuliformis* in the North Atlantic, McIntosh (1916) was the first to emphasize the difference between the abdominal uncini of Greenlandic specimens (very small accessory teeth, forming a straight line with the rostrum, cf. Figure 1f) and those of southern forms (teeth coarse, their tips lying on a convex line above the continuation of the rostrum similar to Figure 3g), thus implying that different forms are involved. Most European records of *C. infundibuliformis* will not be identifiable without the authentic material of the several species; confusion is possible with *C. fauveli*, *C. normani*, and *C. reayi*, all described by McIntosh, and *C. ungvana* Chamberlin. Fauvel (1927, p. 346) has already suggested that *C. reayi* may belong to *Jasmineira* Langerhans.

From the description alone, it is certain that most, if not all, of the material of Fauvel (1913, 1914) is not *C. infundibuliformis*. McIntosh (1916) even believed that Fauvel had before him *C. dumeri*, which is very different from any of the species listed in the previous paragraph. All of Fauvel's drawings of abdominal uncini show coarse accessory teeth not found in *C. infundibuliformis* from Greenland. Also, Fauvel (1913) stated that the teeth in some specimens were arranged in one row only. Fauvel emphasized the variability within specimens of the abdominal uncini (as well as of the tips of the spatulate setae) for his material. The shape of abdominal uncini, however, does not vary in *C. infundibuliformis*. Similarly, Lukasch (1911,

Plate 2, Figures 7 and 8) shows a conspicuous divergence of the form of the anterior and posterior abdominal uncini in material from the Kola Fjord; as shown, this does not occur in Greenlandic material. Also, drawings in Fauvel (1927) do not refer to typical *C. infundibuliformis*. Further, Hartman's (1944b, Plate 23, Figure 46) figure of an uncinus of *C. infundibuliformis* from the Swedish west coast resembles that of *C. fauveli*; according to Eliason (1962, see his remarks under *C. dumeri*), true *C. infundibuliformis* is not found on that coast. Finally, uncini vaguely similar to those of *C. fauveli* have been drawn by Rioja and Lo Bianco (1931) for Iberic material identified as *C. infundibuliformis*, so that this record too is uncertain.

#### *CHONE PAUCIBRANCHIATA* (KRÖYER)

*SABELLA PAUCIBRANCHIATA* Kröyer, 1856, p. 22.

*Material studied*: Holotype, from Finmark, northern Norway (from label). ZMC.

The original description was based on a single specimen. The species has been regarded since Malmgren (1866) as a junior synonym of *Chone infundibuliformis* Kröyer. However, the holotype has ventral shields whereas *C. infundibuliformis* does not. The shields are especially visible after using methyl green; the thorax laterally does not stain. The synonymy of this old species cannot be given without a thorough redescription of other European forms: possibly, the species is indeterminable.

The mature specimen, with polygonal eggs of about 50  $\mu$  diameter, is small, having a trunk length of about 10 mm to which the branchial crown adds about 3.5 mm. The greatest width is slightly less than 1 mm. Approximately 45 abdominal setigers are present. As observed by Kröyer (1856), the animal has three pairs of branchia and some short nude filaments. The length of the palmate membrane, which is now torn, extended at least to one-third of that of the branchial crown but not more than two-thirds. The thoracic uncini are long-handled. The first bundle of setae originates slightly more dorsally than the notosetae of the second setiger,

but all limbate setae are broken off so that a complete redescription of *C. paucibranchiata* is not possible.

### CHONE DUNERI MALMGREN

Figure 2a, b

*CHONE DUNERI* Malmgren, 1867, p. 225.- Hof-sommer, 1913, p. 336.- Pettibone, 1954, p. 339.- Hartmann-Schröder, 1971, p. 517.

*CHONE* sp. I Banse, Hobson, and Nichols, 1968, p. 547.

*CHONE BIMACULATA* Banse and Nichols, 1968, p. 227.- Nichols, 1968, p. 61.

not *CHONE DUNERI*.- Pettibone, 1956, p. 577 (a *Euchone* sp., see Remarks).

**Diagnosis:** A *Chone* of intermediate size without ventral shields. Branchial basis somewhat higher than oblique collar. Up to about 10 pairs of radioles, connected for about two-thirds of length by palmate membrane, with narrow, very long free ends. First bundle of setae very small. Conspicuous notopodial lips in thorax. Spatulate setae with pointed tips. Abdominal uncini with broad bases and small accessory teeth.

**Material studied:** Point Barrow, northern Alaska, 5 miles offshore, 89 m, 6 Oct. 1949. Collected by G. E. McGinitie, identified by M. H. Pettibone (Pettibone, 1954). USNM 23633, 2 specimens.

Paratypes of *C. bimaculata*, from station 5 of Lie (1968, 3 May 1963). USNM 36280, 4 specimens.

West Sound, Orcas Island, Wash., approx. lat 48°36'N, long 112°57'W, 40 m, mud, July 1967. Collected by H. L. Sanders. 1 specimen. Unpublished record.

**Additions to the Description:** The longest complete specimens at hand, from Point Barrow, are 18 and 26 mm long. In all animals examined, the free ends of the radioles are one-quarter to one-third as long as the entire radioles, tending to be relatively longest on the dorsal side of the branchial crown. Ventrally, about four pairs of nude filaments are found; two pairs are almost as long as the branchial crown and at least some

have cartilaginous axes. As described by Malmgren (1867, Plate 14, Figure 75), the collar barely conceals the peristomium so that the branchial base is fully visible. The first (buccal) segment is not clearly distinguishable from the collar in unstained animals. A postsetal girde of glands is present on the second setiger. Ventral shields are absent. The first fascicle of setae is very small in comparison with the following ones. From the second setiger on, notopodial lips are conspicuous. The thoracic neurosetae are winged hooks in Arctic and Puget Sound specimens (see Banse and Nichols, 1968, Figure 2g). An anterior abdominal uncinus is shown in Figure 2a.

The staining pattern of the specimens from Point Barrow (Figure 2b) is similar to that described by Hof-sommer (1913) for an animal from the North Sea. In contrast to the appearance in species with ventral shields, the intensity and appearance of stained tissue in *C. duneri* is uniform around the entire circumference of the thorax and anterior abdomen. Ventrally, the small, weakly dyed fields in the presetal and postsetal rings are present also in the first abdominal setigers but disappear gradually by about the tenth abdominal segment. The dorsal pattern is characterized as follows: The median folds of the collar remain white. The unstained rings in the plane of the parapodia bend rearward on the dorsal surface similarly to but less pronounced than in *C. infundibuliformis* (Figure 1b). Weakly stained fields are present within the presetal stained rings of the thorax (cf. Hof-sommer, 1913, text figure h); they extend laterally on the abdomen to the level of the neuropodia. Consequently the presetal rings of the anterior abdomen are nearly split in two. Occasionally, the postsetal rings are equally split but this is a condition which may occur also in other species without it having been noted herein. In most of the specimens from Washington which are smaller and in part not as well preserved, the pattern agrees but in some the dark longitudinal midventral strip is less conspicuous than in Figure 2b.

**Remarks:** Earlier authors have apparently not noted the glandular ring on the second tho-



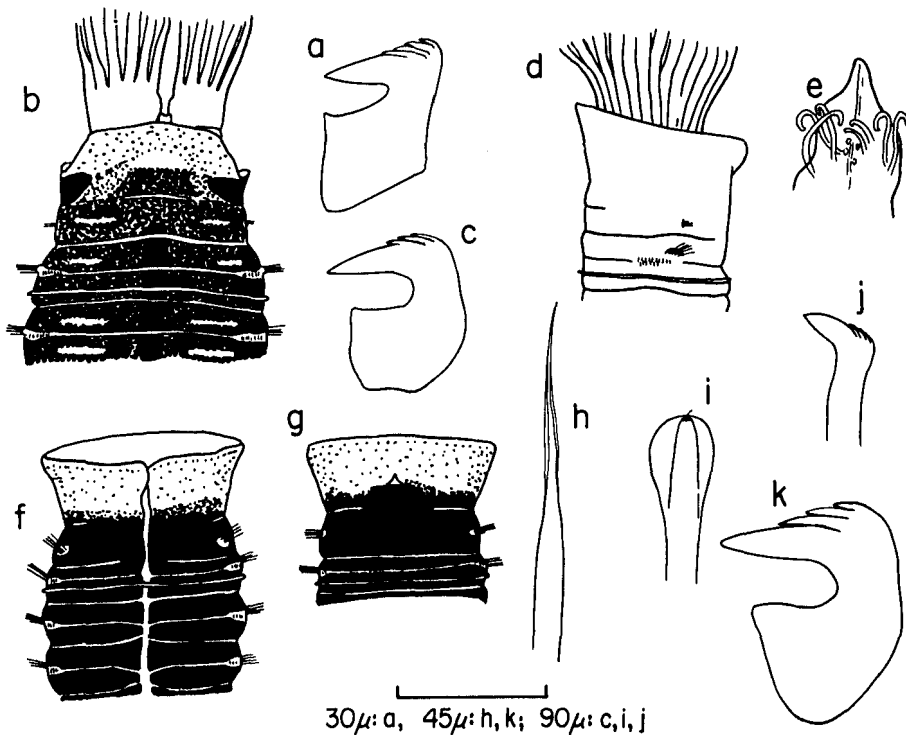


FIGURE 2.—*Chone duneri*, from Point Barrow: a, middle uncinus from fourth abdominal setiger; b, ventral view of anterior end of thorax after staining; *C. aurantiaca*; c from holotype, others from USNM 43637: c, uncinus from second abdominal setiger; d, anterior end from the right side; e, end of median radiole, somewhat schematic; f, g, anterior end in dorsal and ventral views after staining. Slightly schematic, branchial crown omitted; h, i, bayonet and spatulate setae from sixth setiger; j, uncinus from fourth setiger; k, uncinus from approximately 60th (12th to last) abdominal setiger.

racic setiger; Ushakov (1955) has specifically stated that it is absent. This character was one of the main reasons for describing *C. bimaculata*; at that time it was not realized that all *Chone* species have such a ring. Contrary to the original description, the intersegmental furrows of the paratype do not stain and the thoracic intra-segmental furrows, in the plane of the parapodia, are ventrally interrupted by the strongly stained longitudinal midventral line (cf. Banse and Nichols, 1968, Figure 2j). Thus, there is no justification for maintaining *C. bimaculata*.

The record of *C. duneri* from Labrador (Pettibone, 1956, USNM 23635, 2 specimens) is a *Euchone* sp. with conspicuous ventral shields.

### *CHONE AURANTIACA* (JOHNSON)

Figure 2c-k

*MEGACHONE AURANTIACA* Johnson, 1901, p. 430.—Hartman, 1938, p. 19; 1959, p. 549.

*Diagnosis:* A large *Chone* species without ventral shields. Branchial basis shorter than the slightly oblique collar. About 25 pairs of radioles connected for four-fifths of length by palmate membrane, with free ends short and tapered. First bundle of setae small, inserted at same level as following notosetae. Spatulate setae without pointed tips. Abdominal uncini uniform, with a few columns of three to four coarse

accessory teeth each; rostra extending beyond bases. With caudal appendix?

*Material studied:* Holotype, from Port Orchard, Wash. MCZ 1933.

Near Friday Harbor, Wash., lat 48°31.7'N, long 122°58.0'W, at the 0-ft level, in shell gravel, 6 July 1953. Collected and identified as *C. infundibuliformis* by R. I. Smith. FHL 1700, 1 specimen. Unpublished record.

From same site, presumably intertidal, in fine gravel, 10 July 1968. Collected by S. Heller. USNM 43637, 1 specimen. Unpublished record.

*Redescription:* The holotype is now very poorly preserved; it apparently had been allowed to become dry. The diagnostic characters, i.e., the position of the setae on the first setiger, the form of the spatulate setae (in one notopodium), and the abdominal uncini (Figure 2c) can still be recognized; the collar has been depicted by Johnson (1901, Plate 18, Figure 186). According to Johnson, the trunk had 75 setigers and was 87 mm long.

The following description is based on the two animals from near Friday Harbor which are complete, fixed outside their tubes, and well preserved. One specimen (USNM) has 8 thoracic and almost 70 abdominal setigers. The length of the branchial crown is approximately 10 mm, that of the trunk roughly 60 mm, and the greatest width is about 3 mm. The other animal (FHL) has approximately 60 abdominal setigers, its trunk length is about 60 mm, the greatest width almost 5 mm, and the branchial crown approaches 15 mm in length.

In the preserved material the branchial crown forms a funnel with reflexed upper margin, as common in the genus. The basis of the crown is hidden by the collar (Figure 2d). The number of radioles is 20 pairs (USNM) and 26 pairs (FHL). They are united by a palmate membrane for about four-fifths of their length. The tips of the radioles extend beyond the origin of the distal pinnules; they are short and broad, tapering at the ends (Figure 2e). Ventrally the tips are slimmer, dorsally a little wider than shown. Many pinnules reach almost to the ends of the radioles. As nude filaments were not

found, they must be very short. The palps are small triangular processes.

The collar is slightly oblique, being a little longer ventrally than dorsally. It extends dorsally to the intrasegmental furrow of the second setiger (Figure 2f). Consequently, the posterior border of the first setiger does not end in the fecal groove. Ventrally, the first (buccal) segment is not clearly set off from the collar. Ventral shields are not present, and the entire epidermis is glandularized. Setigers in the thorax and abdomen are biannulate. The intrasegmental division of the first setiger is poorly discernible and has not been drawn in Figure 2g. The dorsal pattern of the inter- and intrasegmental borders in the thorax is shown in Figure 2f. The pygidium is pointed. A damaged filiform appendage was seen in one specimen (USNM). It appears to be similar to the caudal appendage of *C. flicaudata* Southern. It is absent in the other animal (FHL).

The first setiger has bundles of a few short setae which insert at right angles to the notopodia of the following segments but on the same level (Figure 2d). Each of the remaining thoracic notopodia has almost 2 doz of upper limbate setae in two sizes and below an anterior series of bayonet-type setae (Figure 2h) with shafts almost as thick as the posterior series of spatulate setae; the bayonet-type setae taper abruptly at about the level of the body surface. The spatulate setae (Figure 2i), 1½ to 2 doz per parapodium, are without pointed tips but some have very tiny hairs instead. The distal end of such a seta can appear as having a dimple. These spatulate setae are present also in the holotype, but were overlooked by Johnson (1901).

About 3 doz of neuropodial hooks (Figure 2j) are arranged in irregular double rows in most thoracic neuropodia. The uppermost half dozen or so are in single rows. The abdominal uncini (Figure 2k) are uniform in shape anteriorly and posteriorly. When seen from the side, they have three or four large coarse accessory teeth arranged in three or four columns. The rostra extend beyond the bases. Two dozen uncini are present even in the 50th to 60th setigers.

Some irregular orange-red speckles remain on the collar and anterior segments of the holotype

which was preserved in Formalin and stored in alcohol. The second specimen was orange-red in life as was the holotype while freshly preserved (Johnson, 1901). Upon staining with methyl green the entire body surface turns uniformly green except for the collar and the inter- and intrasegmental furrows.

*Remarks:* Because of the presence of spatulate setae in the type species, *Megachone* is a synonym of *Chone* (cf. p. 461).

*Megachone aurantiaca* may be distinguished from the similar species, *C. infundibuliformis*, by the insertion of the first thoracic bundle of setae and the form of the abdominal uncini. *Chone magna*, when deprived of the branchial crown, will also be difficult to distinguish from

*C. aurantiaca* but can be recognized by the same diagnostic characters. *Chone mollis*, the third fairly large species of *Chone* on the North American west coast, has a different arrangement of intersegmental furrows anteriorly (Figure 3c), large notopodial lips and somewhat different abdominal uncini, especially posteriorly (Figure 3h).

*CHONE MOLLIS* (BUSH)

Figure 3

*METACHONE MOLLIS* Bush, 1904, p. 216.  
*CHONE MOLLIS*.- Hartman, 1942b, p. 87;  
 1944b, p. 279; 1969, p. 673.

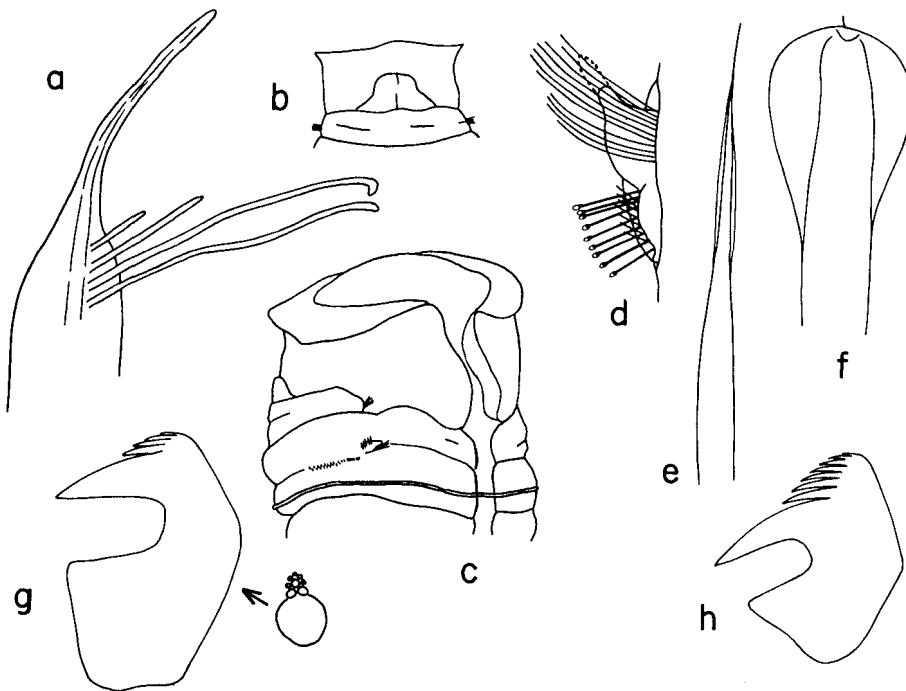


FIGURE 3.—*Chone mollis*; AHF 003258, setae not drawn to scale: a, end of median radiole, pinnules schematically drawn for one side; b, ventral view of anterior end. Somewhat schematic, branchial crown omitted; c, anterior end from the right side, branchial crown omitted; d, anterior view of thoracic notopodium. In dotted outline the extended cirrus; e, bayonet-type seta; f, spatulate seta; g, uncinus from second abdominal setiger. Detail: top viewed *en face*; h, uncinus from 30th abdominal setiger (of about 40 total abdominal segments).

*Diagnosis:* A large *Chone* species without ventral shields. Branchial basis hidden by level collar. Approximately 15 pairs of radioles connected for two-thirds of length by palmate membrane, with free filiform ends of intermediate length. First bundle of setae small, inserted in a furrow (continuation of anterior border of first setiger) on same level as following notosetae. Conspicuous notocirri and notopodial lips in thorax. Spatulate setae without pointed tips. Anterior abdominal uncini with rostra about as long as bases, few coarse teeth in two columns; crowns somewhat enlarged in posterior segments.

*Material studied:* Tomales Bay, Calif., near the low tide line. Summer 1941. Collected by F. A. Pitelka; identified by O. Hartman. AHF n 424, 2 specimens.

Tomales Bay, Calif., clam flats. 8 June 1941. Collected by S. F. Light; identified by O. Hartman. AHF 003258, 2 specimens.

Off Long Beach, Calif., *Velero* station 4886, lat 32°42'34"N, long 118°08'15"W, 22 Feb. 1957. AHF 003218, 6 specimens.

Inner Tomales Bay, Calif., across from the village of Marconi. Coarse intertidal sand. Collected and identified by J. S. Tucker. 6 specimens.

*Additions to the Description:* The largest animals (AHF 003258) are up to 5 cm long (total) and 3 mm wide. The ends of their radioles have flanges (Figure 3a) that taper fairly abruptly at the level of the last pinnules. In specimens from Tomales Bay of 3-cm length and 2-mm width, the free ends may be almost twice as long as shown in the figure. The largest of the several ventral nude filaments recognizable in the latter specimens reach two-thirds of the length of the branchial crown.

The anterior end is distinguished ventrally by a very prominent first (buccal) segment (Figure 3b) that is clearly set off from the collar and tends to be split longitudinally. The anterior border of the first setiger is complete; laterally, it converges with the anterior border of the second setiger where the first bundle of setae inserts (Figure 3c). The furrow between the

first and the second setiger extends to the fecal groove. The segments may appear as biannulate at least through the 25th abdominal setiger.

The thoracic notopodia (Figure 3d) have massive lips. The posterior lips bear more or less contracted notocirri. The whole structure may be almost completely withdrawn into the surrounding epidermal pocket so that only the contracted cirrus, resembling a papilla, is visible under favorable illumination. The bayonet-type setae (Figure 3e) arise from the anterior lower lip shown in Figure 3d. The diameter of their shafts is three-fourths the width of the spatulate setae. They taper abruptly at about the level of the body surface. Spatulate setae (described by Hartman, 1944b, as having a dimple) sometimes have very minute tips (Figure 3f) which presumably are usually broken off. Thoracic uncini may or may not be arranged in irregular double rows. The anterior abdominal uncini (Figure 3g; cf. Bush, 1904, Plate 35, Figure 28; Hartman, 1942b, Figure 141; 1944b, Plate 23, Figure 49) have small and few teeth, in two columns. Posteriorly, however, the number of rows increases (Figure 3h) as well as the number of columns.

In stained specimens, the entire epidermis is uniformly green, i.e., ventral shields are absent. A white crescent-shaped area is found ventrally on the collar anterior to the first segment. The intrasegmental furrows, dorsally in the thorax, are inclined rearwards as in *C. magna* (cf. Figure 5e).

#### *CHONE GRACILIS* MOORE

Figure 4

*CHONE GRACILIS* Moore, 1906, p. 257.- ?Hartman, 1961, p. 42; 1969, p. 665 (same record). not *CHONE GRACILIS* Moore.- Berkeley and Berkeley, 1932, p. 315; 1942, p. 206; 1952, p. 123, in part (for all, see *C. ecaudata*). not *CHONE GRACILIS* Hofsommer, 1913, p. 342 (homonym). *CHONE INFUNDIBULIFORMIS*.- Pettibone, 1954, p. 378, in part.

*Diagnosis:* A *Chone* species of intermediate size without ventral shields. Ten pairs of ra-

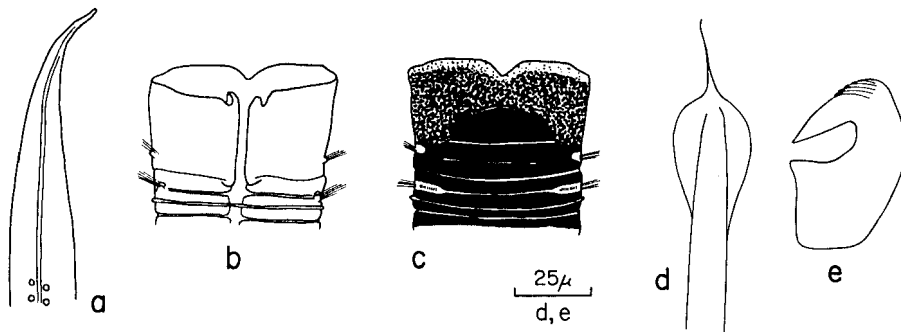


FIGURE 4.—*Chone gracilis*, from holotype: a, end of median radiole. Origin of pinnules indicated schematically; b, dorsal view of anterior end, branchial crown omitted; c, ventral staining pattern of anterior end of trunk; d, spatulate seta from sixth setiger; e, uncinus from third abdominal setiger.

diodes connected for three-fifths of length by palmate membrane, with free ends gradually tapering to pointed tips. Branchial basis as high as collar; collar almost level, with distinct ventral indentation. First bundle of setae of normal size, inserted at same level as following notosetae. Rounded notopodial lips in thorax. Spatulate setae with long pointed tips. Abdominal uncini uniform, with small accessory teeth in several columns; rostra not extended beyond bases.

**Material studied:** Holotype, from Kodiak Island (originally spelled Kadiak), southwestern Alaska. USNM 5513.

**Additions to the Description:** The original description of the specimen, a mature female, was rather complete but was accompanied only by a few figures so that there has been some confusion with other species. The branchial basis is as high as the collar. A tip of a median (lateral) radiole is shown in Figure 4a. The collar (Figures 4b and 4c) inserts dorsally on the anterior part of the second setiger. The free dorsal edge of the collar is folded inwards as stated by Moore (1906). The edge rises ventrolaterally and ventrally slightly over the height attained dorsally. A midventral indentation of the collar is very conspicuous. The first (buccal) segment is distinct ventrally even without staining. The intrasegmental furrow on the second

setiger reaches the fecal furrow. A postsetal girdle of glands is present on this setiger. The first bundle of setae, now preserved on only one side, is of ordinary relative size and inserts at the same level as the notopodia of the following segments. Moore (1906, Plate 12, Figure 62) depicted bayonet-type setae without designating them as such. The spatulate setae (Figure 4d) have unusually long tips as shown also by Moore (1906, Plate 12, Figure 64). The abdominal uncini (Figure 4e) are uniform throughout and have about six rows of approximately six small teeth which are difficult to count. Upon staining with methyl green, thorax and most of the abdomen turn uniformly green excepting the intersegmental and intrasegmental furrows; also, the presetal parts of the segments dorsal in the thorax are paler than the postsetal parts. Ventrally, the incomplete anterior and posterior borders of the first segment are distinct. The intrasegmental furrow of the first setigerous segment is poorly visible.

**Remarks:** I concur with Moore (1906) that this is a species of its own; it is distinct from *C. infundibuliformis* (contrary to Pettibone 1954). Based on his description and the observations provided here, *C. gracilis* is distinguished among the species with glandularized epidermis by its ventrally indented collar; another diagnostic character is the combination of a relatively long branchial crown which contributes more

than one-third of the total length, with the form of the tips of the radioles and spatulate setae, the insertion of the collar dorsal on the second setiger, and the form of the abdominal uncini.

The species is definitely known from southwestern Alaska. Hartman (1961, 1969) recorded it from California but referred expressly to the description by Berkeley and Berkeley (1952). As this largely represents *C. ecaudata* (see p. 473), the record needs confirmation.

*CHONE MAGNA* (MOORE)

Figure 5

*EUCHONE MAGNA* Moore, 1923, p. 245.- Hart-

man, 1961, p. 42.

*CHONE MAGNA*.- Hartman, 1969, p. 669.

*Diagnosis:* A large *Chone* species without ventral shields. Branchial basis shorter than oblique collar. About 30 pairs of radioles, connected for two-thirds of their length by palmate membrane, with free ends narrow and very long. First bundle of thoracic setae small, inserted slightly ventrad to following notsetae. Spatulate seta without pointed tips. Abdominal uncini uniform, with three of four coarse accessory teeth in two columns; rostra extending beyond bases.

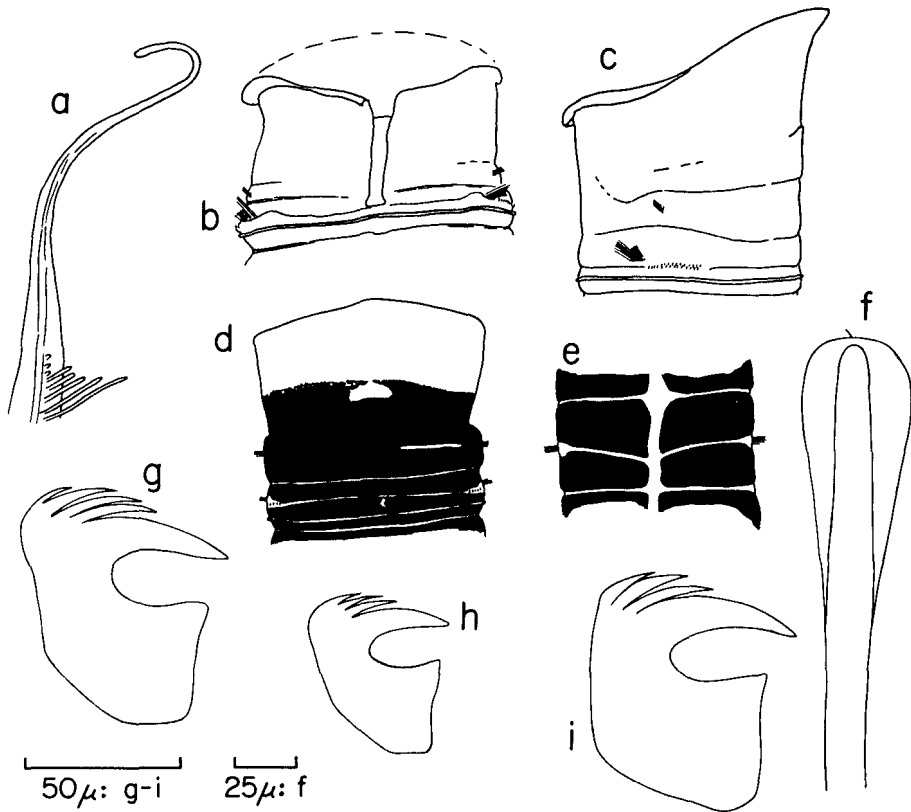


FIGURE 5.—*Chone magna*; e, g, and h from holotype, the others from animals from Washington: a, end of radiole; b, c, ventral and side views of anterior end, branchial crown omitted, setae schematic; d, ventral view of anterior end of stained specimen, body outline schematic; e, dorsal view of posterior thoracic segment of stained specimen; f, spatulate seta; g, h, uncini from 30th and approximately 70th (last of fragment) abdominal segments; i, uncinus from 70th (10th before last) abdominal segments from other animal.

*Material studied:* Holotype, from almost 500-m depth off California. USNM 17281.

North of Santa Catalina Island, Calif., *Velero* station 1178, between lat 33°30'45"N, long 118°30'40"W, and lat 33°27'40"N, long 118°30'00"W, 72 to 78 m, sand, 10 Sept. 1940. Identified by O. Hartman. AHF 003259, 1 specimen.

Off Upright Head, Lopez Island, Wash., approx. lat 48°35.5'N, long 122°53'W, 2 Aug. 1960. Collected by R. P. Dales and G. John. FHL 293, 1 specimen. New record.

South of Orcas Island, Wash., lat 48°34.9'N, long 122°50.8'W, 40 to 54 m, 13 Aug. 1964. Collected by S. van Niel. USNM 43636, 1 specimen. New record.

*Additions to the Description:* The two large complete animals from the San Juan Islands, Wash., were compared with the holotype. The slightly larger one (FHL) has about 65 abdominal setigers and is approximately 7.5 cm long (total) and 0.5 cm wide. The trunk of the Californian specimen (AHF) is slightly longer than 2.5 cm.

The branchial crown, previously unknown, contributes about one-fourth of the total length. The larger specimen has 30 pairs of radioles; in addition, about six pairs of nude filaments maximally one-fifth as long as the branchial crown are present. The palmate membrane connects three-fifths of the length of the radioles. Their free ends (Figure 5a) are 3 to 5 mm long and sometimes coiled up like a watch spring. The very numerous pinnules are about 1.5 mm long.

The collar (Figures 5b and 5c), well recognizable also in the holotype, is large for a species of *Chone*, markedly higher ventrally than dorsally and often opened and folded backward. When closed, it probably conceals fully the common basis of the radioles. The dorsal slit extends to the middle of the second setiger (Figure 5b). The first setiger is indistinctly set off from the first segment; the border is morphologically visible but is not indicated by a white line after staining (Figures 5c and 5d). The setae on the first setiger arise in a more ventral position than the notosetae on the following segments (Figure 5c).

Additions to Moore's description of the trunk

are the following: A glandular postsetal girdle is present on the second setiger. The intrasegmental furrows in the middle and posterior thorax are not parallel to the intersegmental furrows (Figure 5e). Ventral shields are absent, i.e., the epidermis is completely glandularized and stains uniformly in the thorax and most of the abdomen, except for the inter- and intrasegmental furrows (Figure 5d).

Bayonet-type setae are present. The spatulate setae of the holotype, (stated by Moore, 1923, to be without a mucron) are lost and those of the Californian specimen are damaged. The spatulate setae of the material from Washington have hairs on their tips (Figure 5f). The thoracic uncini tend to be arranged in irregular double rows in the large animals. Anterior and posterior abdominal uncini (Figures 5g-i) have beaks longer than the bases, with three or four coarse accessory teeth above them. In frontal view, the teeth appear to be in a single row in most cases; occasionally I have seen two side by side. The difference in outline between Figures 5h and 5i is probably more a question of orientation than real.

*Remarks:* *Euchone magna* was transferred to *Chone* by Hartman (1969). It seems likely that Moore (1923) placed the species in *Euchone* due to a mistake while reconstructing his lost manuscript of 1911: His text states clearly the absence of a caudal membrane. Also, the vial contains a provisional label, *Chone magna*, which is written on stationery of the Philadelphia Academy and, according to Dr. M. H. Pettibone, is in Moore's handwriting.

The species has been known previously only from California.

#### *CHONE ECAUDATA* (MOORE)

Figure 6

*JASMINIERA ECAUDATA* Moore, 1923, p. 246.

*CHONE ECAUDATA*.- Hartman, 1942a, p. 135; 1969, p. 663.- Berkeley and Berkeley, 1950, p. 67; 1952, p. 124.

*CHONE GRACILIS*.- Berkeley and Berkeley, 1932, p. 315; 1942, p. 206; 1952, p. 123, in part.

*CHONE MINUTA* Hartman, 1944b, p. 280; 1969, p. 671.- Rioja, 1963, p. 218.  
 ?*CHONE TERES*.- Okuda, 1934, p. 236; 1946, p. 171.- Imajima and Hartman, 1964, p. 365.

**Diagnosis:** A small *Chone* species with ventral shields. Six to eight radioles connected for approximately one-half of length by palmate membrane, with free ends of variable length. Collar low, almost level, barely covering the branchial basis, with overlapping dorsal ends. First bundle of setae large, on same level as following notosetae. Conspicuous rounded notopodial lips in thorax. Spatulate setae with long pointed tips. Anterior abdominal uncini with rostra

longer than bases, with several rows of teeth in several columns; crowns posteriorly much higher, bases rounded.

**Material studied:** Two syntypes from off Santa Cruz, Calif. Dr. M. H. Pettibone (personal communication) suggested that following Moore's handwritten label, the smaller, complete specimen should be designated the holotype. USNM 17319.

Dillon Beach, Calif., July 1933. Collected by O. L. Williams; originally identified as *C. minuta*. AHF 003229, 11 specimens of a larger sample.

Fort Bragg, Calif., abundant in tunicate and *Lissodendoryx* colonies and eel grass, 29 June

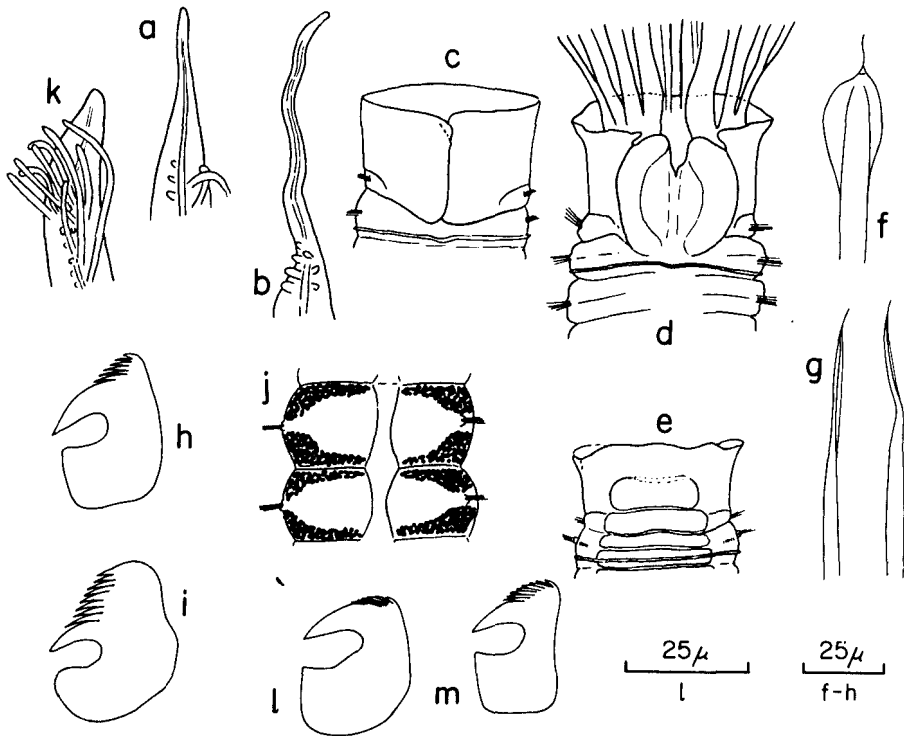


FIGURE 6.—*Chone ecaudata*; a-c, f from types d, e, and k from USNM 40304, h, i from AHF 2720, g, j from AHF 2721, l, m from USNM 45267: a, b, ends of dorso-lateral and ventralmost radioles; c, dorsal view of anterior end, branchial crown omitted (paratype); d, same view, with opened collar; e, ventral view of anterior end of specimen in Figure d; f, spatulate seta from third setiger; g, bayonet-type setae; h, i, largest and smallest uncini from 18th abdominal setiger (out of 25 total). Figure i is enlarged twice over Figure h; j, dorsal staining pattern in midthorax; k, end of lateral radiole; l, uncinus from third abdominal setiger; m, uncinus from 28th abdominal setiger, 20  $\mu$  high.



1934. Originally identified as *C. minuta*. AHF 003230, 5 specimens of a larger sample.

Holotype of *C. minuta* from Dillon Beach, Calif., in holdfasts of algae and among compound ascidians, 14 June 1941. AHF n 417; type AHF-67, Poly. 0182.

Wreck Bay, British Columbia, 1921 (see Berkeley and Berkeley, 1932, as *C. gracilis*). USNM 40722, 16 specimens.

Wreck Bay, west coast of Vancouver Island, 1925. Collected and identified by E. and C. Berkeley (see Berkeley and Berkeley, 1950). USNM 40303, 2 specimens.

Horsewell Point, British Columbia, in seaweed, 25 Apr. 1934. Collected by E. and C. Berkeley and identified as *C. gracilis*. USNM 40721, 2 specimens. Unpublished record.

Dodd's Narrows, British Columbia, 19 June 1957. Collected and identified by E. and C. Berkeley. USNM 40304, 1 specimen. Unpublished record.

Pavlov Bay, Alaska (see Berkeley and Berkeley, 1942, as *C. gracilis*). USNM 40723, 3 specimens.

Samami, Hokkaido, Japan, Aug. 1970. Collected by M. Imajima and identified as *C. teres*. USNM 45267, 3 specimens out of a much larger original sample.

*Additions to the Description:* The syntypes of *C. ecaudata* are mature females. The complete holotype has 18 abdominal setigers and is about 9 mm long (total); the paratype is a larger anterior fragment which is almost twice as wide.

A palmate membrane that "extends well over half the length of the radioles" (cf. Hartman, 1942a, p. 136) connects seven pairs of radioles bearing pinnules. A few pairs of nude filaments are present ventrally, the longest being almost half as long as the radioles proper. The ends of the radioles beyond the origin of the distal pinules are rather short dorsally (cf. Figure 6a). Laterally and ventrally, the ends can be "coiled like a watch spring" (cf. Moore, 1923, p. 246), having long filiform tips and being about a quarter as long as the entire radioles. A ventral radiole may be present, as long as the others but with an especially long terminal portion, the pinnules not extending as far as on the other radioles

(Figure 6b; in one of the types, and USNM 40304).

The low collar barely conceals the bases of the branchial crown. When closed, it overlaps dorsally (Figure 6c); when open as in the holotype, it is formed as shown in Figure 6d (from another specimen; the outer heavy lines in this figure correspond to the edges of the collar in Figure 6c; the anterior incision extends almost to the level of the first bundle of setae in the holotype of *C. minuta*).

Ventral shields and intrasegmental furrows are more or less visible depending on the contraction of the animals (Figure 6e). After weak staining, however, the ventral shields and the biannulated character of the setigers are very distinct as far as the middle of the abdomen in all animals.

The first (buccal) segment (Figure 6e) is unusually large and distinct ventrally. The anterior border of the first setiger approaches the posterior border dorsad to the setae (Figures 6c and 6d). This bundle of setae is as large as those of the following notopodia and emerges on the same level. Rounded anterior and posterior notopodial lips are conspicuous. The limbate setae originate above the lips. All specimens have spatulate setae with long tips (Figure 6f). Bayonet-type setae, with shafts of the same diameter as the spatulate setae, are also present (Figure 6g). A thoracic uncinus of the holotype of *C. ecaudata* was figured by Hartman (1942a, Figure 15g). Other Californian material seems to have uncini with slight wings (Hartman, 1944b, Plate 23, Figure 51) as I have observed for a specimen from British Columbia (USNM 40304). Hartman (1942a, Figure 15f) depicted two abdominal uncini from anterior segments. No satisfactory view of posterior abdominal uncini was obtained from the type material. Anterior and posterior abdominal uncini differ in other California specimens. Anteriorly, four or five rows of accessory teeth in six to eight columns are situated above the rostrum; the rostrum extends beyond the basis (cf. Figure 6h; also Hartman, 1944b, Plate 23, Figure 50). Posteriorly, some uncini having the same shape occur in the same tori with smaller

ones that have higher crowns and more rounded bases (Figure 6i).

After staining of the types of *C. ecaudata*, the ventral shields in the thorax and abdomen are darkest, except for a small area on the anterior border of the first segment (cf. Figure 6e). Most parts of the collar, except for the anterior edge, are stained in the types but may be whitish in other specimens. Dark areas around the thoracic parapodia are separated from the shields by a spottily stained longitudinal band. This is especially obvious in specimens from British Columbia. In some of the other Californian animals (AHF 003230), the thorax seems to stain similarly laterally and ventrally under low power, but when viewed under 100 ×, the lateral areas appear in a granulated pattern, in contrast to the uniformly stained ventral region.

The dorsal pattern, beginning in the middle thoracic segments (Figure 6j), is present in all animals and seems to be very characteristic. It results from the widening of the nonstaining epidermis of the intrasegmental furrow. This pattern continues on the anterior abdominal setigers, but the unstained areas become progressively narrower until, in the middle part of the abdomen, the pale intrasegmental lines are as narrow as the intersegmental rings. In some Californian specimens (AHF, originally identified as *C. minuta*), a conspicuous subcircular spot of heavily stained cells straddles each intersegmental furrow at the level of the parapodia in the posterior thoracic and anterior abdominal segments. The staining pattern was not studied in the holotype of *C. minuta*.

The variability of the ends of the radioles is noteworthy; their shape is not related to size or the region where collected. In material from British Columbia (USNM 40303, 40304), a complete mature female, 11 mm long and 0.9 mm wide, has six pairs of radioles connected for two-thirds of their length by the palmate membrane. The free ends of the radioles scarcely extend beyond the ends of the pinnules (Figure 6k). Also within the samples from California, the length of the free ends of the lateral radioles is variable, sometimes being intermediate between that shown in Figures 6a and 6b, or is even shorter (cf. Hartman, 1944b, Plate 24, Figure 59). The

Californian specimens (AHF), some of which are mature, are up to 15 mm long, and have up to 29 abdominal setigers and seven or eight pairs of radioles (usually connected for half of their length). Although in other species of *Chone* the width of the flanges (i.e., the extension of the palmate membrane) varies between the dorsal- and ventralmost radioles such that the ventral ones appear slimmer, the relative length of the free part is usually fairly consistent (see, however, *C. infundibuliformis*, p. 462).

*Remarks:* *Chone minuta* agrees with *C. ecaudata* by its size, the shape of the collar, the fairly distinct ventral shields, the form of the spatulate setae and anterior abdominal uncini, and the dorsal staining pattern in the thorax (the last character was not checked in the holotype of *C. minuta*). The variability in the length of the free ends of the radioles of the specimens originally described as *C. minuta* is notable.

Among the material identified by the Berkeleys as *C. gracilis*, the lot from Horsewell Point (USNM 40721) allowed staining; the pattern, in addition to the form of the branchial crown, the collar, the ventral shields, and the form of the spatulate setae make identification certain. The lot from Wreck Bay (USNM 40722) is referred here with some hesitation because of the bad preservation. The branchial crown, ventral shields, and the form of spatulate setae, however, agree with *C. ecaudata*. Berkeley and Berkeley had recorded *C. ecaudata* from Wreck Bay in 1950.

With considerable hesitation, Japanese material from Hokkaido, originally identified by Dr. M. Imajima as *C. teres*, is included here. These specimens correspond closely to the description of *C. teres* by Okuda (1934), which, however, does not refer to *C. infundibuliformis* (cf. p. 461). The collars are of even height ventrally and laterally but are lowered dorsally, which is not the case in typical *C. ecaudata* (cf. Okuda, 1934, Figure 3). The radioles end as shown in Figures 6a and 6k. The uncini from anterior segments differ considerably from those in posterior segments (Figures 6l and 6m). The staining pattern dorsally in the thorax is similar to that of *C. ecaudata* (Figure 6j) except that the

pigment-free areas in the middle of the segments are narrower. The main difference between the specimens from Hokkaido and typical *C. ecaudata* is the apparent absence of ventral shields, both morphologically and in fully stained specimens; the distribution of stain-absorbing cells seems to be uniform ventrally of the setae. In animals where the dye has almost been differentiated, however, one does see stronger staining ventrally, and the indication of a whitish line ventral to the parapodia. The Japanese animals are included in *C. ecaudata*, in spite of the fact that the ventral shields seem to be almost absent, because of the general agreement with the typical form and because of the transitional character of specimens from Alaska (USNM 40723). Here, the collar is formed as in Japanese material, but morphologically distinct shields are present. Staining was not possible. Evidently, additional collections are needed for the study of the Alaskan and northwest Pacific forms. The record of *C. teres* by Uchida (1968) cannot be identified from the brief description.

***CHONE ENIWETOKENSIS* (REISH)  
NEW COMBINATION**

*EUCHONE ENIWETOKENSIS* Reish, 1968,  
p. 225.

*Material studied:* Holotype (USNM 38406) and paratype (USNM 38407), from the Marshall Islands.

*Diagnosis:* A very small *Chone* species with weakly developed ventral shields and 13 to 14 abdominal setigers. Three to four pairs of radioles connected by palmate membrane for one-third of length. Collar oblique. Subspatulate setae with very long pointed tips. Abdominal uncini uniform, with a few teeth; rostra larger than bases.

*Additions to the Description:* The collar is higher ventrally than dorsally and has a broad, midventral lowering of the anterior edge. The postsetal girdle of glands is present on the second thoracic setiger. The holotype, but not the

paratype, has a similar but somewhat irregular ring also on the fifth setiger. The fifth setiger of the paratype does not appear to be damaged, although otherwise the paratype is somewhat macerated. The ventrum of the thorax stains strongly; however, ventral shields could not be distinguished morphologically. The posterior end is strongly compressed dorso-ventrally suggesting, in unstained material, an anal depression. Treatment with methyl green showed uninterrupted segmental rings of staining cells around the posterior ends.

*Remarks:* This species is referred to *Chone* because the posterior end lacks the anal depression typical of *Euchone*. The species is not yet well characterized; moreover, it is not known whether the specimens were fully grown. If the fifth thoracic setiger indeed carries a glandular ring, the species would be uniquely distinguished.

***CHONE VELERONIS* NEW SPECIES**

Figure 7

*Holotype:* From *Velero* station 6104, lat 33°39'45"N, long 118°06'40"W, 26 m, dark gray silty fine sand, 19 Feb. 1959. AHF Poly. 0459.

*Paratypes:* Same station and date. AHF Poly. 0460 (>10 specimens).

*Diagnosis:* A small species of *Chone* without ventral shields, with a greatly broadened postsetal girdle of glands on second setiger. Branchial crown long, with very high basis and six to seven pairs of radioles with filiform free ends. Collar low. Palmate membrane reaching beyond distal pinnules. Spatulate setae with pointed tips. Anterior abdominal uncini markedly different within tori, largest with small teeth, rostra as long as bases; small uncini with greatly enlarged crown. Posterior uncini only of the latter kind.

The species is named after the present ship of the Allan Hancock Foundation, the *Velero IV*, which collected the specimens.

*Material studied:* About 10 specimens of the type series.

*Description:* Mature animals, with about 45 abdominal setigers, are 11 to 12 mm long, of which approximately 3 mm are contributed by the branchial crown, and 0.5 to 0.6 mm wide. The smallest animal at hand has about 35 abdominal setigers and is 5 mm long and 0.3 mm wide. All specimens are well preserved.

The branchial crown has six to seven pairs of radioles, on an unusually high basis (Figure 7a). The radioles are connected by a palmate membrane that extends beyond the origin of the distal pinnules (Figure 7b). The narrow free tips are one-eighth to one-sixth as long as the radioles. Nude filaments were not found.

The low collar usually does not conceal the anterior part of the first (buccal) segment fully; it is somewhat higher ventrally than laterally (Figure 7a and 7c) and entire, except for the dorsal slit which reaches to the intrasegmental

furrow of the second setiger. The first segment is sometimes distinct ventrally (Figure 7a). The posterior border of the first setiger does not quite extend to the fecal groove. Segments, except the first one, are biannulate in the thorax and the anterior half of the abdomen. The thoracic intrasegmental furrows bend rearward similar to those of *C. magna* (cf. Figure 5e). The postsetal glandular girdle of the second setiger (Figure 7a) is ventrally greatly broadened, extending into the third setiger. Laterally it is narrowed but still broader than on the dorsal side where it is similar in width to that of other species of *Chone*. The girdle has the same shape in the smallest animal available. A longitudinal band of whitish glandular tissue extends mid-ventrally from the girdle onto the collar. Similar tissue is present in rings near the anterior edges of the posterior thoracic and about half of the

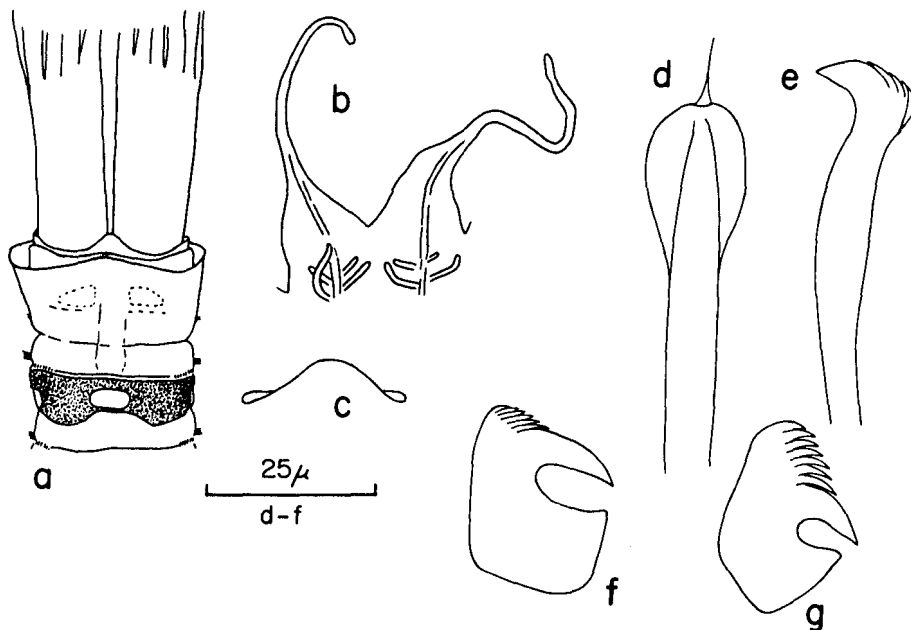


FIGURE 7.—*Chone veleronis* new species; a and c from holotype, rest from paratypes; d, f, not drawn to scale: a, ventral view of anterior end. Horizontal broken line in collar indicates anterior border of first setiger seen occasionally. The two areas on the collar encircled by broken lines remain whitish after staining with methyl green. The glandular girdle has been dotted; b, tips of two radioles; c, collar of another specimen in same view as in a; d, spatulate seta; e, thoracic uncinus; f, large uncinus from anterior abdominal setiger; g, uncinus from 40th abdominal setiger from median position in torus, 17  $\mu$  high.

abdominal setigers. The pygidium is triangular and pointed. Eggs occur from the sixth thoracic setiger.

The inconspicuous first bundle of setae originates at the level of the following notopodia. These have four to six of each upper limbate, very tiny bayonet, and pointed spatulate (Figure 7d) setae. Notopodial lips were not seen. Thoracic neuropodia contain slightly more than half a dozen long-handled uncini (Figure 7e). Abdominal setigers carry approximately half a dozen finely limbate neurosetae and, at least through the 40th setiger, 12 to 15 uncini. The uncini from the anterior abdomen, in the most recently formed sections of the tori, are of the usual form of *Chone* (Figure 7f) with several columns of five to six accessory teeth each. The smallest, i.e., oldest, uncini of these tori, and all uncini in posterior segments (Figure 7g), have smaller bases and appear similar to the uncini of *Oriopsis*. The posterior uncini have about six columns of about seven teeth each.

Staining with methyl green shows the absence of ventral shields. The whole surface in the anterior half of the body accepts the dye uniformly except for the anterior edge and ventral parts of the collar (cf. Figure 7a), the inter- and intra-segmental furrows, and the glandular girdle on the second setiger. Ventrally, the anterior border of the first setiger, which is often invisible in unstained material, is marked as a whitish line. The presetal rings of glandular tissue stain less well than the rest of the epidermis. On the posterior half of the abdomen only few epidermal cells accept the stain.

*Remarks:* Hartman (1959, 1965) has listed the species of *Chone*, to which *C. rosea* Hartmann-Schröder, *C. striata* Hartmann-Schröder, *C. trilobata* Gallardo, and *C. albocincta* described below should be added. Among these, *C. veleronis* is distinguished by the ventral enlargement of the postsetal glandular girdle on the second setiger, the very long branchial bases, and the length of the palmate membrane. Only very few species (e.g., *C. arenicola* Langerhans) have a palmate membrane extending beyond the origin of the distal pinnules.

## *CHONE ALBOCINCTA* NEW SPECIES

Figure 8

*Holotype:* From *Velero* station 6104, lat 33°39'45"N, long 118°06'40"W, 26 m, dark gray silty fine sand, 19 Feb. 1959. AHF Poly. 0454.

*Paratypes:* From same station and date. AHF Poly. 0455, three adults or near-adults, nine juveniles.

*Diagnosis:* A *Chone* species of intermediate size without ventral shields. Branchial basis slightly longer than the slightly oblique collar. Eight to ten pairs of radioles, connected by palmate membrane up to origins of distal pinnules, with abruptly tapered filiform free ends. Presetal whitish rings of tissue in thorax; presetal and postsetal whitish rings in anterior and median abdomen. First bundle of setae small, on same level as following notosetae. Spatulate setae with pointed tips. Anterior abdominal uncini markedly different within tori, smallest with rounded bases and high crowns. Posterior abdominal uncini predominantly of latter type.

The name of the species refers to the whitish rings contrasting in unstained animals with the red-brown color of the remaining epidermis.

*Material studied:* Type series.

*Description:* The holotype is a mature female with 8 thoracic and approximately 50 abdominal setigers. The total length is about 18 mm, the greatest width is 1 mm. The branchial crown measures about 6 mm. Two other adult animals of 51 and 52 abdominal setigers are slightly larger (total 20 mm; branchial crown, 7 mm) and somewhat shorter than the holotype. The juveniles have trunks about 5 mm long and the same body proportions. All specimens are well preserved.

The branchial crown has a base slightly longer than the collar and 9 to 10 pairs of radioles which are united by the palmate membrane up to the insertion of the distal pinnules. A 0.2-mm broad flange extends for a short distance beyond this point but tapers abruptly to a filiform free end (Figure 8a). The free ends of the radioles are

from one-fifth to one-sixth the length of the total radioles. The ends of the radioles surpass the ends of the distal pinnules. Ventral nude filaments were not seen.

The collar (Figures 8b and 8c) is oblique, with entire margin. The first (buccal) segment is invisible and the collar is not clearly set off from the first setiger; the border can be recognized only in stained material. The thoracic and 15 to 20 anterior abdominal setigers are clearly bi-annulate; after staining also the following ones

appear divided. Ventral shields are absent. A thick glandular postsetal girdle is present on the second setiger. Dorsally in the thorax, the intrasegmental borders bend rearward similar to *C. magna* (cf. Figure 5e). Rings of elevated whitish tissue, presumably glandular, are present in the presetal annuli of the thoracic setigers and in the presetal and postsetal annuli of the anterior 15 to 20 abdominal setigers. The ring on the second thoracic setiger is ventrally expanded (Figure 8b). Except on the second se-

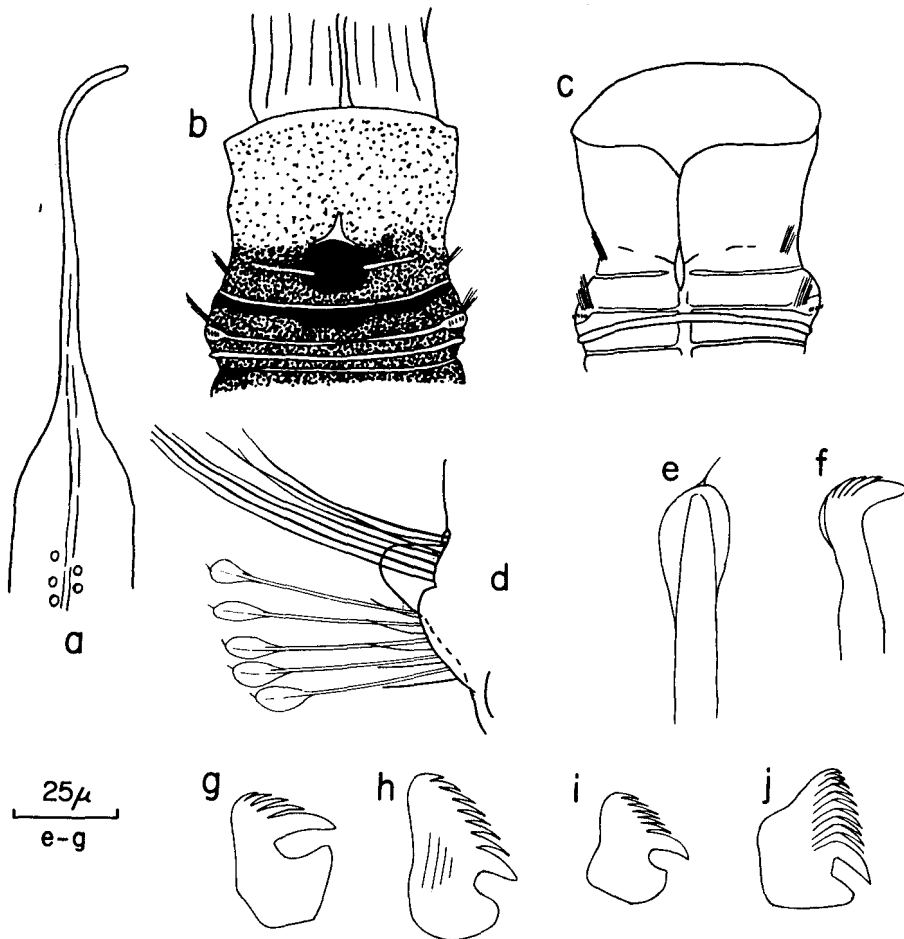


FIGURE 8.—*Chone albocincta* new species, from large types; abdominal uncini not to scale: a, end of median radiole; b, ventral view of anterior end, showing staining pattern; c, dorsal view of anterior end, branchial crown omitted; d, anterior view of fourth notopodium; e, spatulate seta; f, thoracic uncinus; g, large uncinus from fourth abdominal setiger (about  $30 \mu$  high); h, small uncinus from ninth abdominal setiger; i, j, small and large uncini from approximately 40th abdominal setiger.

tiger, the rings are invisible after using methyl green, which stains the setigers in question uniformly except for the inter- and intrasegmental furrows. Posterior to the 15th to 20th abdominal setiger, the stain is accepted by numerous, distinct cells arranged in presetal and postsetal bands. These bands coalesce in the posterior part of the abdomen.

The first bundle of setae, slightly smaller than the following ones, inserts in the collar at the same level as the following notopodia (Figure 8c). The notopodia have small lips (Figure 8d) and long limbate, bayonet-type and narrow spatulate setae; the latter have pointed tips (Figure 8e). The thoracic uncini, with small wings (Figure 8f) are arranged in single rows.

Anterior abdominal parapodia have about 30 uncini. The large (ontogenetically most recent) uncini (Figure 8g) have squarish bases and three to four rows of four or five coarse teeth. The uncini change gradually within the torus into smaller hooks (Figure 8h) with rounded bases and somewhat more teeth (five on the fourth setiger, seven on the ninth). In the posterior abdomen, the smallest uncini of a torus are similar (Figure 8i; about 10 columns of teeth); the largest ones (Figure 8j), however, have very broad posterior portions and crowns with more numerous teeth in approximately half as many rows.

Juveniles of about 5-mm trunk length and 0.4- to 0.5-mm width, with about 35 abdominal setigers, show the white rings clearly. Staining with methyl green, however, indicates that the glandularization of the epidermis is not complete. The dye-absorbing cells are distributed principally along the edges of the stained areas so that the centers of the areas are light.

*Remarks:* *Chone albocincta* seems to be distinguished from all other species of the genus (cf. p. 479) by the whitish segmental rings of tissue. Somewhat similar presetal rings, however, also occur in *C. veleronis* described above. Neglecting differences in size, *C. albocincta* may be separated from the northeast Pacific species without ventral shields (*C. aurantiaca*, *C. dumeri*, *C. infundibuliformis*, *C. magna*, *C. mollis*, and *C. veleronis*) also by the following: the post-

setal glandular girdle on the second segment is narrow ventrally (from *C. veleronis*); the first segment is indistinguishable in the first segment in unstained animals (from *C. mollis*); the radioles have long free ends (from *C. aurantiaca* and *C. infundibuliformis*); the abdominal uncini have coarse teeth (from *C. dumeri*). *Chone magna* has spatulate setae without pointed tips and only one form of abdominal uncini.

#### *EUCHONE* MALMGREN, 1866 EMENDED

*EUCHONE* Malmgren, 1866, p. 405.- Langerhans, 1881, p. 111.- Saint-Joseph, 1894, p. 250.- Bush, 1904, p. 190.- Hofsommer, 1913, p. 327.- McIntosh, 1923, p. 281.- Fauvel, 1927, p. 339.- Berkeley and Berkeley, 1952, p. 121.- Ushakov, 1955, p. 418.- Day, 1967, p. 774.- Banse, 1970, p. 389.

*Type species:* *Euchone analis* (Kröyer) (cf. Bush, 1904).

*Diagnosis:* Sabellidae with semicircular branchial lobes sometimes united by palmate membrane. Collar conspicuous, sometimes bilobed. Postsetal girdle of glands on second setiger. Ventral shields sometimes present. Anal depression with lateral wings formed by variable number of caudal segments. Three types of thoracic notosetae: upper, or upper-anterior ones limbate; lower, anterior ones narrowly limbate (bayonet-type); and lower, posterior ones spatulate or usually subspatulate. Thoracic neuropodial uncini long-handled, acicular. Abdominal notopodial uncini avicular, with rounded or square bases; abdominal neurosetae limbate.

*Remarks:* The genus continues to comprise all Fabriciinae with an anal depression. Added to previous diagnoses are presence or absence of the palmate membrane, the note about the collar, the postsetal girdle of glands, the bayonet-type setae, and the ventral shields. The last three characters had previously been mentioned by Banse (1970). It must be noted that *E. alicaudata* Moore, known so far only from one specimen, possibly lacks bayonet-type setae (cf. p. 489). The number of thoracic setigers (almost

always eight) is not considered as a diagnostic character for this genus.

Of great consequence for the systematics of the Sabellidae is the opinion that the number of lobes in the collar and the presence or absence of a palmate membrane are specific characters in *Euchone*. Therefore, they cannot be used for dividing genera (cf. p. 459 and 461). The reason is my opinion that the anal depression is of monophyletic origin and therefore a primary character, sufficient to characterize *Euchone*.

### *EUCHONE ANALIS* (KRÖYER)

Figure 9a-c

*SABELLA ANALIS* Kröyer, 1856, p. 17.

*EUCHONE ANALIS*.- Malmgren, 1866, p. 406; 1867, p. 223.- Berkeley and Berkeley, 1952, p. 121.- Pettibone, 1954, p. 339 (synonymy).-

Hartmann-Schröder, 1971, p. 521.

not *EUCHONE ANALIS* Imajima, 1963, p. 367.

**Diagnosis:** A *Euchone* species with ventral shields, with 16 to 22 anterior abdominal setigers and 9 to 12 setigers in anal depression. Nine to 17 pairs of radioles united by palmate membrane for half their length, with free ends tapered, intermediate in length; 5 to 10 pairs of ventral nude filaments. Collar level, with slight ventral incision, almost concealing the branchial basis. Lower thoracic notosetae spatulate. Uncini from anterior and posterior abdomen similar, with squarish bases.

**Material studied:** Point Barrow, northern Alaska, about 65 m. Identified by M. H. Pettibone (cf. Pettibone, 1954). USNM 23651, 1 specimen.

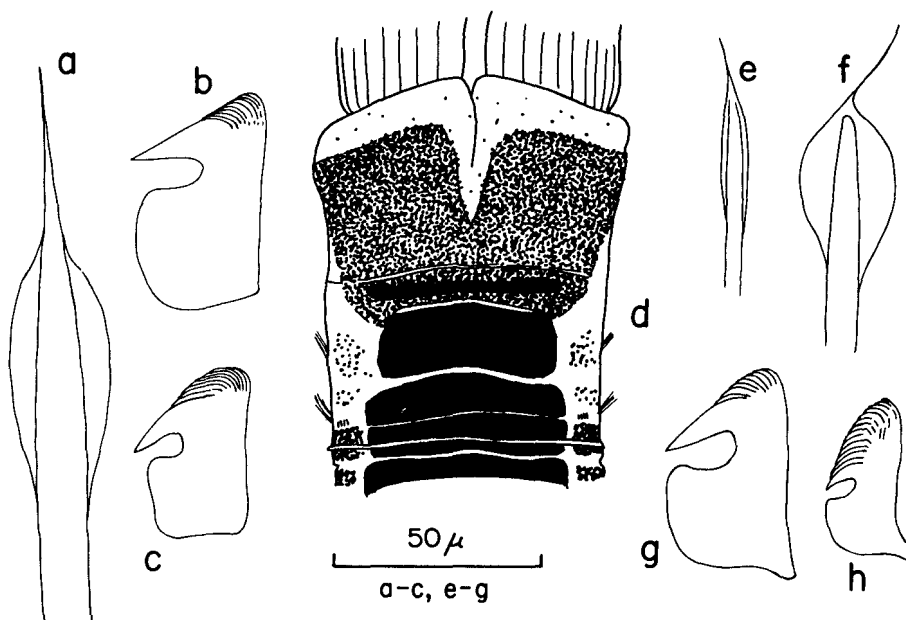


FIGURE 9.—*Euchone analis*: a, subspatulate notoseta; b, median uncinus from third abdominal setiger; c, same, from 21st. Accessory teeth schematic; *E. papillosa*: d, anterior end of thorax, ventral view, showing staining pattern; e, bayonet-type seta; f, spatulate seta; g, median uncinus from third abdominal segment; h, uncinus from anterior depression segment, approximately one and a half times enlarged over Figure g.



*Addition to the Description:* The specimen is complete. The length of the trunk is about 15 mm, that of the branchial crown approximately 4 mm. The branchial crown consists of some ventral nude filaments (5 to 10 pairs according to Kröyer, 1856, and Malmgren, 1866), and 10 pairs of radioles bearing pinnules and connected by a palmate membrane. The ends of the radioles are like those of *E. elegans* (cf. Figure 11a). The collar has a small ventral incision. The second setiger is ringed by a postsetal girdle of glands. Segments are biannulate up to the anal depression. There are 17 anterior abdominal segments and 9 setigers in the anal depression. Ventral shields are present in thorax and abdomen. The shields of the first segment and first setiger are divided by intrasegmental furrows which do not stand out as whitish lines after staining. In the abdomen the shields have the form depicted by Malmgren (1866, Plate 28, Figure 88).

The notopodia, including the large first one, have conspicuous lips of the same form as *E. rubrocincta* (cf. Figure 10d). The bayonet-type setae have shafts almost as thick as the spatulate ones (Figure 9a) behind them and are terminally thin, as usual. Anterior abdominal uncini (Figure 9b) are all alike within the tori; each has a squarish basis and a crown of about 10 rows of accessory teeth in several columns. The bases of the posterior uncini (Figure 9c) are similar but the crowns have about 15 rows of teeth in approximately a dozen columns.

After staining, the ventral shields and, separate from them, areas before and behind the parapodia are conspicuous in thorax and abdomen. The first setiger does not seem to be separated from the preceding and following segments by nonstaining lines, nor is the intrasegmental furrow distinct. The intrasegmental furrow on the second setiger resembles that of *E. rubrocincta* (Figure 10c). Dorsally, the thorax and the anterior segments of the abdomen are essentially free of stain-accepting cells. In middle and posterior abdominal setigers, presetal broad rings are complete; they are visible as whitish tissue also in the unstained animal.

*Remarks:* This specimen has 17 anterior ab-

dominal setigers, fewer than stated by Malmgren (1866, about 19) and Berkeley and Berkeley (1952, 20 to 22) but similar to Kröyer (1856, about 16). More material must be studied in order to see whether the number of anterior abdominal setigers overlaps those of the similar *E. elegans* and *E. rubrocincta*. If so, a probably reliable difference of *E. analis* from the others will be the form of the anterior abdominal uncini.

The record by Irajima (1963) from the west coast of Kamchatka is not this species because of the low number of anterior abdominal setigers and the high number of segments in the anal depression.

#### *EUCHONE PAPILLOSA* (SARS)

Figure 9d-h

*SABELLA PAPILLOSA* Sars, 1851, p. 203.

*EUCHONE PAPILLOSA*.- Malmgren 1866, p. 407.- Hofsommer, 1913, p. 327.- Augener, 1928, p. 805 (synonymy).- Evenkamp, 1931, p. 412.- Pettibone, 1956, p. 578 (synonymy).- Kühlmorgen-Hille, 1963, p. 51.- Hartmann-Schröder, 1971, p. 521.

*SABELLA TUBERCULOSA* Kröyer, 1856, p. 18.

*EUCHONE TUBERCULOSA*.- Malmgren, 1866, p. 407.

*Diagnosis:* A large *Euchone* species with ventral shields, with at least 21 abdominal setigers; 8 to 10 form anal depression. Ten to 15 pairs of radioles connected for approximately one-half their length by palmate membrane, with long filiform free ends. Two to five pairs of ventral nude filaments. Collar oblique, with mid-ventral incision, scarcely concealing the branchial basis. Very conspicuous round fields of glands ventrally in abdomen. Spatulate setae with very long tips. Uncini of anterior abdomen with small crowns of teeth and bases with posterior extension; markedly higher crowns in posterior abdomen.

*Material studied:* Kiel Bight, western Baltic (unknown locality). Collected and identified by G. Kühlmorgen-Hille (cf. Kühlmorgen-Hille, 1963). Part of sample, USNM 45390, 6 specimens.

*Additions to description:* Because the species is well known, only some characters have been studied, mostly for a comparison with *E. capensis* Day and *E. velifera* new species, both of which also have collars with ventral incisions. The animals studied were fixed in their tubes, are up to 2.5 cm long, and are well preserved.

The radioles have free filiform ends as shown by Malmgren (1866, Plate 29, Figure 92G but not 94G). The collar (Figure 9d) is markedly longer ventrally than dorsally. The number of abdominal segments in six animals is 21, 21, 22, 23, 23, and 24, of which 8 to 10 form the anal depression. Similarly Hofsommer (1913) found specimens from the western Baltic, which he believed to be juveniles, with a total of 29 segments (= setigers, from the context) and stated that in adults the number is constantly 35, similar to Malmgren (1866). Evenkamp (1931) in material from Kiel Fjord, however, observed up to 62 segments of which, again, 8 were thoracic.

Thoracic notopodia contain broad bayonet-type setae (Figure 9e) and spatulate setae (Figure 9f). The spatulate setae in the present material are broader than those depicted by Malmgren (1866, Plate 29, Figures 92B<sup>1</sup> and 94B<sup>1</sup>). The uncini on anterior abdominal segments (Figure 9g) have broad bases with small posterior appendages and crowns with approximately 10 columns with 10 to 13 teeth each, depending on the size of the uncini. Posteriorly in the abdomen, the bases of the uncini become more rounded, and there are about 15 rows of teeth in much enlarged crowns (Figure 9h).

The thoracic and abdominal ventral shields are very conspicuous even in unstained material (cf. Malmgren, 1866, Plate 29, Figures 92 and 94). After using methyl green, the ventral pattern in the anterior thorax is as shown in Figure 9d. Laterally in the thorax, crescentic areas of stained tissue occur posterior to the parapodia and to a lesser degree anterior to them. The dorsal side of the thorax is unstained except for a pair of conspicuous rounded areas near the anterior border of each segment from the 4th setiger onwards. In the anterior and middle regions of the abdomen, each setiger shows ventrally two pairs of rounded patches, one near

the anterior and one near the posterior border. These have been figured first by Malmgren (1866, Plate 29, Figures 92 and 94). Their size varies among individuals; they sometimes occupy almost half of the ventral area of the segments. Laterally in the abdomen, the stained tissue around the parapodia, observed in the thorax, becomes gradually larger and extends onto the dorsal side so that from the middle of the abdomen, a pigmented band crosses the posterior part of the segments (the parapodia insert here posteriorly on the segments). In the same region, the anterior dorsal patches coalesce. Shortly before the depression segments, the intrasegmental furrows disappear and each segment is uniformly stained both dorsally and ventrally.

#### *EUCHONE RUBROCINCTA* (SARS)

Figure 10

*CHONE RUBROCINCTA* Sars, 1862, p. 128.

*EUCHONE RUBROCINCTA*.- Malmgren, 1866, p. 406.- Southern, 1914, p. 144.- McIntosh, 1916, p. 33; 1923, p. 282.- Southward, 1956, p. 278.

*Diagnosis:* A *Euchone* species with conspicuous ventral shields, with 11 to 15 anterior abdominal setigers and up to 12 setigers in anal depression. Up to 16 pairs of radioles united by palmate membrane for about half their length, with long free ends. Up to eight pairs of nude filaments. Collar level, with a small ventral notch. Lower thoracic notosetae subspatulate. Uncini of anterior abdomen with small crowns of teeth, slim necks, and narrow bases with marked posterior extensions. Uncini of posterior abdomen with large crowns, without necks.

*Material studied:* Syntypes, from Florø, near Bergen, Norway, approximately lat 61°40'N, long 5°00'E, stony bottom (Sars, 1862). ZMO, 3 specimens.

Ballynakill Harbour, Northwest Ireland, stations L 245, L 310, and ML L 11a (cf. Southern,

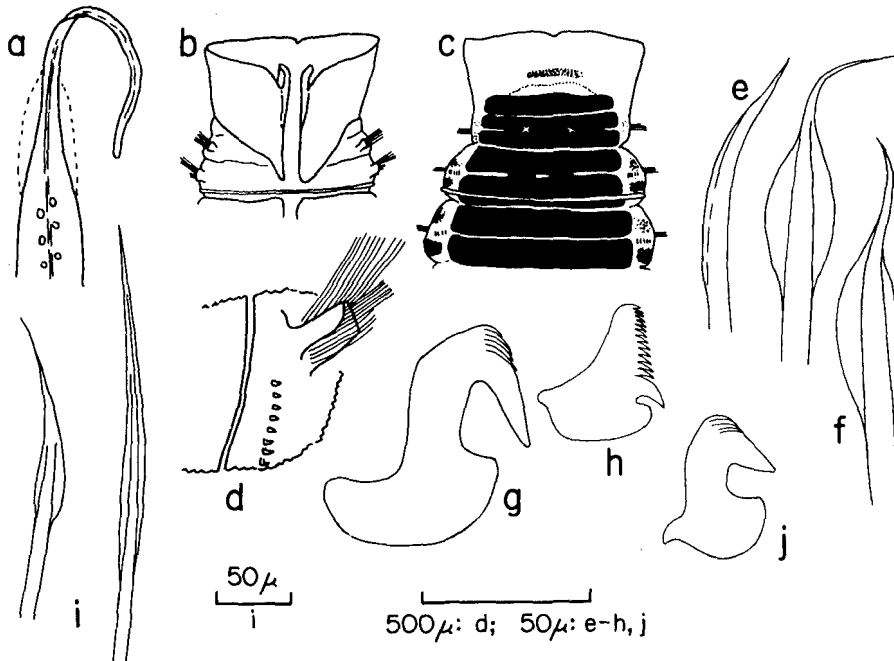


FIGURE 10.—*Euchone rubrocincta*; b-h from syntypes, a and i from NMI, j from Southward's material: a, end of representative radiole. Broken line indicates extent of flange in syntypes (see also text); b, dorsal view of anterior end, branchial crown omitted; c, ventral view of anterior end, branchial crown omitted, after staining. Slightly schematic; x indicates the extent of the incision of the ventral shield on the first setiger of *E. elegans*; d, part of lateral body wall of second setiger, seen slightly from below and behind, with setae and glandular girdle; e, f, bayonet-type and two subspatulate setae from fifth thoracic setiger; g, anterior abdominal uncini (seventh abdominal setiger). Accessory teeth schematic; h, uncinus from depression segment (17th abdominal setiger); i, subspatulate and limbate setae from sixth thoracic setiger; j, uncinus from seventh abdominal setiger.

1914). NMI 77.1908, 1 specimen from each station.

Irish Sea, station 22 of Southward (1956, 1957). Dr. E. C. Southward's private collection. 3 specimens.

*Additions to the Description:* The largest of the well-preserved syntypes, a fairly relaxed specimen, is approximately 2.5 cm long of which about one-fourth is contributed by the branchial crown. The width is about 2 mm. The other syntypes are approximately two-thirds as long; in one of them, a mature female, the branchial crown contributes about one-third of the total length, in the other one it is lost.

The branchial crowns of the two complete specimens consist of 10 and 13 pairs of radioles with pinnules and up to 8 pairs of slender naked ventral filaments. Two to three pairs of the latter are very short, and one or two pairs are as long as the radioles. The radioles are united for about half their length by a conspicuous palmate membrane. They end in bare tips, proximally broad owing to the continuation of the palmate membrane, but narrow in the terminal sections. The latter tend to be shorter ventrally than dorsally and are, on the average, about half as long in the syntypes as in the material from northwestern Ireland (Figure 10a). The length of the sections of the radioles free of pinnules is very approximately one-eighth of

the total length in the syntypes and in Southern's material.

In the syntypes, the collar is of equal height dorsally and ventrally and has only a small ventral notch (Figures 10b and c). Setigers are biannulate, which is especially obvious in the thorax. In the three syntypes, there are 11 anterior abdominal, 1 transitional, and 11 depression setigers; 15, 1, 9; and 12, 0, 10 setigers, respectively. Ventral shields are distinct in the thorax and abdomen as depicted by Malmgren (1866, Plate 29, Figure 91).

The thoracic notopodia (Figure 10d) are very conspicuous; each contains about a dozen each of long limbate, short bayonet-type (Figure 10e), and subspatulate (Figure 10f) setae. The long limbate setae originate above the semicircular lip shown in Figure 10d which is about 0.2 mm long; the other two kinds below it. Each neuropodium contains approximately  $1\frac{1}{2}$  doz of long-handled hooks of the usual form (cf. McIntosh, 1923, Plate 131, Figure 2a). The uncini of the anterior abdomen (Figure 10g; cf. Figure 10j) do not have the squarish basis usually found in *Euchone* species but have a slim neck and a large posterior extension making them almost S-shaped. Even the dorsalmost ones in the tori studied have essentially this outline. Only a few columns of teeth are found in these uncini. The uncini of the depression segments are formed as shown in Figure 10h; they have approximately eight columns of teeth, and the number of rows is 12 to 14. The number of uncini is about 2 doz per torus anteriorly in the abdomen and in median segments of the anal depression. The abdominal capillary setae are arranged in two series per neuropodium.

After using methyl green, the collar (Figure 10c) is lightly stained except for a ventral unstained area and, in some animals, a diffuse band anterior to it. The thoracic ventral shields are clearly marked. Laterally strongly staining areas are found posterior to and, to a lesser degree, anterior to the thoracic parapodia. In the last thoracic segments, these areas touch the ventral shields but do not continue onto the dorsal side, except as traces. In the abdomen, however, the stained cells form two girdles around each segment, interrupted only by the fecal

groove; the presetal ring, which may appear dorsally as whitish glandular tissue even in unstained material, stains more strongly than the postsetal one. The ventral shields are not markedly darker after staining than the lateral and dorsal parts. The intersegmental unstained furrows disappear gradually in the depression segments.

In the material from northwestern Ireland, the largest animal, a mature male, is almost 2.5 cm long, of which about one-third is contributed by the branchial crown; the smallest specimen is 1.5 cm long. The latter has 11, the former, 15 pairs of radioles, with about 4 doz pairs of pinnules each. In all specimens, there are 12 anterior abdominal setigers, the twelfth sometimes appearing to be a transitional segment, and 10 to 12 depression segments. The notopodia (cf. Figure 10d) appear to be divided into anterior and posterior lips, rather than form one semicircular fold. Limbate and subspatulate notosetae are shown in Figure 10i; the total number of notopodial setae is 2 doz. The other characters agree with the syntypes.

No color is left in the syntypes of the Irish material, but Southern (1914) stated that the bright red bands, which gave the species its name, were present in Formalin-preserved material until the transfer into alcohol. Sars (1862) observed one purple ring on each segment.

McIntosh (1916) reported on animals with 15 to 16 pairs of radioles. It must be noted that McIntosh's description (1916, also 1923) of other features of the branchial crown contains quotations of Southern's (1914) text for *E. rosea*.

Southward's specimens are small, up to 7 mm long. Two have 11 anterior abdominal setigers, and one transitional setiger; the third animal has 13 or 14 anterior abdominal setigers. An uncinus from this region (Figure 10j) has a broader neck than the material treated above but otherwise has the same characteristic form. The staining pattern is as described by the syntypes as far as this can be recognized in the previously dried specimens.

*Remarks:* *Euchone rubrocincta* is close to the smaller *E. elegans* Verrill from which it is

distinguished by the larger number of radioles with long slender ends, and especially the form of the anterior abdominal uncini. Further, the incision of the ventral shield at the level of the first parapodium is very short in *E. rubrocincta* (see also *E. analis*, p. 483). *E. rosea* Langerhans, as described by Banse (1970) for specimens from the Ivory Coast, is very similar in regard to the tips of the radioles, the collar, the subspatulate notosetae, and especially the abdominal uncini. However, the ventral shield on the first setiger is not divided, and the number of anterior abdominal setigers is only 10 or 11, and that of the anal depression only 6. The smaller number of radioles in the African material may be due to their smaller size.

The distribution of the species is not well known. Material of Southern (1914) and Southward (1956) collected around Ireland has been treated above. The specimens of Malmgren (1866) from the Skagerak and McIntosh (1916, 1923) from the Shetlands are certainly *E. rubrocincta*. The species is also reported from the Mediterranean Sea (cf. Fauvel, 1927), but I have not searched the literature for Lusitanian and more southern records. Also, the reports of *E. rubrocincta* from the northwest Atlantic by Moore (1909) and Baillie (1946) should be checked because of the possible confusion with *E. elegans* treated below. The former author did not give any reference for identification; the latter referred to Malmgren's description.

#### *EUCHONE ELEGANS* VERRILL

Figure 11a-e

*EUCHONE ELEGANS* Verrill, 1873, p. 618.-Hartman, 1944a, p. 334 (with other references).

**Diagnosis:** A *Euchone* species with ventral shields, with 12 to 15 anterior abdominal setigers and 8 to 10 setigers in anal depression. Six to eight pairs of radioles, united by palmate membrane for about half their length, and rather broad and free ends. Three to four pairs of nude filaments. Collar level, with small ventral notch. Lower thoracic notosetae subspatulate. Marked divergence of uncini within tori of anterior ab-

domen; ontogenetically recent uncini with broad bases and small posterior extension; old uncini with rounded bases and high crowns, similar to those in depression.

**Material studied:** Syntypes, collected from Block Island Sound, Mass., in 1871. USNM 7513, 5 specimens.

Cape Cod Bay, Mass., SEP station 1412 E5, lat 41°55.0'N, long 70°08.5'W, 33 m, muddy sand, 11 June 1968. SEP, 4 specimens. Unpublished record.

Cape Cod Bay, Mass., SEP station 2318 Ep, lat 41°45.0'N, long 70°06.5'W, 16 m, sand, 13 Oct. 1966. SEP, 22 specimens. Unpublished record.

**Additions to the Description:** The available specimens are up to 1 cm long; about one-third of the length is contributed by the branchial crown. Verrill (1873) observed animals up to 2 cm long. Most of the branchial crowns have seven pairs of radioles with up to 3 doz pinnules each and three to four pairs of ventral nude filaments; one pair of these is about as long as the radioles. The free ends (Figure 11a) contribute about one-sixth of the total length of the radioles. The collar is of equal height dorsally and ventrally and has only a small ventral notch. Segments are biannulate, particularly in the thorax. A postsetal girdle of glands is present on the second setiger. Ventral shields are moderately visible in unstained material in the thorax and anterior abdomen but stand out clearly upon staining. In the syntypes, the number of abdominal setigers is 13 (12 in one) followed by 1 transitional and 8 depression setigers. In the 10 SEP specimens, up to 9 mm long, 15 setigers are present prior to the beginning of the depression in 7 specimens; 14 setigers in 2 specimens; and 14 or 15 in 1 specimen. The anal depression extends through 10 setigers in the largest animals.

The thoracic notopodia are almost as conspicuous as in *E. rubrocincta* (cf. Figure 10d). Each contains long limbate, short bayonet-type, and subspatulate (Figure 11b) setae, totaling less than a dozen. Each neuropodium has about 10 long-handled hooks. The uncini of the anterior abdominal segments (Figure 11c) have a broad

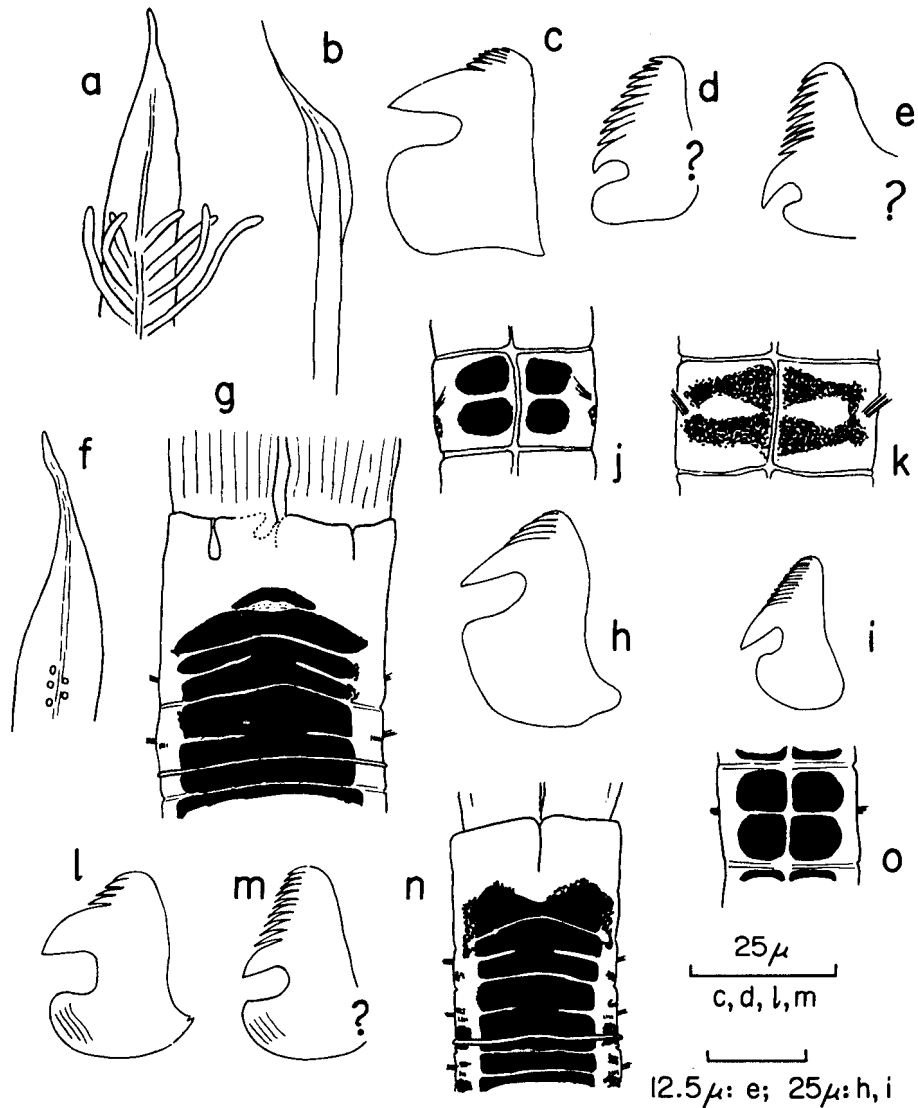


FIGURE 11.—*Euchone elegans*; a, c, d from syntypes, b, e from SEP stn. 2318Ep; a, end of medio-ventral radiole; b, subspatulate notoseta; c, d, middle and dorsalmost uncini from second abdominal setiger; e, uncinus from 17th abdominal setiger (depression); *E. alicaudata*, from holotype: f, end of median radiole; g, ventral view of anterior end of thorax after staining; h, i, uncini from second and 18th abdominal setigers; j, ventral view of middle abdominal segment after staining; k, dorsal view of middle thoracic segment; g, j, and k are oriented in the same way; *E. capensis*, from paratypes: l, m, uncini from second and 19th abdominal setigers, the latter slightly enlarged; n, o, ventral views of anterior end of thorax and median abdominal segment after staining, slightly schematic.

square base similar to those of many other *Chone* and *Euchone* species. The dorsalmost and ontogenetically oldest ones (Figure 11d), have a much higher crown with about 10 rows of teeth and are similar to the uncini in the depression segments (Figure 11e).

After staining with methyl green, the pattern on the first setiger agrees with that of *E. rubrocincta* (cf. Figure 10c) where the incomplete division of the ventral shield reaches somewhat closer to the midline than that of the second one (Figure 10c, marked by x).

*Remarks:* *Euchone elegans* is close to *E. rubrocincta* from which it is distinguished by the much smaller number of radioles and their short free ends and the form of the uncini of the anterior abdominal segments. The division of the ventral shield at the level of the first parapodium is marked. The species is also similar to *E. analis* as described by Malmgren (1866, 1867; cf. p. 482) but has slightly fewer anterior abdominal setigers. The posterior abdominal uncini of *E. analis* are similar to the anterior ones but are markedly different in *E. elegans*.

#### *EUCHONE ALICAUDATA* MOORE AND BUSH

Figure 11f-k

*EUCHONE ALICAUDATA* Moore and Bush, 1904, p. 165.

*Diagnosis:* A large *Euchone* species with ventral shields, with 22 abdominal setigers; 8 form anal depression with broad wings. Fifteen to 20 pairs of radioles connected by palmate membrane for one-quarter of their length, with broad flanges extending beyond distal pinnules, and tapering to slender tips. Several pairs of ventral nude filaments. Collar level, with ventro-lateral incisions or folds, probably ventrally incised, concealing the branchial basis. Lower thoracic notosetae subspatulate. Uncini of anterior abdomen with strong necks and bases with posterior extensions; uncini of the posterior abdomen with high crowns.

*Material studied:* Holotype from 280 m near Tokyo. USNM 5496.

*Additions to the Description:* The radioles number somewhat more than 15 as stated in the original description; they end in tips as shown in Figure 11f. The collar (Figure 11g) appears to have ventro-lateral incisions rather than folds, as originally stated; owing to injury the presence or absence of a marked midventral incision, implied by Moore and Bush (1904), cannot be verified. A postsetal girdle of glands is present on the second setiger. Bayonet-type setae were not found on the two dissected thoracic notopodia. In this respect, *E. alicaudata* is unique among the 25 species of *Chone* and *Euchone* I have studied; an investigation of more specimens is very desirable. The subspatulate setae were correctly depicted by Moore and Bush (1904, Plate 11, Figure 15). The uncini of the anterior abdomen (Figure 11h) have a posterior extension which is not so distinct in depression segments (Figure 11i). The latter, however, have high crowns with 13 to 15 rows of teeth.

The ventral shields are distinct in thorax and abdomen, becoming even more marked after staining (Figures 11g and 11j). The shields of the first and second setigers are not completely divided by the intrasegmental furrows. The dorsal thoracic staining pattern is shown in Figure 11k. In the abdomen, simple broad bands extend from the level of the parapodia across the dorsum except in the segments of the anal depression where the intrasegmental furrows disappear.

*Remark:* *Euchone capensis* Day bears some resemblance to *E. alicaudata*, but the species are well distinguished by the form of the ventral shields on the first (buccal) segment (cf. Figures 11g and 11n).

#### *EUCHONE CAPENSIS* DAY

Figure 11l-o

*EUCHONE CAPENSIS* Day, 1961, p. 540; 1967, p. 776.

*Diagnosis:* A *Euchone* species with ventral shields, with 25 to 32 abdominal setigers; 7 or 8 form anal depression. Nine pairs of radioles,

united by palmate membrane for two-thirds of length, with very long filiform tips. Two to three pairs of ventral nude filaments. Collar approximately as long as branchial basis, with deep ventral incision. Lower thoracic notosetae subspatulate. Uncini of anterior abdomen with strong necks and few rows of teeth, bases with small posterior elongation; uncini of posterior abdomen with greatly enlarged crowns.

*Material studied:* Paratypes from Stn. TRA. 73M, off South Africa, Ecological Survey, UCT. 311 m. Material at UCT, 3 specimens.

*Additions to the Description:* The radioles are flanged some distance beyond the palmate membrane. Many pinnules of the middle sections of the radioles extend as far as the end of the distal pinnules. The very long and filiform tips of the radioles extend beyond this level. Whereas Day (1961, Figure 14t; 1967, Figure 37.6j) depicted the branchial base as not concealed by the collar; the branchial base in at least one of the paratypes is hidden. A post-setal girdle of glands is present on the second thoracic setiger. The ventral shields are divided within each thoracic segment. While Day (1961) reported 32 abdominal setigers for the holotype, 2 complete specimens have 25 and 25 or 26 abdominal setigers; 7 or 8 form the anal depression.

An uncinus from the anterior abdominal region is shown in Figure 11l (cf. Day, 1961, Figure 14n). The uncini of the posterior region seem to be similar except that the number of rows of teeth above the main fang is about 10 (Figure 11m). The number of uncini is anteriorly just below, posteriorly slightly above, a dozen per torus.

After using methyl green, the ventral shields are bordered laterally by unstained epidermis (Figure 11n), except in the first thoracic setigers. In the abdomen, intra- and intersegmental borders appear broader than in the thorax, and the outline of the shields becomes rounded (Figure 11q); they are almost circular large patches anterior to the anal depression. Broad, lateral areas of staining cells are present on the first and second thoracic setiger, and a small anterior

and a large posterior patch are found around each parapodium on the subsequent segments. These patches seem to be characteristic for the species. The posterior patches tend to form crescents around the parapodia in the abdominal segments. From about the middle part of the abdomen, bands of scattered staining cells cross the dorsal side forming two bands per setiger and becoming most distinct on the depression segments.

*Remarks:* *Euchone capensis* has abdominal uncini that are somewhat similar to those of *E. alicaudata*, *E. rosea*, and *E. rubrocincta*. The ventral incision in the collar and the distinct abdominal ventral shields separate the South African form clearly from the two latter species. A clear distinction between *E. capensis* and *E. alicaudata* is provided by the form of the ventral shields of the first (buccal) segment (cf. Figures 11g and 11n).

#### *EUCHONE VELIFERA* NEW SPECIES

Figure 12

*EUCHONE* sp. Hartman, 1955, p. 114.

*Holotype:* Off Catalina Island, Calif., *Velero* station 2412, lat 33°30'02"N, long 118°12'02"W, 593 m, fine mud, 17 Sept. 1953 (cf. Hartman, 1955). AHF, Poly. 0256.

*Paratypes:* Off Point Vicente Light, Calif., *Velero* station 4854, long 33°47'30"W, lat 118°30'00"W, 179 m, 8 Feb. 1957. AHF Poly. 0453, 2 specimens.

*Diagnosis:* A large *Euchone* species with indistinct ventral shields, with 27 to 32 abdominal setigers; 7 to 9 form anal depression with large wings. Nine to 10 pairs of radioles united by palmate membrane for half of their length at least in juveniles, with short filiform free ends. Collar with lateral notches, ventrally deeply incised and folded in between the two halves of the branchial crown, concealing branchial basis. Lower thoracic notosetae subspatulate. Uncini of anterior abdomen with small crowns and square bases; uncini of posterior abdomen with



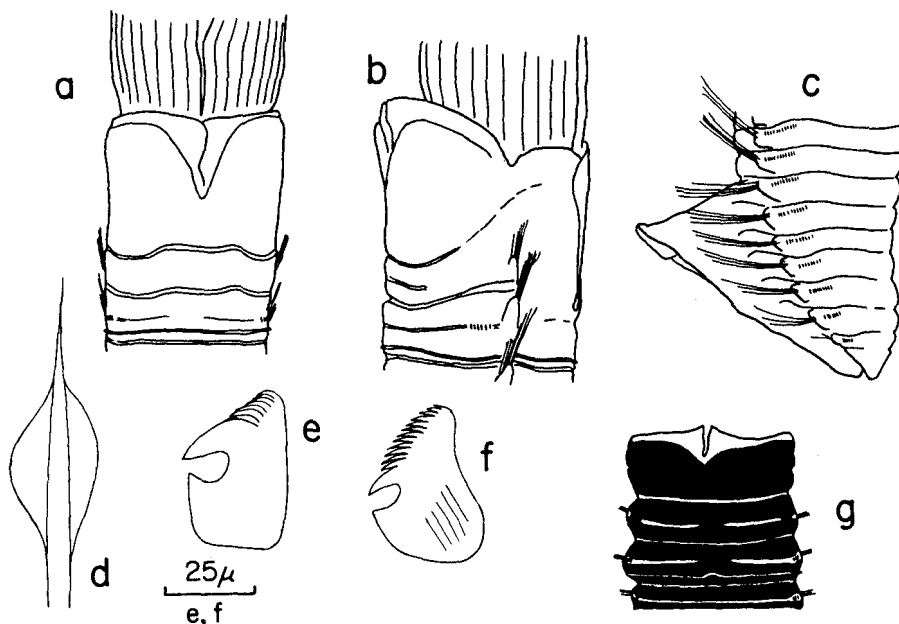


FIGURE 12.—*Euchone velifera* new species; c-e from holotype, a, b from paratypes; a-c, g not drawn to scale: a, b, ventral and left side views of anterior end of juvenile specimen; c, posterior end from the left side; d, subspatulate thoracic seta; e, f, uncini from fifth and 27th (sixth to last) abdominal segments. Accessory teeth schematic; g, anterior end in ventral view showing staining pattern.

high crowns and rounded, posteriorly enlarged bases.

The name refers to the sail-like wings of the anal depression.

*Material studied:* Type series.

*Description:* The holotype is a complete, well-preserved mature female of almost 3-cm total length (trunk length 17 mm) and 1.5-mm width. The paratypes are juveniles. In the holotype the branchial crown contributes a little more than one-third of the total length. The 9 or 10 pairs of pinnulated slender radioles are in the holotype free from each other through their entire length and have only rudimentary flanges. The juveniles have a palmate membrane uniting the radioles for approximately half of their length. The pinnules, which are of a uniform, relatively short length, are present almost to the ends of the radioles so that there are only rel-

atively short filiform free tips. A few thin naked filaments are also present, the longest one being about half as long as the radioles. Triangular lips occur on both sides of the mouth.

The collar (Figures 12a and 12b) is slightly longer ventrally than dorsally. The dorsal gap is narrow; laterally there is a small notch. Ventrally, a deep incision is formed by the collar being folded inward between the two halves of the branchial crown. A postsetal girde of glands encircles the second setiger. The ventral shields of unstained specimens are more distinct in the juveniles than in the adult animal. They are indicated more by the appearance of the ventral and lateral epidermis in the thorax, as contrasted to that of the dorsal side, than by morphological elevation (pads) on the ventrum. This is borne out by staining. In the adult, very conspicuous, subepidermal tissue of a creamy color is present dorsally from the third setiger, having the

appearance of ventral shields. The intrasegmental division of this tissue into anterior and posterior sections is particularly obvious in the abdomen. In contrast to shields, this material is not stained by methyl green. The very large wings of the anal depression are shown in Figure 12c.

Each thoracic notopodium after the first setiger contains three series of setae: about a dozen limbate, about half a dozen bayonet-type setae with very small wings, and 2 doz subspatulate setae (Figure 12d). The thoracic hooks are of the ordinary kind. An uncinus from the anterior abdominal region is shown in Figure 12e; there are about 8 teeth above the main fang in the smaller, and about 10 teeth in the larger, hooks of a torus. Uncini from the posterior regions differ markedly (Figure 12f), not only because of an increase of the number of teeth above the main fang but also by a marked posterior enlargement. There are about half a dozen ventral limbate setae in each abdominal neuropodium with very narrow wings.

The color of the preserved holotype is pale red-brown, except for the dorsal creamy tissue. Very numerous polygonal eggs have diameters up to 150  $\mu$ . The tube is clearly constructed by the successive addition of rings of mucus and mud.

After using methyl green, the collar is dorsally fully stained except at the anterior margin; the ventral pattern is indicated in Figure 12g; the patterns on the fourth and following setigers are the same as those on the third. In the abdomen, the intrasegmental divisions appear broader in the thorax so that, owing to the fecal groove, four rectangular fields of pigment per segment are seen. Laterally in the thorax and abdomen, the stained epidermis extends from the shields around the parapodia, uniting immediately dorsal to the notopodia. Staining cells are absent dorsally in the thorax but appear as faint lines in the abdomen.

The two young specimens (paratypes) are about 10 mm long and 0.5 to 0.6 mm wide. The approximately six pairs of radioles are almost as long as the trunk and united by the palmate membrane for about half their length. The collar (Figure 12b) is not as level as in the holo-

type. The number of abdominal setigers is difficult to ascertain but seems to be 27 or 28 in one, with 7 setigers in the anal depression, and 29 in the other specimen, with 9 setigers in the anal depression.

The smallest uncini in the third and fourth abdominal setiger of one of the specimens were very similar to Figure 12f, that of an uncinus of the adult animal from the posterior segments. The staining pattern is similar to that of the holotype except for a lateral tongue of nonstaining tissue which extends latero-ventrally between the posterior border of the collar, at the level of the lateral notch, and the first parapodium.

*Remarks:* *Euchone velifera* is unique in regard to its very deeply bilobed collar. Distinct midventral incisions are also known for *E. papillosa* and *E. capensis*. The latter two species lack laterally notched collars and very large wings in the anal depression.

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