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NEPHTYIDAE (POLYCHAETA) FROM NORWEGIAN WATERS

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ABSTRACT

The paper is a revision of the Norwegian nephtyids. The following species have been found in Norwegian waters: *Nephtys hombergi*, *N. ciliata*, *N. longosetosa*, *N. caeca*, *N. paradoxa*, *N. incisa*, *Aglaophamus malmgreni* and *A. rubella*. The ecological data existing for the present material are discussed and some comments are given on the geographical and bathymetrical distribution of the species.

INTRODUCTION

The family Nephtyidae was erected by GRUBE (1851) on a genus *Nephtys* described by CUVIER (1817). Prior to 1817 two species had been described, *N. caeca* (FABRICIUS, 1780) and *N. ciliata* (O. F. MÜLLER, 1789) both as belonging to *Nereis;* they were referred to *Nephtys* by SAVIGNY (1818). According to HARTMAN (1959) a total of 3 genera and 79 species are now recognised for the family. 10—11 species are found in European waters, and 8 of these in Norwegian waters.

The descriptions of the different species have changed in the course of time and most of the descriptions prior to EHLERS (1868) may be said to characterize whole genera rather than any particular species, the result being considerable

confusion. Valuable revisions were made by MICHAELSEN (1896), HEINEN (1911) and FAUVEL (1911, 1914, 1923), and it is mostly details that are left for consideration.

MATERIAL

The material existing in the Norwegian museums has been examined, supplemented with fresh specimens collected partly on short trips around the Biological Station, Espegrend and partly on a trip to Sunnfjord and Nordfjord north of Bergen which made it possible for me to get fresh material of the rarer species, e.g. *N. longosetosa*. All the material used, both the revised and the new, is presented in tables deposited in the University Library, Bergen.

TAXONOMY

Definitions of the family are found in FAUVEL (1923) and HARTMAN (1950). A number of genera have been erected, but after the revision by HARTMAN (1950), it looks as if most of them have been erected on erroneous observations or insignificant morphological details. HARTMAN (1950) recognised the following genera: *Nephtys* CUVIER, 1817; *Aglaophamus* KINBERG, 1866 and *Micronephthys* FRIEDRICH, 1939 of which the two first have been found in Norwegian waters. As far as my material is concerned HARTMAN's definitions of the genera seem to be good.

The key given below must be used with caution and collated with the descriptions. The parapodial characters are present only on the middle setigers. It is not possible to identify parts of animals from this key, something which applies to most other keys I have seen. I have intentionally not used certain clues. The proboscis is characteristic, but is not always evaginated. The prostomium is also typical for each species, but the morphological details are not easily recognised without training.

Key to the Norwegian species of the family

1. Interramal cirri recurved (Fig. 3D) . . . . . Genus *Nephtys* 2
   Interramal cirri involute (Fig. 3H) . . . . . Genus *Aglaophamus* 7
2. Interramal cirri foliaceous . . . . . *N. paradoxa* (p. 13)
   Interramal cirri not foliaceous 3
3. Neuropodial postacicular lobe greatly prolonged, much longer than the acicular lobe 4
   Neuropodial postacicular lobe not much longer than the acicular lobe 6
4. Preacicular lobes well developed, bilobed . . . . . *N. hombergi* (p. 3)
   Preacicular lobes very small 5
5. Acicular lobes slightly bilobed . . . . . *N. caeca* (p. 11)
   Acicular lobes evenly rounded, may be somewhat flattened . . . *N. longosetosa* (p. 8)
6. Acicular lobes bilobed, preacicular lobes rudimental . . . . . *N. ciliata* (p. 5)
   Acicular lobes conical, preacicular lobes partly developed . . . . . *N. incisa* (p. 15)
7. Interramal cirri present from setiger 3 . . . . . *A. rubella* (p. 20)
   Interramal cirri present from setiger 8-10 . . . . . *A. malmgreni* (p. 17)

The older Norwegian records consist mostly of notices in fauna lists and it is often impossible to judge what the authors meant by the names. Part of the material on which these records were based has been lost and, with one exception, the authors did not give any descriptions of their specimens. The lists of records in this paper contain those records I have not been able to identify from existing samples, whereas the maps contain new and verified old records.

The lists of the world distribution are not complete. The older literature is covered in FAUVEL (1923) and I have concentrated on getting as many new records as possible. VERRILL (1879) gives a check-list of invertebrates from the east coast of USA. As far as I have been able to check, only *N. incisa* occurs on both sides of the Atlantic, but I find it best to record VERRILLS paper under all the species he mentioned.

For morphological terms I have followed HARTMAN (1950) with one exception, I prefer "neuropodial cirrus" to "ventral cirrus".

Nephtys hombergi SAVIGNY, 1818 (Figs. 1G, 2D, 3E)

Description. Prostomium subpentagonal, front nearly straight or slightly concave, sides somewhat convex. First antennae relatively long, pointed, second antennae of the same shape, but somewhat longer.

Proboscis cylindrical or clavate, with 22 rows of well developed, triangular subterminal papillae, 2—4 papillae in each row. On the dorsal side a well developed median papilla, often long and slender; a similar papilla may be found on the ventral side as well, but is never as well developed as the one on the dorsal side. Proximal surface of proboscis smooth. The tips of the papillae, both terminal and subterminal often dark-pigmented, especially in larger specimens.

Parapodiae fully developed from setigers 25—30. In the notopodium the acicular lobe is evenly, somewhat obliquely, rounded with a digitate lobe on the ventral side of the tip of the aciculum. Preacicular lobe bilobed; the ventral part of it being somewhat pointed, the dorsal part broader, more rectangular in shape. Postacicular lobe simple, longer than the acicular lobe (1.3:1). On the dorsal part of the notopodial postacicular lobe a dark brown pigment-spot is often found. Acicular lobe of the neuropodium evenly rounded; the digitate lobe is present, but not as distinct as in the notopodium. Preacicular lobe bilobed; the dorsal part evenly rounded, the ventral part of a more rectangular shape. Postacicular lobe twice as long as the acicular lobe (1.9:1 for 31 specimens) with a, normally distinct, incision on the d o r s a l side. The ventral side evenly rounded. Neuropodial cirrus short and conical.

All the parapodial characters are distinct from setigers 10—15. Posterior to setiger 45 the parapodiae become reduced, the acicular lobes more pointed, the preacicular lobes reduced and their bilobation shallower. The postacicular lobes also become somewhat reduced.

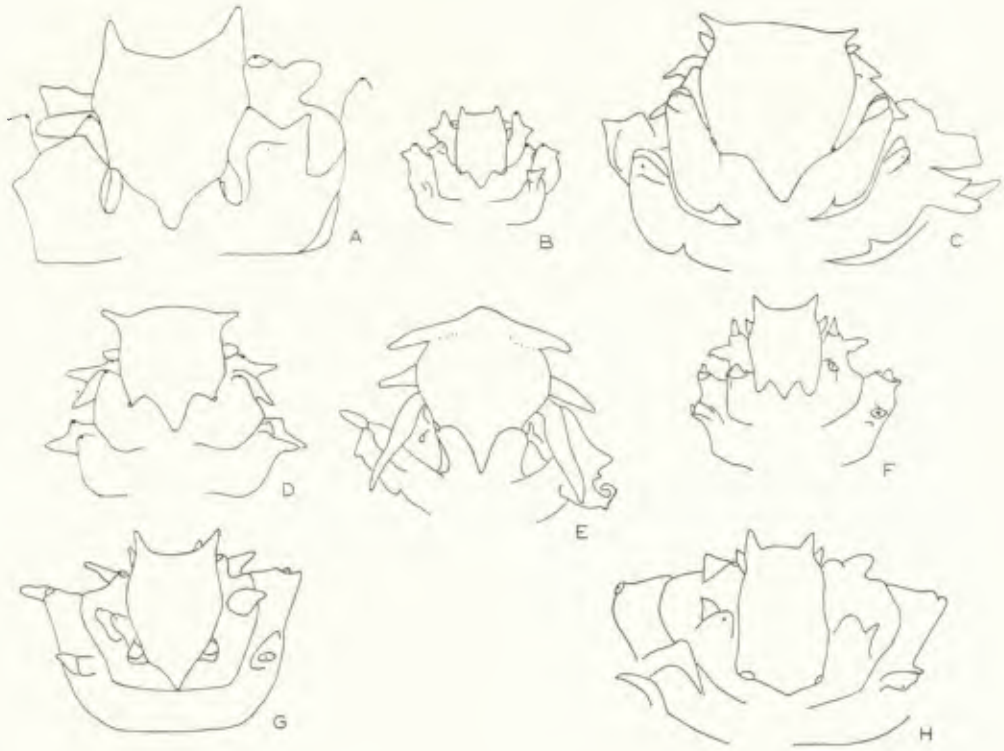

Fig. 1. Prostomium and first setigers. A *N. paradoxa*, 30×; B *N. ciliata*, 7×; C *N. longosetosa*, 18×; D *N. cacca*, 9×; E *A. rubella*, 3.5×; F *A. malmgreni*, 16×; G *N. hombergi*, 3.5×; H *N. incisa*, 17.5×.

Interramal cirri digitate with a distinct basal swelling (not clearly shown in the drawing). The cirri are present on all setigers from setigers 5—6 and are fully developed from setigers 15—20 though reduced in the 15—20 last ones.

Setae of the postacicular fascicle always longer than the acicular lobe; setae of the preacicular fascicle shorter with a distal barred area, proximally often double-refracting. Postacicular setae slender and tapering with a subdistal bristled area.

Discussion. HARTMAN (1959) mentioned the following as synonyms for *N. hombergi: N. Cuvieri* QUATREFAGES; *N. Ehlersi* CZERNIAVSKY; *N. Langerhansi* CZERNIAVSKY; *N. Macandrewi* BAIRD; *N. maeotica* CZERNIAVSKY; *N. neapolitana* GRUBE; *N. scolopendroides* DELLE CHIAJE; *N. hombergi vasculosa*, MCINTOSH; *N. ehlersi* HEINEN for *N. hombergi kersivalensis* MCINTOSH. This agrees well with what I have found from the literature with one exception; *N. hombergi vaseulosa* may be an artefact resulting from the fixation. I have achieved the same type of vascularization when fixating too slowly with alcohol.

One may divide *N. hombergi* into three groups:

1. *N. hombergi* s. str. Postacicular lobe of the neuropodium about twice as long as the acicular lobe, rounded at the tip. Setae long or short.
2. *N. hombergi ehlersi*. Postacicular lobe of the neuropodium not much longer than the acicular lobe, rounded. Setae long.
3. *N. hombergi kersivalensis*. Postacicular lobe of the neuropodium not much longer than the acicular lobe, pointed. Setae short. There are indications in the literature that the two last-mentioned may be the epitoe and atoc stage of the same sub-species (AUGENER, 1912; FAGE & LEGENDRE, 1927), but as far as I have been able to ascertain, the connection has not yet been proved.

N. hombergi s. str. dominates in my material. The two other forms are represented with one specimen each, both from the Oslofjord area. They are not taken into consideration in the key partly because they represent a small percentage of the Norwegian material, and partly because I am not sure as to how distinct they will prove to be in a greater material.

Distribution in Norwegian waters. See Fig. 5A.

Unverified Norwegian records. — SARS, 1835: Florö, "nedgravet i Sandet nærved laveste Ebbe..., ikke almindelig" (buried in the sand near lowest low-water... not common K.Fd. transl.). HANSEN, 1882: Norw. N. Atl. Exp. St. 147. 66° 48′ N., 12° 8′ E., 260 m, greyish clay; St. 262, 70° 36′ N., 32° 35′., sandy clay; Skjærstadfjord, 481 m, green-greyish clay. BIDENKAP, 1894b: Tromsö. BIDENKAP, 1907: Trondhjemsfjord, some localities, 20—200 fathoms. BROCH, 1935: Dröbak, det. AUGENER.

Some records from other waters. TRYBOM, 1881: Bohuslän, one locality. COLLIN, 1884: Limfjorden. LEVINSEN, 1893: North Sea; Kattegatt; the Belts and Öresund (as *N. assimilis* ÖRSTED). DITLEVSEN, 1914: Davis Strait. FAUVEL, 1914: Baie du Ferrol; North Sea; Atlantic Ocean; Cape of Good Hope; The Mediterranean. DITLEVSEN, 1925: "The species is widely distributed in Danish waters but is, according to ELIASON, not to be found in the Sound". STEPHEN, 1928: Firth of Clyde; Firth of Forth. DITLEVSEN, 1929: The Faroes. CASPERS, 1928: Tiefe Rinne, Helgoland, det. AUGENER. AUGENER, 1940: Friedrichsort (the Baltic). VIELLA, 1947: Portugal, estuarine conditions. CASPERS, 1950: Helgoländer Austernbank, det. FRIEDRICH. RAYMONT, 1950: Kyle Scotnish (Scotland). WESENBERG-LUND, 1950: Davis Strait, old records. SCHUSTER, 1951: Mellum (German North Sea Coast). DAWYDOFF, 1952: Indochina, det. FAUVEL. DAY et al., 1952: South African estuaries. SCHUSTER, 1952: Vareler Rinne, Jadebusen (German North Sea coast). SOUTHWARD, 1953: Isle of Man, some localities. CASPERS, 1954: mouth of the Elbe. JONES, 1956: Port Erin, Isle of Man. DAY, 1958: South African estuaries. MCINTYRE, 1958: St. Andrew-area; Aberdeen-coastal-area; Smith-Bank-area.

Nephtys ciliata (O. F. MÜLLER, 1789) (Figs. 1B, 2E, 3A)

Description. Prostomium subpentagonal, somewhat longer than wide, front straight or slightly convex, sides slightly convex. Greatest width anterior to the middle. First antennae short and triangular, second antennae of the same shape, but longer.

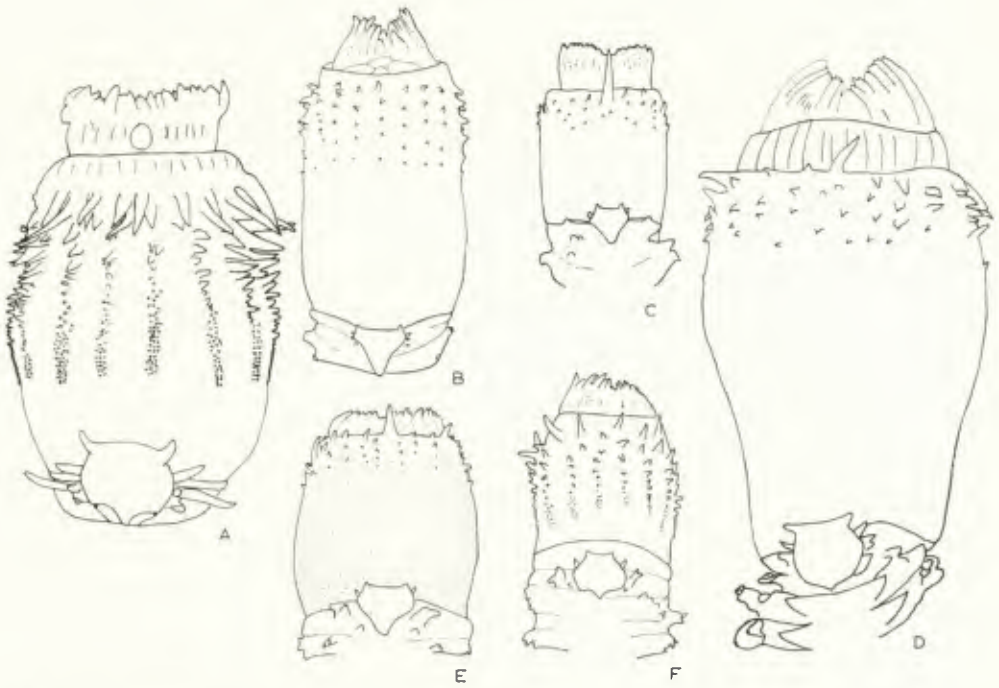

Fig. 2. Proboscis, prostomium and first setigers. A *A. rubella*, 3×; B *N. paradoxa*, 6×; C *N. incisa*, 8×; D *N. hombergi*, 6×; E *N. ciliata*, 3×; F *A. malmgreni*, 14×.

Proboscis clavate, subterminally with 22 rows of digitate papillae, 3—5 papillae in each row. A short, stout median papilla on the dorsal side; a corresponding one may occur on the ventral side as well. Proximal surface of the proboscis coated with flat warts; these may also extend to the surface between the rows of subterminal papillae.

Parapodiae fully developed from setiger 15. Acicular lobes distinctly bilobed, in the notopodium the dorsal part is evenly rounded and somewhat shorter than the ventral part. Preacicular lobe rudimental; postacicular lobe somewhat shorter than, or as long as, the acicular lobe. Notopodial cirrus well developed, normally triangular, but may have an incision giving a tapered tip. In the neuropodium the ventral part of the acicular lobe is somewhat shorter, but wider and more rounded than the dorsal part. Preacicular lobe small but distinct. Postacicular lobe slightly longer than the acicular lobe. Neuropodial cirrus conical. The parapodiae become reduced behind setiger 50, the bilobation of the acicular lobes disappears, they become more rounded and in the last setigers even somewhat pointed. The preacicular lobes are reduced to mere vestiges, the postacicular lobes become the same size and shape as the acicular lobes.

Interramal cirri present from setigers 8—10, fully developed from setigers 25—30. They are stout but rather short without distinct basal swelling. The

cirri become reduced behind setigers 45—50, and are rudimentary but distinct on the last setigers.

Setae about as long as the acicular lobes. In the postacicular fascicle the setae have a bristled area subdistally. The preacicular fascicle has short setae with a barred structure.

Discussion. *N. ciliata* was described by MÜLLER (1789) in a not too detailed diagnosis. His drawings of the complete animal and of the proboscis show that he had a nephtyid, but the drawing of the parapodiae looks as if it was made from another polychaete. RATHKE (1843, 1844) gave as a possible explanation that ABILDGAARD and not MÜLLER had prepared both the drawings and description of this species.

MÖBIUS (1873) lumped together the following species: *N. cacca* FABRICIUS, *ciliata* MÜLLER, *assimilis* ÖRSTED, and *incisa* MALMGREN under the name *N. cacca*. The descriptions on which MÖBIUS based his conclusions were those published by MALMGREN (1865, 1867) and it must be admitted that not all MALMGREN's descriptions are sufficiently clear. The main argument MÖBIUS used was that the parapodiae vary so much along the body of any one individual that they are useless as systematic characters. MALMGREN gave no indication of from what part of the animals his descriptions and drawings had been taken. Because of this I think that MALMGREN must take at least part of the blame for the confusion that followed.

MÖBIUS was followed reservedly by SCHACK (1868) and wholeheartedly by WIRÉN (1883). WIRÉN also lumped *N. longisetosa* ÖRSTED (sic! see page 10), *borealis* ÖRSTED, *cirrosa* EHLERS and *emarginata* MALM together with the group MÖBIUS had made, still with *N. cacca* as name. WIRÉN compared the descriptions of the parapodiae of the different species and came to the conclusion that, for some characters at least, they defined a series of transitions between *N. ciliata* and *N. cacca*. As far as I can judge from WIRÉN's Pl. 30, Fig. 1 is *N. ciliata*, Fig. 2 *N. longosetosa*, Fig. 3 *N. ciliata*. In Pl. 31, Fig. 1 looks like *N. longosetosa* and Figs. 2 and 3 seem to represent *N. cacca*. AUGENER (1912) reexamined the material WIRÉN had used, and did not find any *N. cacca*, but as far as I can see from WIRÉN's figures the latter must have had some specimens.

MICHAELSEN (1896), HEINEN (1911) and FAUVEL (1911, 1914) revised the European species of the family and concluded that MÖBIUS' and WIRÉN's *N. cacca* consisted of the following species: *N. cacca* FABRICIUS, *ciliata* MÜLLER, *incisa* MALMGREN, *longosetosa* ÖRSTED, *cirrosa* EHLERS. The latest revisions have been made by FAUVEL (1923) and HARTMAN (1950, 1959).

N. ciliata is perhaps the most variable of the European species and at the same time the dominating species. The result of these two facts is that a number of varieties have been described either as subspecies or as separate species. I cannot find any reason to divide *N. ciliata* into lesser groups at the moment, even if

some of the "subspecies" described are present in my material. I have found that these are always connected with the main form in a series of transitions and prefer to make the descriptions of the species so wide as to include them. It is worthwhile noticing that the descriptions even of the main form vary quite a lot from one author to the next.

Distribution in Norwegian waters. See Fig. 5 B.

Unverified Norwegian records. — RATHKE, 1843: Molde. ÖRSTED, 1845: Dröbak, 30—50 fathoms. KOREN, 1856: Korsfjord and/or Herdlafjord, 30—50 fathoms. DANIELSSEN, 1859: "Temmelig almindelig paa sandig, stenet Bund fra 10—40 fv, til Vadsöe, i Finmarken ikke ganske sjælden paa meget store Dyb, indtil 160 fv". (Rather common on sandy, stony bottom from 10—40 fathoms, north to Vadsö, in Finnmark not unusual at very great depths, down to 160 fathoms. K.Fd. transl.). DANIELSSEN, 1861: "Ikke sjælden paa enkelte Steder, saasom ved Tromsöe og Vadsöe, sandig, stenet Bund, 20—160 fv." (Not rare in some localities such as around Tromsö and Vadsöe, sandy, stony bottom, 20—160 fathoms). SARS, G. O., 1873: "Temmelig almindelig ved Dröbak, 20—50 fv." (Rather common around Dröbak, 20—50 fathoms). KÜKENTHAL et al., 1886: Alversund (near Bergen), rare. BIDENKAP, 1894b: Christianiafjord — Vadsö, common. KIÆR, 1904: Sandspollen, Dröbak, Dröbak—Hvidsten, ca. 200 m. NORDGAARD, 1905: Landego, 200—400 m; Ögsfjord, 100 m; Malangen, 100—120 m; specimens determined by BIDENKAP or LEVINSEN. BIDENKAP, 1907: Malvik, 80 m, mud; North of Garten, 20 m, *Modiola* and *Serpulidae* (both localities in the Trondhjemsfjord); Beitstadfjord, rare. NORDGAARD, 1923: Lorvikleret, 15 m, soft mud; Rolsöy, 10—20 m, sandy bottom (localities in the Trondhjemsfjord). BROCH, 1935: Dröbak, det. AUGENER.

Some records from other waters. RATHKE, 1843: Heligoland. MCINTOSH 1868: Shetland, first record from British waters. KUPFFER, 1873: north of the Skaw, 110 fathoms. MÖBIUS, 1873: the Bay of Kiel (?). VERRILL, 1879: eastcoast of USA. HORST, 1881: the Barents Sea. TRYBOM, 1881: Bohuslän, Sweden, rather common, 12—135 fathoms. LENZ, 1882: the Bay of Travemünde. LEVINSEN, 1887: the Sea of Kara. LEVINSEN, 1893: Skagerrack; Kattegatt; the Belts and Öresund; the Baltic. GRIEG, 1909: Spitzbergen, det. ARWIDSON. FAUVEL, 1911: Porte de Kara, 135 m. DITLEVSEN, 1914: Greenland, several localities. FAUVEL, 1914: Hopen; Svalbard, some localities. SÆMUNDSON, 1918: Iceland, several localities. MORTENSEN, 1922: Danish sandy beaches; Blåvandshuk, some specimens. SPÄRCK, 1922: Limfjorden, the most common annelid on soft bottoms. FAUVEL, 1923: the North Sea; the Channel (Boulogne, St. Malo, Roscoff). DITLEVSEN, 1925: the most common species of the family in Danish waters. GURJANOVA et al., 1928: the Kolafjord. DITLEVSEN, 1929: the most common species of the family around the Faroes. THORSON, 1933: Greenland, some localities. GUSTAFSON, 1936: along the Siberian coast, several localities. FRIEDRICH, 1939: the Barents Sea. WESENBERG-LUND, 1950: the most common species of the family in Greenland waters. USHAKOV, 1955: the Sea of Japan; Sea of Okhotsk; the Bering Sea down to 900 m; is known from the Yellow Sea. PURCHON, 1957: Morros, Bristol Channel, on a beach.

Nephtys longosetosa ÖRSTED, 1842—43 (Figs. 1C, 3F)

Description. Prostomium with convex front, sides swollen with the widest part anterior to the middle, hind sides somewhat concave. First antennae triangularily tapered, second antennae of approximately the same length, conical and constricted at the base.

Proboscis not stretched in any of the specimens; for a description see FAUVEL (1923).

Parapodiae fully developed from setiger 25. Notopodial acicular lobe evenly, somewhat obliquely rounded. Preacicular lobe small and evenly rounded; postacicular lobe longer than the acicular lobe, and bilobed, the dorsal part being the longest and obliquely oval in shape; the ventral part short and evenly rounded. Notopodial cirrus small and slender. Neuropodial acicular lobe evenly rounded, somewhat more symmetrical than the notopodial one. Preacicular lobe short and simple, rounded. Postacicular lobe about twice as long as the acicular lobe, rounded oval, but with a, normally distinct, incision on the *ventral* side (cfr. *N. hombergi*, p. 3). Neuropodial cirrus conical. The incision in the postacicular lobe of the neuropodium more distinct in the posterior part of the body, but as with all characters of the parapodiae becomes somewhat reduced at the extreme hind end. The acicular lobes become more conical, the other lobes very reduced. Preacicular lobes not distinguishable on the 10—15 last setigers; postacicular lobes become the same length as the corresponding acicular lobes.

Interramal cirri present from setiger 3, distinct even from the beginning, fully developed from setigers 10—15, when they are long, relatively slender, somewhat swollen at the base. They become reduced on the posterior part of the body, but are present and distinct even in the last setigers.

The length of the setae about twice the length of the complete parapodiae. Postacicular setae narrow with a long, finely tapered tip, subdistally with a bristled structure; preacicular setae much shorter and stouter, with a short conical tip and a barred structure.

Discussion. *N. longosetosa* was described by ÖRSTED (1842—43) in a short latin diagnosis with the comment: «Denne Art kjendes ved förste Öjekast paa de meget lange Börster» (This species is recognisable on sight by the very long setae. K. Fd. transl.). ÖRSTED (1843) also gave a short diagnosis but had in addition two drawings (Pl. VI, Figs. 75—76). The species may be identified on Fig. 75 where ÖRSTED has drawn a parapodium. It is especially the shape of the neuropodial postacicular lobe that permits identification. MALMGREN (1865) gave a description of a species which he referred to *N. longisetosa* ÖRSTED. THÉEL (1879) pointed out that the specimens MALMGREN described could not belong to the same species as those ÖRSTED had drawn, the reason being the curving of the interramal cirri (extrovert in ÖRSTED, introvert in MALMGREN); accordingly he gave MALMGREN's specimens a new name, *N. malmgreni* (see *Aglaophamus malmgreni*, p. 29). EHLERS (1868) doubtfully placed *N. longosetosa* as a synonym for *N. hombergi* and THÉEL (1879) did the same. These two authors must have noticed the size, but not the shape of the neuropodial postacicular lobes. There is a quite distinct difference in shape, even though the size of the postacicular lobes is about the same in both species.

MALM (1874) described a *N. emarginata* which is clearly synonymous with *N. longosetosa*, the only difference being that the incision on the ventral side of the neuropodial postacicular lobes is more distinct in MALM's drawings than in those given by ÖRSTED (1843). MICHAELSEN (1896) remarked correctly that this character is very variable even in the same sample and concluded that the two were synonymous. MCINTOSH (1908) described a *N. longisetosa* (sic!) which is a mixture of *Aglaophamus malmgreni* and *A. rubella* (see pp. 17 and 20). There are some indications in his illustrations that he also knew *N. longosetosa*, but that is not reflected in his description. EHLERS (1868) placed *N. longosetosa* ÖRSTED as a synonym for *N. hombergi* and surmised that ÖRSTED had printed a drawing of *N. hombergi* instead of one of his new species. JOHNSTON (1865) recorded *N. longisetosa* from British waters. MALMGREN (1867) re-examined the British specimens and said that they were not identical with his *N. longisetosa*, but belonged either to *N. hombergi* or to a new species. EHLERS (1868) preferred the first alternative, but later (1874) described a *N. johnstoni* and referred *N. longisetosa* JOHNSTON to it. As far as I can see EHLERS could not possibly have had anything else than the true *N. longosetosa*; *N. johnstoni* EHLERS is thus a younger synonym for *N. longosetosa*. MCINTOSH (1908) redescribed *N. johnstoni*, but his description shows that he had *N. longosetosa* and also some other not identifiable species in his material. The whole may be summarized as follows:

N. longosetosa ÖRSTED = *N. longisetosa* JOHNSTON.
N. longisetosa EHLERS (1868) = *N. hombergi*
N. johnstoni EHLERS (1874) = *N. longosetosa* ÖRSTED.
N. johnstoni MCINTOSH (1908) = ??

HEINEN (1911) and FAUVEL (1914, 1923) established *N. longosetosa* on much the same lines as the above, and I refer to them for a direct list of synonyms. Their descriptions accord pretty well, with certain discrepancies with what I have found. HEINEN (1911) said about the notopodial cirrus: ... "der konische und lange, am Ursprunge verdickte Rückencirrus ragt weit über die Würzelhöcker hinaus". This description does not accord with what I have found, but recalls the condition in *A. malmgreni!* FAUVEL (1923) mentioned that the neuropodial acicular lobe may be slightly bilobed. I have not found this, but it is worth mentioning in view of USHAKOV's claim (1955) to have found specimens transitional between *N. ciliata* and *N. longosetosa*. I have not seen any transitional specimens and for that reason prefer to distinguish the two as different species; it is not impossible that such transitions occur even in Norwegian waters, the present material being rather small.

Because of the rather complex synonymy of *N. longosetosa* it is nearly impossible to establish a reliable list of unverified Norwegian records. HANSEN (1882) mentioned *N. longosetosa* from the Norwegian North-Atlantic Expedition, but I have not been able to find it in the collections from that expedition.

Distribution in Norwegian waters. See Fig. 6 A.

Unverified Norwegian records. — Sars, 1851: Ramfjord, 50—60 fathoms. Sars, 1853: the coast near Bergen, 10—20 fathoms. Koren, 1956: Korsfjord and/or Herdlafjord, 300 fathoms. Sars, 1864: has been found on the Norwegian coast down to 200 fathoms. Hansen, 1879: the Norw. North-Atl. Expedition St. 124 and 172.

Some records from other waters. Verrill, 1879: east-coast of USA. Levinsen, 1893: Kattegatt. Ditlevsen, 1914: Godthaab, leg. Örsted. Fauvel, 1914 l'est des Oreades, 88 m. Sæmundson, 1918: Iceland. Fauvel, 1923: the Channel (coast of England, Channel Isles); the Atlantic. Ditlevsen, 1925: the North Sea and the Skagerack where it seems to be rather common. Ditlevsen, 1929: the Faroes. Augener, 1940: Bülk (the Baltic). Friedrich, 1939: the Barents Sea. Caspers, 1950: Helgoländer Austernbank, det. Friedrich. Wesenberg-Lund, 1950: Greenland. Caspers, 1954: the lightship *Elbe I*. Colman et al., 1955: Stoupe Beck Sands, Yorkshire. Ushakov, 1955: the Japan Sea; the Bering Sea; the Sea of Okhotsk.

Nephtys cacca (Fabricius, 1780) (Figs. 1D, 3D)

Description. Prostomium with slightly convex front, sides convex, posterior end drawn out to a concavely triangular tip. First antennae slender, second antennae longer and much stouter, somewhat constricted at the base.

Proboscis sub-cylindrical or slightly clavate, with 22 rows of subterminal papillae, 4—5 papillae in each row, these papillae are conical, the proximal ones not much longer than the warts that coat the rest of the surface of the proboscis. On larger specimens the pigmentation of the proboscis is often dark, normally dark brown. No subterminal median papillae.

From setigers 20—25 the parapodiae are fully developed. Notopodial acicular lobe distinctly bilobed, the ventral part longer and evenly rounded, the dorsal part somewhat shorter and obliquely rounded. Preacicular lobe very small, postacicular lobe nearly twice as long as the acicular lobes, obliquely oval in shape and simple. Notopodial cirrus small and slender. Neuropodial acicular lobe more rounded than the notopodial one; the bilobation being very slight. Preacicular lobe small, postacicular lobe very long with both the ventral and dorsal sides evenly rounded; they run together in an obtuse, but distinct tip. Neuropodial cirrus conical, but somewhat constricted at the base.

On the posterior part of the body the postacicular lobes become reduced and on the 10—15 last setigers they are of about the same size as the acicular lobes. The bilobation of the acicular lobes disappears and the lobes become a more conical shape on the last few setigers.

Interramal cirrus is fully developed, stout and relatively short, somewhat swollen near the base. It appears on setigers 4—5 and is present even in the last setigers, but becomes reduced on the posterior part of the body.

The setae do not reach past the postacicular lobes on the fully developed parapodiae. Postacicular setae slender with a finely tapered tip and a subdistal structure of rather coarse bristles. Setae from the preacicular fascicle rather short and stiff, with a barred structure.

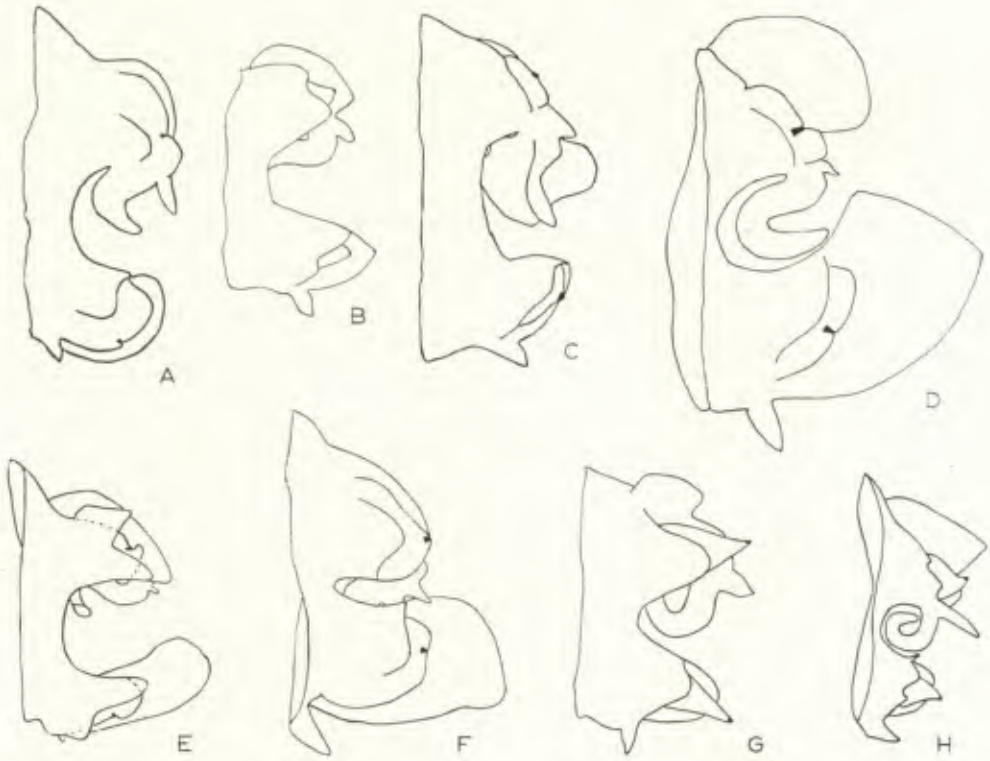

Fig. 3. Middle parapodiae, seen from the anterior side. A *N. ciliata*, 2.5×; B *N. incisa*, 12×; C *N. paradoxa*, 5×; D *N. cacca*, 18×; E *N. hombergi*, 12×; F *N. longosetosa*, 12×; G *A. malmgreni*, 2.5×; H *A. rubella*, 4×.

Discussion. *N. cacca* is the earliest described nepthyid. For the early synonymy I refer to EHLERS (1868) who also gave a good description, and to FAUVEL (1923). MÖBIUS (1873) and, among others WIRÉN (1883) did not differentiate between a number of European species, but referred to them all as *N. cacca*, because *cacca* was the earliest published name (see *N. ciliata*, p. 7 and *N. longosetosa*, p. 9).

How many of the unverified Norwegian records may be correct, it is not possible to guess; it suffices to mention that about 2/3 of the material had been wrongly identified as this species.

Distribution in Norwegian waters. See Fig. 6 B.

Unverified Norwegian records. — SARS, 1851: Florö. SARS, 1863: Florö, in mud at extreme low water. MALMGREN, 1865: Andersdalen, Balsfjord; Karlsö, Öxfjord. STORM, 1879: Rödberg, Trondhjemsfjord, on the beach. GRIEG, 1888: have been found by MOBIUS in the deepest part of the fjord (The Hardangerfjord). BIDENKAP 1894b: the coast near Bergen, in the North, to Finmark, 0—400 fathoms, sandy bottom. APPELLÖF, 1896: Herdlafjord by Berlandsö, 150 fathoms. NORDGAARD, 1905 (identified by BIDENKAP or LEVINSEN): Beierfjord, 30—150 m; Ögsfjord I, 100 m; mouth of Raftsundet, 250—300 m;

Svolvær 1894; Henningsvær, 150 m; Kirkfjord, 30—50 m. BIDENKAP, 1907: Trondhjemsfjord, 0—400 m; Rödberg, Trondhjemsfjord, in the beach. KIÆR, 1907: Balsfjord, on the beach, ripe ovae 30 april 1901. NORDGAARD, 1907: two localities in Mofjord near Bergen. BROCH, 1935: Dröbak, det. AUGENER.

Some records from other waters. VERRILL, 1879: east coast of USA. COLLIN, 1884: known from Limfjorden. DAHL, 1893: Eitzenloch, Mouth of the Elbe. LEVINSEN, 1893: the North Sea; Kattegatt; the Belts and Öresund. DITLEVSEN, 1914: Greenland, several localities. SÆMUNDSON, 1918: Iceland, several localities. SPÄRCK et al., 1921: Lögstör Bredning, Limfjorden. DITLEVSEN, 1925: Occurs in Danish waters anywhere within the Skaw, also in the Baltic. ZENKEVITSCH, 1925: Nowaja Zemlja. GURJANOVA et al., 1928: the Kolafjord. STEPHEN, 1928: Firth of Clyde, in the littoral; Firth of Forth, in the littoral. DITLEVSEN, 1929: the Faroes. CASPERS, 1938: Tiefe Rinne, Helgoland det. AUGENER. AUGENER, 1940: Friedrichsort and Bülk (the Baltic). WATKIN, 1942: Kames Bay, Millport, in the littoral. CASPERS, 1950: Helgoländer Austernbank, det. FRIEDRICH. WESENBERG-LUND, 1950: Greenland. SCHUSTER, 1952: Vareler Rinne, Jadebusen (German North Sea Coast), on the *Sabellaria*-reef, det. FRIEDRICH. CASPERS, 1954: the lightship *Elbe I*. OKUDA et al., 1954: Japanese waters. USHAKOV, 1955: the northern part of the Japan Sea; the Sea of Okhotsk; Penchilijskij-bay (Yellow Sea). PURCHON, 1957: Llanwit Major, The Bristol Channel.

Nephtys paradoxa MALM, 1874 (Figs. 1A, 2B, 3C)

Description. Prostomium pentagonal, front somewhat concave. First antennae relatively long and pointed. Second antennae of about the same length, but much stouter.

Proboscis subcylindrical, subterminally with 22 rows of short, nearly triangular papillae, 5—6 papillae in each row. The proximal of these papillae are very small, wartlike. Median papillae present both on the dorsal and ventral side of the proboscis. They do not differ much from the other papillæ; being of the same shape, but slightly longer. Proximal surface of proboscis smooth.

Parapodiae fully developed from setigers 20—25. Notopodial acicular lobe obliquely rounded; preacicular lobe rudimental, postacicular lobe small, never longer than the acicular lobe. Notopodial cirrus triangular. Neuropodial acicular lobe of the same general shape as the notopodial one, but more symmetrical; preacicular lobe rudimental, postacicular lobe somewhat longer than the acicular lobe (1.1:1). Neuropodial cirrus triangular with a constricted base. Posterior setigers with conical acicular lobes, more symmetrical at the hind end of the body; the other lobes become reduced.

Interramal cirri present from setigers 5—14, normally from setigers 8—10 (c. 3/4 of 62 specimens). They are first present just as a small outgrowth ventral to the notopodial cirrus: from setigers 16—20 they increase rather rapidly and are fully developed by setigers 25—27. Posterior to setiger 40 they become reduced rapidly to a short straight process, and vanish completely by setigers 55—60. Fully developed, the interramal cirrus is equipped with two lateral foliaceous lobes. These may be somewhat undulated along the edge, but have often smooth edges. There are two types of foliaceous lobes: in the one type the

lobes cover the whole cirrus; in the other type the distal end of the cirrus proper is left free. Of 100 specimens 40 had covered distal end, the other 60 free end.

Setae relatively short and stout; postacicular setae with a strong bristled structure, setae from the preacicular fascicle with a barred structure.

Discussion. *N. paradoxa* was named by MALM (1874) in a short description but with two excellent drawings. His manuscript was dated 17 June. In April the same year EHLERS described a *Nephthys pansa* from the *Porcupine* Expedition. He gave a short diagnosis in latin but no illustrations. A year later (1875) he redescribed his species and gave some illustrations. It seems that he had not noticed the paper by MALM.

There has, as far as I can see, never been any doubt that the two are synonymous, but it also seems that none of the later authors have observed EHLERS first paper until HARTMAN (1959) mentioned it.

HORST (1881) who was the first to record this species afterwards used EHLERS (1875) to identify his specimens, but did not mention the paper by MALM. LEVINSEN (1887) recorded *N. pansa* as a synonym for *N. paradoxa* and used this last name, but as mentioned above, he did not know the earlier paper by EHLERS. The latest to use the name *N. pansa* was MCINTOSH (1908); he, too, just cites EHLERS (1875) and in addition HORST (1881) but neither the earlier paper by EHLERS, nor MALM (1874). I think it would be best to treat *Nephthys pansa* EHLERS, 1874 as a *nomen oblitum* to avoid more confusion over this question.

HARTMAN (1950) placed *N. phyllocirra* MCINTOSH as a possible synonym for *N. paradoxa*. There is nothing in the original description to contradict such a decision. FAUVEL (1914) mentioned that *N. ingens* STIMPSON, 1853 may belong to *N. paradoxa*, but said that STIMPSON's description gave too little detail. HARTMAN (1959) placed *N. ingens* near *N. incisa* MALMGREN. The description in STIMPSON (1853) certainly is altogether insufficiently detailed and I propose to treat *Nephtys ingens* STIMPSON, 1853 as a *nomen dubium*.

There are some morphological variations in the present material; most noticeable is the variation in the shape of the interramal cirri. Both morphological variations have been described above. They are constant in each individual, but cannot be correlated with any other morphological character or ecological factor. At present it seems most plausible to put them down as an individual variation.

USHAKOV (1955) said in a key to the Russian—Siberian representatives of the family:

"The gills of a rounded shape, with smooth edges and with a slender thread-like distal appendix (similar to an apple with stalk) . . . . . .*N. brachycephala* MOORE.

The gills oblong, with rough edges, without the distal thread-like appendix. . . . . .*N. paradoxa* MALM''

(This key has first been translated from Russian to Norwegian).

The use of this key would split what in this paper is recognized as *N. paradoxa* into two species on account of the different types of interramal cirri. Moore (1903) gave a very detailed description of his species, though without illustrations. Among other distinguishing characters he mentioned especially the shape of the acicular lobes. In *N. brachycephala* they are slightly bilobed, in *N. paradoxa* they are obliquely rounded. This fact alone is in my opinion enough to establish that the variety I have found in the Norwegian material is distinct from *N. brachycephala*. The key Ushakov gave may signify that one of the two types, the one with free distal end of the interramal cirri, is not to be found in the northern part of the range of the species. There is nothing to substantiate such a supposition in the present material, which also includes specimens from typical arctic waters.

Distribution in Norwegian waters. See Fig. 7 A.

Unverified Norwegian records. — Bidenkap, 1894b: Bukkenfjord, 40—50 fathoms, leg. M. Sars. Bidenkap, 1907: Sundsetvåg (Norviksund, Trondhjemsfjord), 50—60 m, leg. Nordgaard; Skarnsund, leg. Swenander. Nordgaard, 1912: Röväer, 14 March 1902, 145 m, 1 specimen. Broch, 1935: Dröbak, det. Augener.

Some records from other waters. Ehlers, 1874: 51° 1′ N,. 11° 21′ W., 126 fathoms (*N. pansa*). Malm, 1874: Koster, Bohuslän, Sweden. Verrill, 1879: east coast of USA. Horst, 1881: the Barentz Sea (*N. pansa*). Levinsen, 1887: many specimens from the *Djimphna* Expedition. Levinsen, 1893: Kattegatt. Michaelsen, 1896: Koster, Malm; N.—NE. Kattegatt, Levinsen. Fauvel, 1911: the Kara Sea. Heinen, 1911: the North Sea; Skagerrack. Augener, 1912: Spitzbergen. Ditlevsen, 1914: Greenland. Fauvel, 1923: the North Sea; SE of Ireland; the North Atlantic; the arctic seas. Ditlevsen, 1925: Kattegatt. Gustafson, 1936: New Siberian Islands to the Bering Strait. Friedrich, 1939: the Barents Sea. Hartman, 1950: Gullmarfjord, Sweden. Wesenberg-Lund, 1950: Greenland; NE. of Iceland. Gauld et al., 1953: St. Kilda. Ushakov, 1955: the Sea of Japan; Bering Sea; the Sea of Okhotsk, 0—270 m.

Nephtys incisa Malmgren, 1865 (Figs. 1H, 2C, 3B)

Description. *N. incisa* s. str. Postromium sub-pentagonal, small, distinctly longer than broad, front straight or slightly convex, sides slightly convex. First antennae short and stout, second pair of the same shape but somewhat longer (c. 1/5).

Proboscis cylindrical with 22 rows of weak, often nearly invisible subterminal papillae, 4—5 papillae in each row. Dorsal median papilla very well developed, long and slender. No median papilla on the ventral side. Surface of proboscis smooth.

Parapodiae fully developed from setigers 15—20. The description is of parapodia 25. Notopodial acicular lobe conical, not pointed; preacicular lobe shorter than the acicular lobe (0.9:1), the dorsal part of it reduced or weakly developed. Postacicular lobe somewhat longer than the acicular lobe (1.1:1) and of obliquely oval shape. Notopodial cirrus triangular. Neuropodial acicular

lobe conical, not pointed; preacicular lobe of about the same length as the acicular lobe — the ventral part of it much less developed than the dorsal part. Postacicular lobe somewhat longer than the acicular lobe, triangular in shape. Neuropodial cirrus digitate, relatively small. The parapodiae become somewhat simplified in the posterior part of the body; pre- and postacicular lobes are reduced and are, on the 10—15 last setigers, completely rudimentary. The acicular lobes become somewhat pointed but always retain a distinctly conical shape.

Interramal cirri present from setiger 6, they increase rapidly in size and are fully developed from setiger 15. They are long, slender with a distinct basal swelling. They become reduced behind setigers 35—40 and are lacking in the 15 last setigers.

Setae from the postacicular fascicle very long, as long as or somewhat longer than the total length of the parapodiae. They have a structure of rather coarse bristles, the tip is smooth and tapering. Preacicular setae much shorter with a barred structure subdistally and a short tip without outer structures.

N. incisa var. *bilobata* HEINEN. In the variety the preacicular lobes both in the noto- and neuropodium are deeply bilobed. Both parts of the preacicular lobes are evenly rounded. Postacicular lobes somewhat better developed than in the main form.

Discussion. *N. incisa* was described by MALMGREN in 1865 and was rapidly recognized with the exception of authors such as MÖBIUS and WIRÉN (see discussion on *N. ciliata*, p. 7).

HEINEN (1911) described a variety *bilobata*. From the description given the variety ought to be easily recognizable, but this is not always the case. In the Norwegian material the greatest part consists of var. *bilobata;* the main form is also well represented. But part of the material consists of individuals which it is impossible to consign to either group. In the specimens of *N. incisa* I have seen, the development of the preacicular lobes is variable and I have found that the var. *bilobata* specimens represent one end of a series, the main form being near to the other end.

Distribution in Norwegian waters. See Fig. 7 B.

Unverified Norwegian records. — BIDENKAP, 1894b: Bergensfjord. NORDGAARD, 1905: Svolvær, 1894; Malangen, 380 m; Jökelfjord, det. BIDENKAP or LEVINSEN. AUGENER, 1925: Skarnsund, Trondhjemsfjord; Mekgrunnen, Molde. BROCH, 1935: Dröbak, det. AUGENER.

Some records from other waters. KUPFFER, 1873: North of the Skaw, 110 fathoms. VERRILL, 1879: east coast of USA. LEVINSEN, 1893: Skagerrack; Kattegatt. DITLEVSEN, 1914: Greenland, fide LEVINSEN. FAUVEL, 1914: Corse and Port Empedocle, the Mediterranean; the Atlantic, 165—1200 m. FAUVEL, 1923: the North Sea; the Atlantic (Golfe de Gascogne, Santander and the coast of Portugal); the Mediterranen (Corse, Sicilia). MOLANDER, 1928: Gullmarfjord, Sweden. DITLEVSEN, 1929: the Faroes. AUGENER, 1940: Stoller Grund, the Baltic. WESENBERG-LUND, 1950: Greenland. SOUTHWARD, 1953: Derbyhaven, Isle of Man. JONES, 1956: Port Erin, 30—40 fathoms. SANDERS, 1958: Buzzards Bay, Massachusetts. BELLAN, 1959: Canal du Minorque, the Mediterranean.

Aglaophamus malmgreni (THÉEL, 1879) (Figs. 1F, 2F, 3G)

Description. Anterior corner of the prostomium nearly right-angled. Front straight or slightly concave. Sides only slightly concave near to the anterior corners. First antennae short, c. 1/4 of the length of the prostomium. Second antennae of about the same length or somewhat longer than the first, but much stouter.

Proboscis clavate with 14 rows of subterminal papillae, 12—18 papillae in each row. The papillae decrease rapidly in size towards the proximal end. Free surface smooth.

Notopodial acicular lobe very pointed, nearly straight. Preacicular lobe simple, small and obliquely rounded. Postacicular lobe deeply bilobed; the dorsal part has a rounded, obliquely triangular shape, the ventral part is rounded, of the same length or somewhat shorter than the acicular lobe. Notopodial cirrus stout, triangularily pointed. Neuropodial acicular lobe very pointed, straight, preacicular lobe small and obliquely rounded. Postacicular lobe shorter than the acicular lobe, evenly rounded. Neuropodial cirrus stout, conical.

The parapodiae become somewhat reduced behind setigers 40—50, but the different lobes are always recognizable.

Interramal cirri present and rather well developed from setigers 8—15, reaching full development around setiger 15. They are then stout, cirriform and nearly fill the room between the noto- and neuropodium. They are lacking behind setiger 35 without becoming distinctly reduced before.

Setae of about the same length as the acicular lobe. Setae from the preacicular fascicle shorter than those from the postacicular one and with a barred structure. Postacicular setae with a bristled structure.

Description of the type material of *Nephthys atlantica* HANSEN, 1879. Zoological Museum, Bergen No. 2173.

The material consists of three pieces. The description is based on the specimen drawn in HANSEN (1879).

Proboscis partly protruded, with 14 rows of subterminal papillae; it is not possible to count the number of papillae in each row. It is not possible to recognize any characters on the prostomium. The parapodiae have a very pointed acicular lobe, with the tip bent backwards. It is not possible to distinguish pre- or postacicular lobes on this specimen. Interramal cirri are lacking on the anterior part of the body; they seem to be restricted to the middle part of the body. They are slender and involute. Notopodial cirri are rather short.

The setae are very long, the postacicular ones have a finely tapered tip and a structure of fine bristles. In the preacicular fascicle the setae are somewhat shorter, with a short tip and a barred structure. The aciculum is finely tapered and is bent backwards at the tip.

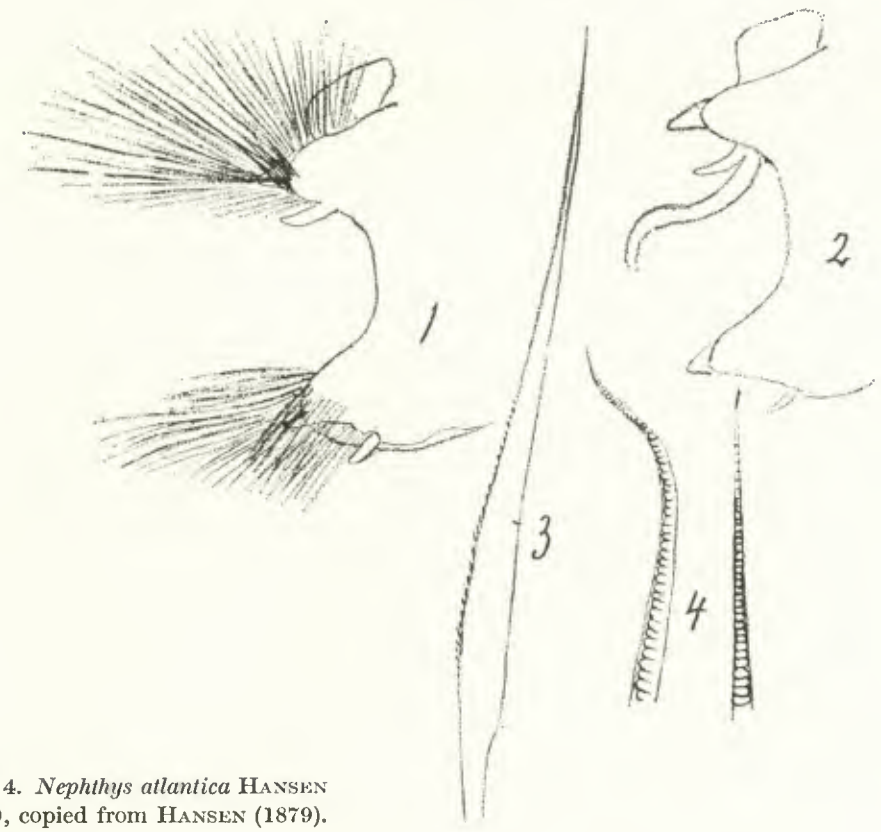

Fig. 4. *Nephthys atlantica* HANSEN 1879, copied from HANSEN (1879).

Type localities: HANSEN, 1879: The Norwegian North Atlantic Expedition 1876—78: St. 18, 62°44′ N., 1°40′ E., 21 June 1876, 753 m, clay; — St. 31, 63°10′ N., 5° E., 29 June 1876, 763 m, clay; — St. 87, 64°2′ N., 5°35′ E., 22 Aug. 1876, 911 m, clay. One piece from each of the stations together in one tube.

Discussion. *Nephthys atlantica* HANSEN, 1879 has always been somewhat enigmatical. In order to clarify the position of this species I have found it best to redescribe the type material, and I will cite the original description with the illustrations (Fig. 4). The text I cite is the English version in HANSEN (1882); this text is virtually identical with the Norwegian version, and this last version is again identical with the version published in 1879. HANSEN (1882) also publishes the same illustrations as in the earlier paper.

"A small fragment from each Station, the largest measuring 5 cm. In one of the mutilated specimens, the proboscis is partially exserted, and the evaginated portion appears densely studded with papillae, arranged in longitudinal series; the part nearest the head is smooth. On opening the proboscis, the papillae may

be traced to the oral aperture, which is encircled by a cincture of larger papillae. Branchiae occur from the 13th to the 35th segment, but are wanting on the others (Pl. IV, Figs. 1, 2)."

If one collates the two descriptions of *N. atlantica* with the description given of *A. malmgreni* I think it proved that the two are identical. WIRÉN (1883) and AUGENER (1912) came to the same conclusion without examining the type material. There is an indication in WIRÉN (1883) that *N. atlantica* had been published earlier than *A. malmgreni*, but as the first-mentioned has always at best been considered rather doubtful I propose to treat *Nephthys atlantica* HANSEN, 1879 as a *nomen oblitum* for *Aglaophamus malmgreni* (THÉEL, 1879).

THÉEL (1879) identified his species with *N. longisetosa* MALMGREN. Neither from descriptions nor drawings in MALMGREN (1865, 1867) is it possible to decide whether he had this species or *A. rubella* (MICHAELSEN), but the locality seems to exclude the latter. MCINTOSH (1908) published a *N. longisetosa* that seems to be a mixture of the two North-Atlantic *Aglaophamus* species. His description of the very long cirri on the first setigers may signify that he at least had some specimens of *A. rubella*. On the other hand his drawings of the parapodia seem to signify that he also must just have had *A. malmgreni* among his specimens. Certain features in the same drawing may also mean that he had *N. longosetosa* ÖRSTED, but that is not traceable in his description. *N. Grubei* MCINTOSH is from the description and drawing a typical *A. malmgreni*.

FAUVEL (1923) gave a very valuable revision of this species. My description diverges from his in the following points:

1. The number of papillae in the rows of subterminal papillae on the proboscis is different (12—18 against 10—13).
2. The interramal cirri start somewhat more posteriorly (10—15 setigers against 8—15).

It is not possible to decide whether this divergence represents a geographical variation or is a real systematic difference.

Distribution in Norwegian waters. See Fig. 8 A.

Unverified Norwegian records. — BIDENKAP, 1894b: Tanafjord, 127 fathoms, ARMAUER HANSEN. KIÆR, 1907: Balsfjord, deepest part, innermost, 130 m, mud; Ramfjord, in the mouth, 150 m, mud.

Some records from other waters. — THÉEL, 1879: Novaya Zemlya. LEVINSEN, 1887: the Kara Sea, 22 specimens. HARTLAUB, 1900: 73° 23′N., 19° 6′ E., 28 July 1898, 530 m, mud and stones. THÉEL, 1907: the harbour of Bonden, Kristineberg, Sweden. FAUVEL, 1911: the Kara Sea. DITLEVSEN, 1914: Greenland. FAUVEL, 1914: Isfjord, Svalbard: the Atlantic between Norway and Björnöya, 1898. FAUVEL, 1923: the North Sea (coast of England); the Atlantic (coast of Portugal); the Mediterranean (Candie and Phineka). GUSTAFSON, 1936: the Arctic Ocean to 179° W. FRIEDRICH, 1939: the Barents Sea. WESENBERG-LUND, 1950: Greenland. USHAKOV, 1955: the Sea of Japan; the Bering Sea; the Sea of Okhotsk, 72—2300 m; the Shikotin Island.

Aglaophamus rubella (Michaelsen), 1896 (Figs. 1E, 2A, 3H)

Description. Prostomium rounded pentagonal. Front normally slightly convex, but may also be very convex as in the drawing. The length of first antennae about 1/3 of the length of the prostomium. Second antennae somewhat longer, both pairs are cirriform. Eyes present, but not distinct.

Proboscis clavate with 14 rows of subterminal papillae, 22—23 papillae in each row. The distal ones long and tapered, the proximal ones small, wart-like, often 3—4 papillae arranged in square rows. Free surface smooth and iridescent.

Parapodiae fully developed from setiger 15. The description is based on setiger 30. Notopodial acicular lobe very pointed, somewhat dorsally curved at the tip. Preacicular lobe well developed, somewhat shorter than the acicular lobe and bilobed, the ventral part of it longer than the dorsal part. Postacicular lobe bilobed; the dorsal part longer than the acicular lobe and pointed, the ventral part shorter and more rounded in shape. Notopodial cirrus very well developed, conical. Neuropodial acicular lobe pointed, slightly ventrally curved at the tip. Preacicular lobe shorter than the acicular lobe, bilobed, the ventral part shorter than the dorsal. Postacicular lobe shorter than the acicular lobe, simple but with a small, erect cirriform lobe on the dorsal side. Notopodial cirrus well developed and triangularily pointed. From setigers 45—50 the parapodiae are reduced, the pre- and postacicular lobes become reduced, their bilobation shallower, and the acicular lobes become even more pointed.

Interramal cirri present from setiger 2—3 and are even then well developed. They are cirriform when fully developed and fill the room between the noto- and neuropodium completely. They become somewhat reduced on the posterior setigers but are present even in the last setigers.

Setae very long, the postacicular ones as long as or longer than the acicular lobe with a finely bristled structure. Preacicular setae shorter with a very coarse barred structure.

Discussion. *A. rubella* was recorded for the first time from Norwegian waters by Broch (1935). I have found that quite a lot of the older material in the museums identified as *A. malmgreni* actually belongs to this species. It may be mentioned that Bidenkap (1894a) who recorded *A. malmgreni* for the first time from Norwegian waters actually had a specimen of *A. rubella*.

Stöp-Bowitz (1948) recorded *A. rubella* from south of Newfoundland in material from the *Michael Sars* Expedition 1910. These specimens are somewhat different from the Norwegian. The interramal cirri are present from setiger 6, the antennae are shorter and the erect lobe on the neuropodial postacicular lobe is not as distinct as in the Norwegian specimens. It may be that these only represent a rather aberrant form, or perhaps a closely related species.

Distribution in Norwegian waters. See Fig. 8 B.

Unverified Norwegian record. — Broch, 1935: Dröbak, new to Norway det. Augener.

Some records from other waters. Fauvel, 1914: Golfe de Gascogne; Strait of Messina. Fauvel, 1923: the North Sea; Golfe de Gascogne; Strait of Messina. Ditlevsen, 1925: Groves Flak and Gaden, Kattegatt, det. Blegvad. Ditlevsen, 1929: the Faroes. Caspers, 1938: Helgoländer Tiefe Rinne, det. Augener. Caspers, 1950: Helgoländer Austernbank, det. Friedrich. Pérès, 1952: Castiglione, the Mediterranean.

Some of the material in the Norwegian collections is in so bad a condition as to be indeterminable. In all, that part of the collections consists of c. 20 samples, distributed along the whole coast.

The measurements given have been taken as follows: the acicular lobe has been measured from the base of the parapodium to the tip: pre- and post-acicular lobes from their base on the acicular lobe, that is, from the point where they are recognizable as separate lobes. The setae have been measured from the exit from the setae-fold to the tip, preferably in the middle of the fascicle.

GEOGRAPHICAL DISTRIBUTION IN NORWEGIAN WATERS (Figs. 5—8)

N. hombergi is common in the southern part of Norway, but seems to be rather rare in northern Norway with a northern limit around 70° N. In northern Norway it seems to prefer the open coast to the fjords. *N. ciliata* is common along the whole coast, but is especially abundant in northern Norway. Of *N. longosetosa* and *N. caeca* I have too few samples to be able to draw any conclusions about the distribution. *N. paradoxa* is found along the whole coast. *N. incisa* is found north to Finnmark but has not yet been recorded in Finnmark itself. It seems to have the same type of distribution as *N. hombergi*. *Aglaophamus malmgreni* is found along the whole coast but is especially abundant in northern Norway. *A. rubella* has not been found north of Ålesund and thus has a markedly southern occurrence in Norwegian waters.

On all the maps a marked gap in western Norway is noticeable; the coast between Stad and the opening of the Trondhjemsfjord has never been investigated, and the same gap will be found in all maps of the distribution of marine invertebrates in Norway.

On the maps the dots mean single samples, the hatched areas signify several samples in the same district.

BATHYMETRICAL DISTRIBUTION (Fig. 9)

The material was not especially collected for this purpose; it is partly very old and the depths given are often rather inexact. In addition data are lacking for 17 % of the specimens. Because of these facts any numerical results will be

Fig. 5. Distribution in Norwegian waters. A *N. hombergi;* B *N. ciliata.*

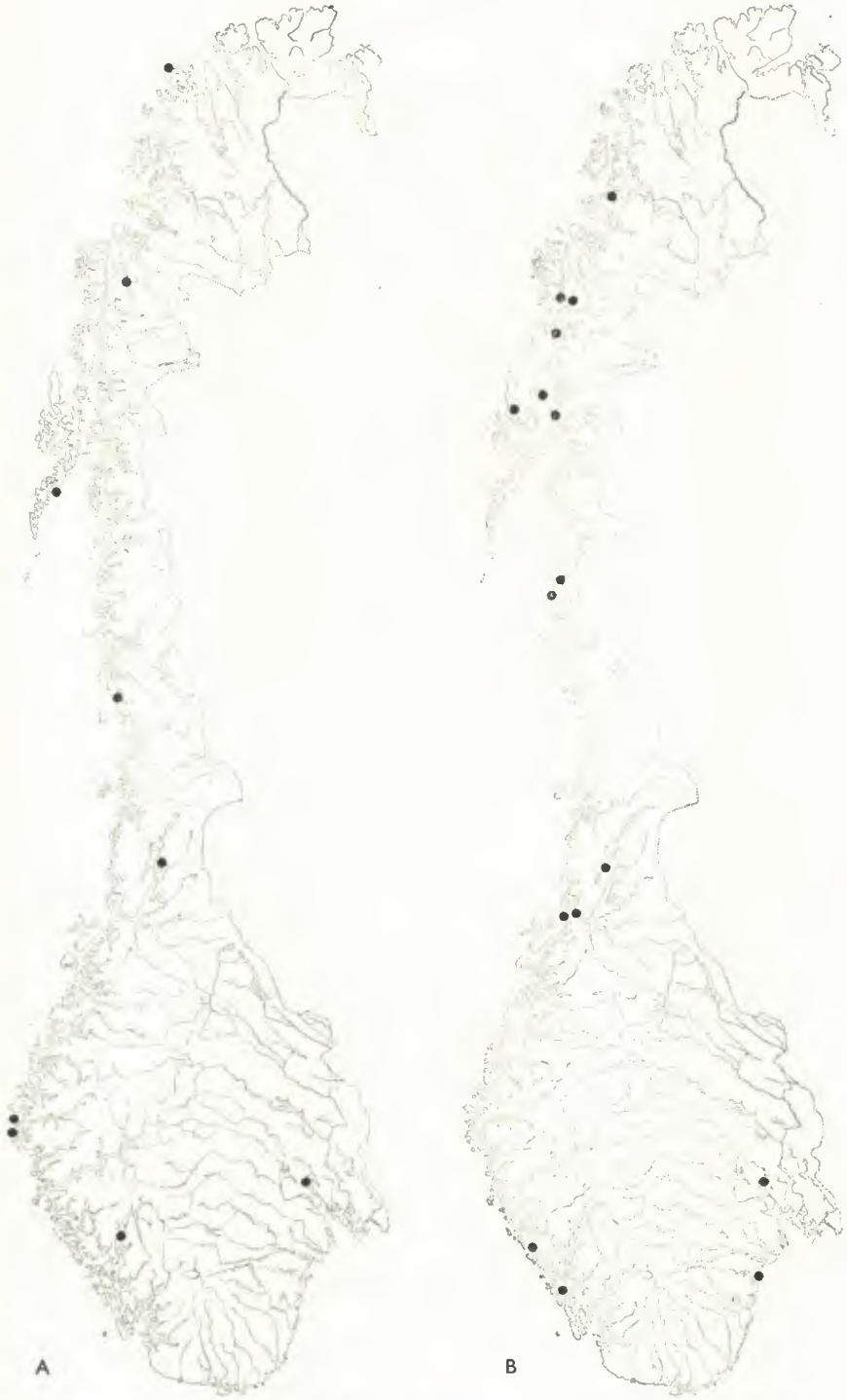

Fig. 6. Distribution in Norwegian waters. A *N. longosetosa;* B *N. caeca.*

Fig. 7. Distribution in Norwegian waters. A *N. paradoxa;* B *N. incisa.*

Fig. 8. Distribution in Norwegian waters. A *A. malmgreni;* B *A. rubella.*

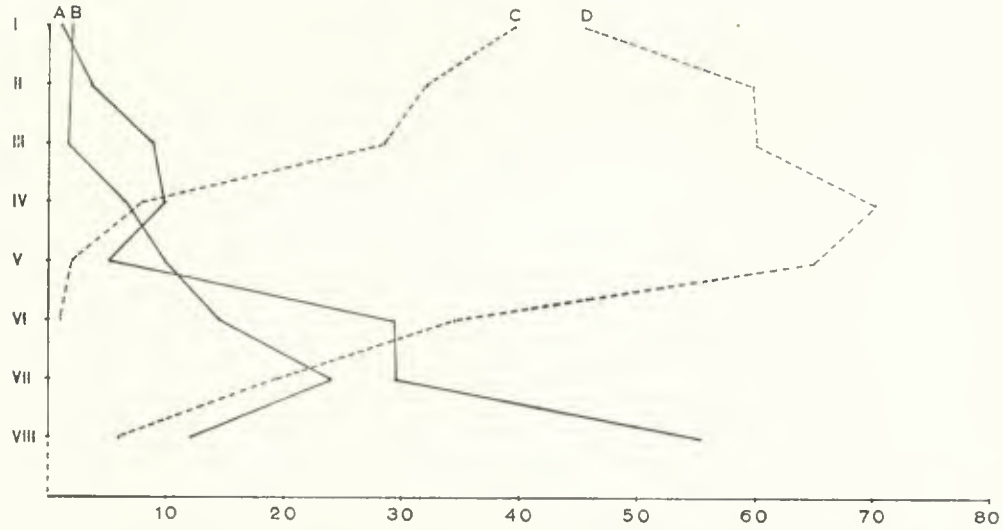

Fig. 9. Types of depth distribution. The species are: A *N. incisa;* B *A. malmgreni;* C *N. hombergi* and D *N. ciliata.* The abcissa gives the percentage of each species per depth group; the ordinate the depth groups (roman numbers). Further explanation see p. 27 and Table 1.

rather unreliable, but I think it possible to judge at least the types of distribution from the general trends the figure shows.

The calculation was made as follows: the depth was divided in 8 groups: I. 0 — 5 m; II. 6 — 10 m; III. 11 — 50 m; IV. 51 — 100 m; V. 101 — 150 m; VI. 151 — 250 m; VII. 251 — 350 m; VIII. More than 351 m.

I consider it better to establish a normal upper than lower boundary because of the greater exactitude in sounding and of the much greater number of specimens taken there. That is the reason why the uppermost depth-groups are narrower than the deeper ones. Because of the inexactitude of the depth data I made two similar calculations, one for the shallower alternative and one for the deeper. That is, if a dredging was made at a depth of 90—110 m it would be represented in two of my depth-groups; to avoid double representation I made two sets of calculations.

I prefer to use the number of specimens instead of the number of samples because of the very unequal size of the samples. If the material had been collected especially for this purpose one ought to calculate with a mean sample and then recalculate all the samples to this basis. As the main purpose of my calculations has been not to show the exact values, but rather a general trend I have not found it worth while to make such a recalculation.

I then calculated the percentage of each species in each of the depth-groups for the two sets of depth data and from these two values got the mean percentage pr. species pr. depth-group. In Table 1 these mean percentages for each species

Table 1. Mean percentage of each species per depth group. Further explanation see p. 26—27 The two lowermost horizontal rows show the total number of specimens per depth group.

Species	Group I 0—5 m	Group II 6—10 m	Group III 11—50 m	Group IV 51—100 m	Group V 101—150 m	Group VI 151—250 m	Group VII 251—350 m	Group VIII > 350 m
N. hombergi	39.75	33.32	27.32	8.12	2.49	1.42	—	—
N. ciliata	47.32	59.95	60.85	70.23	65.19	34.83	19.23	6.28
N. longosetosa	1.52	3.67	—	0.54	0.78	0.97	4.15	—
N. caeca	9.44	—	0.26	—	—	—	—	—
N. paradoxa	1.52	1.59	1.58	6.79	9.33	14.63	23.15	12.06
N. incisa	0.04	3.26	8.47	9.53	5.32	28.60	28.73	55.92
A. malmgreni	—	—	0.38	4.24	4.05	16.16	24.88	23.97
A. rubella	—	—	1.16	0.64	12.89	4.11	—	2.29
Number of specimens Shallow	107	184	820	541	223	277	79	83
Number of specimens Deep	86	48	732	569	310	353	124	92

are given and the total number of specimens for each depth group and alternative. Fig. 9 shows examples of the different types of distribution.

I tried to collate the bathymetrical distribution with the geographical range to show sub- or emergence, but the number of specimens from the different parts of Norway is too small to allow such a procedure.

One may draw the following conclusions from the figure. There exist at least two types of bathymetrical distribution. One consists of the species normally occurring in very shallow water, less than 50 m, e.g. *N. hombergi;* the other consists of species occurring in water deeper than 50 m e.g. *N. paradoxa*, *N. incisa*, *A. malmgreni* and *A. rubella*. *N. ciliata* probably belongs to the first group. Two of the species, *N. longosetosa* and *N. caeca*, are so poorly represented that I do not think it advisable even to try to arrive at any conclusions.

It is worth noticing that while the two species in the shallow-water group were described earlier than 1820 none of the others was described before 1860.

BOTTOM SUBSTRATE AND HYDROGRAPHICAL REQUIREMENTS

It is nearly impossible from a material collected by a number of zoologists with quite different opinions as to what is sand and what is mud to arrive at any other conclusion than that nephtyids live on soft bottoms.

Neither do the few hydrographical data present give any indications, except that all the species are able to tolerate remarkably wide ranges of temperature and salinity. It is worth noticing that the two species occurring in the Porsangerfjord in water of negative temperatures also have the widest geographical distribution in arctic waters, e.g. *N. ciliata* and *A. malmgreni*.

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