

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Hutchings, P. A., and S. Rainer, 1982. Designation of a neotype of *Capitella filiformis* Claparède, 1864, type species of the genus *Heteromastus* (Polychaeta: Capitellidae). *Records of the Australian Museum* 34(4): 373–380. [15 March 1982].

doi:10.3853/j.0067-1975.34.1982.295

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

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DESIGNATION OF A NEOTYPE OF *CAPITELLA FILIFORMIS*
CLAPARÈDE, 1864, TYPE SPECIES
OF THE GENUS *HETEROMASTUS* (POLYCHAETA:
CAPITELLIDAE)

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SUMMARY

The synonymy of *Heteromastus filiformis* (Claparède, 1864) was examined to clarify the status of the genus *Heteromastus* Eisig, 1887. The synonymy is confused by inadequate descriptions and the absence of type material of *Capitella filiformis* Claparède, 1864, or of any of its synonyms. A neotype of *C. filiformis* Claparède was designated to stabilize the future use of *Heteromastus* Eisig.

INTRODUCTION

Heteromastus filiformis (Claparède, 1864) is a cosmopolitan species, occurring in a wide variety of habitats, and is commonly referred to in the ecological literature.

This species is also recognized by most workers as the type species of the genus *Heteromastus* Eisig, 1887. From Eisig's description, it is apparent that some confusion exists in the diagnostic characters of the genus *Heteromastus* as defined by the type species. Most subsequent workers have ignored this confusion, but we feel it is essential to redescribe the type species of *Heteromastus*, *H. filiformis*, to stabilize this common and widely distributed genus, and also to stabilize the genus *Mediomastus* Hartman, 1944.

The following abbreviations have been used below: AM W — Australian Museum; HMV — Zoologisches Institut, Hamburg; USFC — United States Fisheries Commission; USNM — United States National Museum, Smithsonian Institution; YPM — Peabody Museum of Natural History, Yale; MNHN — Museum National D'Histoire Naturelle, Paris.

TAXONOMY

Heteromastus Eisig, 1887

DIAGNOSIS: Thorax with 12 segments first asetigerous, setigers 2-6 with capillary setae and setigers 7-12 with hooded hooks, abdominal setae all hooded hooks. Notopodial branchiae present on posterior abdomen.

TYPE SPECIES: *Capitella filiformis* Claparède, 1864.

Heteromastus filiformis (Claparède, 1864)

Capitella filiformis Claparède, 1864: 49-50, Pl. IV, fig. 10. — Eisig, 1887: 839, 841-843. Type-locality: Port-Vendres; France.

Notomastus filiformis Verrill, 1873a: 611. — 1882: 302. — Webster, 1879a:123, Pl. 5, figs 51-54. — 1886: 152-153, Pl. (V) VIII, figs 51-54. — Webster and Benedict, 1884: 730. — Eisig, 1887: 870. — Hartman, 1942: 70 [*partim*]. — 1947: 427. Type locality: Great Egg Harbour, New Haven, Watch Hill, Vineyard Sound; U.S.A.

Notomastus luridus. — Verrill, 1874: 370. — Eisig, 1887: 869 [*partim*]. [*Non* Verrill, 1873a: 610.]

[?] *Areniella filiformis* Verrill, 1874: 386-387. — Hartman, 1942: 70. — 1944: 334, 341. — 1947: 427. Type locality: Casco Bay; U.S.A.

Ancistria minima. — Webster, 1879a, 1879b: 122, 258. [*fide* Hartman, 1947: 427.]. [*Non* Quatrefages, 1865: 252-253, Pl. 11, figs. 28-34.]

Notomastus laevis Webster, 1886: 152. [*fide* Hartman, 1947: 427.] Type locality: Provincetown; U.S.A.

Heteromastus filiformis Eisig, 1887: 839-840. — Fauvel, 1927: 150-152, fig. 53 a-i. — Hartman, 1947: 427-428, Pl. 52, figs 1-4. — Uschakov, 1965: 304 [*partim*]. — Day, 1967: 601, fig. 28-3a-d. — Hartmann-Schröder, 1971: 400-403 [*partim*]. — Hutchings and Rainer 1979.

MATERIAL EXAMINED: *Capitella filiformis* Neotype MNHN AS405, Alexandria, Egypt, 1933, ident. P. Fauvel. *Notomastus filiformis* YPM 1444 (1 spec.), Watch Hill, R.I., low water, Apr. 1873, ident. A. E. Verrill; YPM 1446 (1 spec.), Vineyard Sound, Mass., 1871, USFC 43, ident. A. E. Verrill; YPM 1460 (1 spec.), Great Egg Harbour, N. J., ident. A. E. Verrill; USNM 12188 (1 spec.), Gutters, Woods Hole, Mass., Aug. 1881, ident. A. E. Verrill; USNM 12189 (8 specs.); 12191 (20 specs.); 12193 (4 specs.), 2 fm, Newport, R.I., 2 Aug. 1880, ident. A. E. Verrill; USNM 16128, Hog Island, Casco Bay, Maine, low water, USFC, 1873, ident. A. E. Verrill. *Areniella filiformis* USNM 16129 (2 specs.), Cape Cod, 15 fm, 29 Aug. 1879, USFC St. 313, ident. A. E. Verrill. *Notomastus luridus* USNM 16128 (3 specs.), Hog Island, Casco Bay, Maine, low water, USFC, ident. A. E. Verrill. *Heteromastus filiformis* USNM 32151 (15+ specs.), Barnstable Flats, Mass., 23 Aug. 1954, coll. & ident. M. Pettibone; USNM 32149 (15+ specs.), West Falmouth Harbour, Mass., 11 July 1954, coll. & ident. M. Pettibone; USNM 32147 (7 specs.), Wallfleet Harbour, Mass., 29 Aug. 1954, coll. & ident. M. Pettibone; HMV-12317, North Sea (Sylt), coll. R. Wescherrfelder, ident. H. Augener.

Australian material (representative samples of the material examined):

Victoria: Port Phillip Bay Environmental Survey, 1969-1973. AM W5647, Stn. 966, 23 Jan. 1973; AM W16190, Stn.939, 18 Feb. 1971; AM W16334, Stn. 1224, 9 Mar. 1971; AM W16622, Stn. 966, 23 Jan. 1973; AM W16626, Stn. 984, 17 Feb. 1971. Westernport

Environmental Survey, Nov. 1973-Jan. 1974; AM W16861, Stn. 1717, 1 Jan. 1974; AM W16862, Stn. 1717-2, 2 Jan. 1974.

NSW: Merimbula Lake. — *Posidonia*, AM W11269, 11356, 12737, Oct. 1975; *Zostera*, AM W11917, Dec. 1975. Port Hacking. — *Posidonia*, AM W9591, May 1975; AM W11014, Nov. 1975; AM W11164, Aug. 1976. Botany Bay, Towra Point. — sand, AM W7739; *Posidonia*, AM W9637, 9689, 9705, 9725, 9735, 9759, Apr. 1973. Malabar. — AM W6509, 51 m, 16 May 1972. Careel Bay. — *Posidonia*, AM W8357-60, Dec. 1973.

Queensland: Gladstone. — Auckland Ck., AM W13239; Calliope R., AM W13525-6, 13528, May 1976.

DESCRIPTION: Neotype, 52 mm long, 0.6 mm wide at thorax, 0.4 mm wide at posterior abdomen, with approximately 160 segments, incomplete posteriorly. Colour of alcohol-preserved specimen, light brown in anterior and posterior segments, colourless in middle segments. Prostomium small, conical, without eyespots. Thorax of 12 segments, first segment asetigerous. Thorax, smooth and slightly inflated anteriorly, areolated and narrowed posteriorly; anterior abdominal segments project posterodorsally, demarcation between thorax and abdomen distinct. Nephridiopores not visible in thorax. Setae of segments 2-6, narrow, limbate capillaries; setae of segments 7-12, hooded hooks; setae of all abdominal segments, hooded hooks; tori of all segments short. Dental formula of abdominal hooks, main fang: 3-4:4-5:4-6. Thoracic setae, 12-18 capillaries per ramus in segments 2-6, 10-14 hooded hooks in segments 7-12. Abdominal setae, notopodia with 8-9 hooded hooks per torus in anterior segments, decreasing to 1-2 per torus in segments with gills; neuropodia with 12-14 hooded hooks per torus in anterior segments, decreasing to 3-5 per torus in posterior segments. Gills, short, broadly-based, rounded lamellae projecting posteriorly over adjacent segment, commencing from about segment 100, well-developed by segment 120.

COMMENTS: We have examined material from the Mediterranean, the North Sea, Australia and the east coast of the USA, from a range of soft-bottom habitats. The material varies considerably in size and in the extent to which gills are developed. We could not detect any consistent differences between material from different localities, and agree with the widely-held understanding that *Heteromastus filiformis* is a cosmopolitan species.

Capitella filiformis was described from Port-Vendres, France, while Eisig (1887) worked on material from the Gulf of Genoa, Italy. The neotype was selected from the only Mediterranean material available to us. It lacks posterior segments, and appears to have been stretched during preservation.

Complete specimens, from the east coast of the U.S.A., have up to 230 setigers for a length of 40 mm, and the abdomen terminates in a small digitiform caudal cirrus. The anterior thorax is usually inflated, and the demarcation between thorax and abdomen is usually distinct. Nephridiopores are present between segments 7-8, 8-9, 10-11 and 11-12; in some specimens there appears to be a nephridiopore between segments 6-7. Gills are variably developed on the abdomen, and appear to be absent in small specimens. In large specimens, gills are usually first present by segment 80, and are well-developed by segment 100. The substantially reduced number of setae in posterior abdominal segments seems to be a constant feature.

Among the material we examined from the east coast of the U.S.A. were specimens variously identified by Verrill as *Notomastus filiformis*, *Notomastus luridus* and *Areniella filiformis*. Some of this material had been examined by Hartman, who concluded in an initial paper (1942) that both *N. filiformis* Verrill, 1873 and *A. filiformis*

Verrill, 1874 were indeterminate. In a later paper (Hartman, 1947), however, these species were accepted as synonyms of *H. filiformis*. We have re-examined this material and it does contain some specimens of *H. filiformis* and we consider that *A. filiformis* is synonymous with *H. filiformis*. The specimens of *N. filiformis* that we examined, from the type locality for the species, were in excellent condition, and agreed with the accepted description of *Heteromastus filiformis*. The specimens of *A. filiformis* that we examined, collected from Cape Cod in 1879, also agreed well with *H. filiformis*. The specimens of *N. luridus* that we examined, from Casco Bay, also agreed with the description of *H. filiformis*. These were not type specimens, and we do not disagree with Hartman's conclusion that *N. luridus* is a valid species of *Notomastus*. We did not examine the type material of *N. luridus* (YPM 24-14) selected by Hartman (1942).

DISCUSSION

A fixed number of thoracic segments and a constant setal pattern are considered to be generic characters in the family Capitellidae. New species often have not conformed to the diagnoses of existing genera, and the result has been a proliferation of genera within the family. The precise affinities of genera are often unclear, and the family is in need of careful revision, which is beyond the scope of this study. Before this revisionary study can be undertaken, material of the type species of *Heteromastus* Eisig must be examined. No type material exists and, as discussed below, the synonymy is confused. We have therefore designated a neotype of *Capitella filiformis* Claparède, 1864. This neotype agrees with the original diagnosis of *Heteromastus*, by Eisig (1887) given above, which has been widely accepted by polychaete specialists such as Fauvel (1927), Hartman (1947), Hartmann-Schröder (1962), Day (1967) and Fauchald (1977). However, some workers have not accepted this diagnosis. For example, Uschakov (1965) defined the genus as having 12 thoracic segments, with capillary setae on a variable number (4-6) of thoracic segments. Such an interpretation may be the result of Eisig's (1887) description of the type species of *Heteromastus*, *H. filiformis* (Claparède, 1864) in which juveniles of *Heteromastus* may have a reduced number of thoracic segments. The latter interpretation of the genus is implicit in the studies of Wesenberg-Lund (1941), Rasmussen (1956) and Hartmann-Schröder (1971). The reference to *Heteromastus* McIntosh, 1885 by Hartmann-Schröder (1971) appears to be a *lapsus calami*.

In capitellids, the number of adult thoracic segments is constant and in most genera there is a clear demarcation between thorax and abdomen. Somatic growth in polychaetes, and certainly in capitellids, occurs by the proliferation of segments just anterior to the pygidium. The number of thoracic segments is fixed very early in development, and all segments developing subsequently are abdominal. There is evidence that the thoracic setal distribution in the genus *Capitella* may change during growth but there is no evidence of the total number of thoracic segments changing with increasing size (Warren, 1976). Our experience of examining many hundreds of specimens of *Heteromastus filiformis*, including many small individuals from Port Phillip Bay, Victoria (total length 1-2 cm), provides no evidence of changes in thoracic setal pattern or number of thoracic segments with increasing size of individuals. We believe that it is highly unlikely that juvenile animals of *Heteromastus* have a different number of thoracic setigers or setal pattern from adults. Similarly, none of the workers using Eisig's definition of the genus, Fauvel (1927), Hartman (1947), Hartmann-Schröder (1962), Day (1967) and Fauchald (1977), have indicated any variation in setal counts in small individuals. The variant interpretations by Wesenberg-Lund (1941), Rasmussen (1956) and Hartmann-Schröder (1971) were based

on material with only 11 thoracic segments. Subsequently, Rasmussen (1973) redescribed the *H. filiformis* of his 1956 paper as a new species, *Mediomastus fragilis*. Warren (1979) believed that *M. fragilis* has mistakenly been described by other workers as *H. filiformis*, and we consider it likely that the other authors were also referring to species of *Mediomastus*.

The genera of capitellids that had been erected by 1887 were usually poorly defined. Eisig (1887) endeavoured to clarify the situation on the basis of material available to him from the Gulf of Naples. The inadequacy of many species' descriptions was evident to Eisig as was the likelihood that many of the species were synonymous. According to the original diagnosis of *Heteromastus* by Eisig, the thorax comprised 12 segments, an achaetous segment followed by 5 setigers with capillary setae and then a further 6 setigers with hooded hooks. Eisig designated *Capitella filiformis* Claparède, 1864 as the type species of *Heteromastus*, and included the following species as synonyms of *C. filiformis*: *Capitella costana* Claparède, 1869; *Ancistria minima* Quatrefages, 1865; *Ancistria capillaris* Verrill, 1874; *Notomastus capillaris* Verrill, 1880; *Arenia* sp. ? Verrill, 1873. *Capitella fimbriata* Van Beneden, 1857 was doubtfully included in the synonymy. Eisig did not examine any material to establish the synonymy.

Claparède described *Capitella filiformis* from mature specimens, having the first 4 thoracic segments with capillary setae, the following 6 thoracic and all abdominal segments with hooded hooks. The characteristics of the setae include having the hooded hooks of the abdomen at least three times longer (0.078 mm) than those of the thorax (0.022 mm). This is at variance with Eisig's diagnosis of *Heteromastus*, apparently having one fewer thoracic segment with capillary setae. It is apparent from the many references in the systematic and ecological literature that a species conforming to the description of *Heteromastus filiformis sensu* Eisig is a common cosmopolitan species. Since there is a discrepancy between the description of *Capitella filiformis* and the diagnosis of the genus *Heteromastus* we attempted to examine Eisig's material and the type material of *C. filiformis* and its synonyms. We contacted all the major museums in Europe and many on the east coast of the United States of America. We were able to locate only some non-type material identified by Verrill as *Ancistria capillaris* Verrill, 1874. This material has previously been examined by Hartman (1942). All other type material, together with Eisig's material, is presumed lost or never deposited at all. It seems unlikely, for example, that Claparède ever deposited any material. In his 1869 paper he asks "Pour-quoi M. de Quatrefages, . . . s'est-il laissé entraîner à décrire tant de genres et d'espèces d'après des individus conservés dans l'alcool au Muséum de Paris? Il sait, mieux que personne, que ce genre de travail est profondément inutile, que les Annélides ne peuvent bien s'étudier qu'au bord de la mer, à l'aide d'individus vivants. Décrire, comme il le fait, tant de variétés alcooliques, c'est embarrasser la science d'un *câput mortuum* dont il faudra de longues années pour se débarrasser."

Since no type material of *Capitella filiformis* or any of its synonyms could be found, we then examined the descriptions of each species in detail to determine whether any of these was closer to *Heteromastus* Eisig than *C. filiformis* Claparède. These are considered below.

Capitella fimbriata Van Beneden, 1857: 140. Van Beneden's description does not allow the species to be distinguished from several capitellid genera. D'Udekem (1859) expanded Van Beneden's description, but did not quote the number of thoracic segments or give any indication as to where the setae commenced. No diagrams were given. Since the thoracic setal pattern is unclear, and the number of thoracic segments is unknown, we consider that *C. fimbriata* is indeterminate.

Ancistria minima Quatrefages, 1865. This species was described from an adult or sub-adult individual having an anterior region with simple (= capillary?) setae in both rami and a posterior region with hooded hooks in both rami. No diagrams were given. Since the number of thoracic segments is unknown, we consider that *A. minima* is indeterminate.

Capitella costana Claparède, 1869. This species was described as having the first two segments (buccal included) with fringed subulate setae and the nine following segments, with setae having a large terminal paddle (= hooded hook?). No diagrams were given. A thoracic setal formula of 11 setigers, of which only the first 2 have capillary setae, is strongly at variance with the adult diagnosis of *Heteromastus* Eisig and we consider that *C. costana* cannot be placed in the genus *Heteromastus* Eisig.

Ancistria capillaris Verrill, 1874. This species was described as having the first four segments with capillary setae, and succeeding segments with uncini. Subsequently Verrill (1880) renamed *A. capillaris* as *Notomastus capillaris*, without amplifying the original description. No diagrams were given. As the number of thoracic segments is unknown, we consider that *A. capillaris* Verrill and *N. capillaris* (Verrill) are indeterminate.

Arenia sp.? Verrill, 1873b. The name was used by Verrill in 1873, without a description. In 1882, Verrill synonymized *Arenia* sp.(?) with *Notomastus capillaris* Verrill, 1880. As argued above, *Arenia* sp.? is also indeterminate.

We did, however, find material of *Notomastus filiformis* Verrill, 1873, a species that Eisig 1887 had considered indeterminate, but that Hartman (1947) had synonymized with *H. filiformis*. We examined type material of *Notomastus filiformis* Verrill and found that it conformed to Eisig's definition of the genus *Heteromastus*. This represents the earliest published description with extant type material which conforms to *Heteromastus* Eisig. However, this species was not included in the synonymy established by Eisig for *H. filiformis* and thus is not available as a type species of the genus *Heteromastus*.

Of the synonyms given by Eisig for *Heteromastus filiformis*, the description of *Capitella filiformis* conforms most closely to Eisig's diagnosis. If *Capitella filiformis* is rejected as the type species of *Heteromastus* Eisig, then a new genus would have to be erected, possibly with *Notomastus filiformis* as its type species. We consider that the similarities between Claparède's description and Eisig's description of *H. filiformis* are such that the erection of a new genus is not required.

Two differences between Claparède's description and that of Eisig (1887) are in the number of anterior thoracic segments and the presence or absence of branchiae. All known species with 10 or more thoracic setigers normally have an achaetous peristomial segment. This suggests that Claparède either did not examine the anterior of his animals carefully or that he was dealing with specimens that had been damaged in some way and had not regrown their normal complement of anterior segments. In either case, it is likely that he was dealing with a species that possessed more thoracic segments than described. Branchiae in *Heteromastus filiformis* are not developed before about the 80th segment, and often not until about the 120th segment. They are initially small and could easily be missed when examining anterior fragments. Evidence suggesting that Claparède was dealing with *Heteromastus filiformis sensu* Eisig includes the number of thoracic segments with hooded hooks, the size and form of the hooded hooks, the absence of any copulatory apparatus and the relatively large size and number of segments in the mature individuals.

Heteromastus filiformis sensu Eisig has been widely referred to, and it is therefore desirable to maintain the stability and use of the genus *Heteromastus* and of the species *H. filiformis sensu* Eisig. The designation of a neotype of *Capitella filiformis* Claparède permits such stability to be maintained. We recognize that the neotype does not agree in some respects with Claparède's description. However, it does conform to the description of Eisig, and to most subsequent descriptions, and we consider that these differences probably result from the use of incomplete and possibly atypical material as the basis of Claparède's description.

ACKNOWLEDGEMENTS

We thank the following for lending material or providing constructive comments to the manuscript; Drs D. George, British Museum (Natural History); W. D. Hartman, Peabody Museum of Natural History; G. Hartmann-Schröder, Zoologische Institut und Zoologische Museum, Hamburg; M. Jones, Smithsonian Institution for Natural History; Mme. J. Renaud-Mornant, Muséum National d'Histoire Naturelle, Paris. Drs F. Rullier Université Catholique d'Angers; Cl. Vaucher, Muséum d'Histoire Naturelle, Geneva; L. Warren, University of London, are thanked for providing information, Drs H. Cogger and D. McAlpine, Australian Museum, for their systematic advice and Ms K. Handley for help with literature searches. We are particularly grateful for the encouragement and patient comments provided by Drs K. Fauchald and M. Pettibone, Smithsonian Institution, National Museum of Natural History.

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