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PELAGIC NEMERTEANS OF THE AMSTERDAM MID NORTH ATLANTIC PLANKTON EXPEDITIONS (AMNAPE), 1980-1983*

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ABSTRACT

From the Mid North Atlantic Ocean 18 species of Nemertinea are reported, two of which are new for the Atlantic, six are new for the North Atlantic. One specimen was the first male to be described of *Dinonemertes investigatoris*. For *Nectonemertes mirabilis* a seasonal shift in distribution is found with very shallow (300 m) occurrence in winter and spring north of 41°N. The other species were all collected in hauls below 500 m.

INTRODUCTION AND METHODS

To determine the upper level of the bathypelagic realm, the Nemertinea were selected as an indicator-group and studied from the material of the spring (1980), summer (1983), autumn (1981) and winter (1982) cruises of the Amsterdam Mid North Atlantic Plankton Expeditions made between 24°N and 55°N along approx. 30°W. (cf. Van der Spoel, 1981, in press; Van der Spoel & Meerding, 1983).

The present paper gives mainly a zoogeographical account. Insufficient data on the histology of the species excluded a detailed taxonomic survey of the material. All the specimens were measured to an accuracy of 0.5 mm after preservation in propylene-phenoxetol/propylene-glycol. From larger series of identical specimens about 50% was studied without staining. Some problematic specimens were studied histologically. The remaining material was stained with borax-carmine and cleared.

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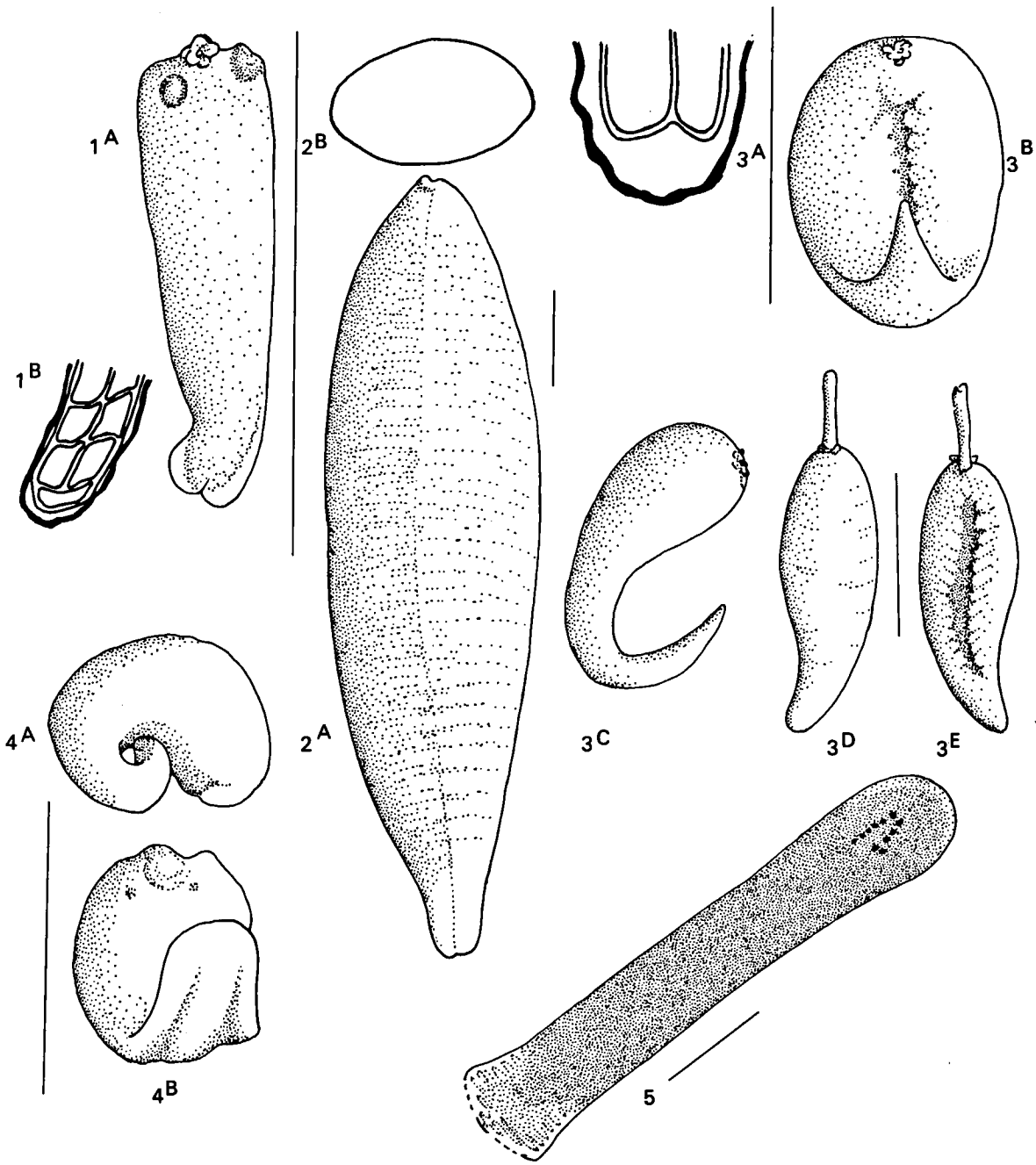
ANNOTATED LIST OF SPECIES

Plotonemertes cf. **adhaerens** Brinkmann, 1917

No histological study was made; identification could be based on absence of tentacles, presence of a primitive dorsal bloodvessel with numerous interconnections with the lateral vessels in the tail (fig. 1b) (cf. Brinkmann, 1917), and the presence of two well-developed glandular adhesive organs. The tail is slightly flattened to form a small caudal fin, which makes the species identification uncertain. The proboscis sheet reaches to 2/3 of the body length. The juvenile specimen is 9 mm long and 3.5 mm wide.



Figs. 1-5. Fig. 1. *Plotonemertes adhaerens*, a—from ventral, b—blood vessels (open) and nerve (black) in the tail. Fig. 2. *Calonemertes hardyi*, a—from dorsal, b—cross section in the middle. Fig. 3. *Pendonemertes levensini*, a—blood vessel (open) and nerve (black) in the tail, b—from ventral, c—from lateral, d—other specimen from ventral, e—from dorsal. Fig. 4. *Planktonemertes vanhoeffeni*, a—from lateral, b—from ventral. Fig. 5. *Neuronemertes aurantiaca* from ventral. The scale lines represent 10 mm.

Calonemertes hardyi (Wheeler, 1913)

This very large (80 mm) specimen is distinguished from the large *Dinonemertes* by its dark red colour when alive, tapering caudal end and normally developed body wall muscles. Caudal fin and tentacles absent, the dorsal blood vessel runs through the entire body, the proboscis sheet muscles interlace. The body is nearly circular in cross section. Body length 80 mm, width 22 mm.

Pendonemertes levensini Brinkmann, 1917

Identification of all species is based on histological material available from one specimen. No caudal fin, dorsal blood vessel runs through entire body length, no tentacles, 16-22 pairs of small ovaries, 25-36 pairs of intestinal diverticula, proboscis running to 2/3-1/2 of the body length. To conclude from the size and development of the ovaries, the specimens were not yet mature. Body length 14-25 mm, body width 5-8 mm. In a specimen of 14 mm length the length of the extended proboscis is 25 mm.

Planktonemertes vanhoeffeni Brinkmann, 1915

Mouth and proboscis pores separate, rudimentary eyes at both sides of the mouth, proboscis reaches to 2/3 of the body length, no tentacles, dorsal blood vessel reaches the body end, caudal fin slightly developed. Body length 13 mm, body width 6 mm.

cf. **Neuronemertes aurantiaca** Coe, 1927

Damaged male specimen, identification of which is problematic. Six pairs of spermaries in single row, close to proboscis sheet. Body length 50 mm, body width 9 mm.

Buergeriella notabilis Brinkmann, 1917

Damaged specimen, the strongly branched intestinal diverticula, the proboscis sheet half the body in length and the rudimentary eyes make identification still possible. Tentacles and caudal fin absent, the dorsal blood vessel reaches the posterior body end. Body length of this juvenile specimen 21 mm, width 7 mm.

Paradinonemertes wheeleri Coe, 1936

Strongly damaged specimen, characterised by the seven pairs of spermaries placed closely together in a single row at both sides of the proboscis sheet. Body length 36 mm, body width 7 mm.

Dinonemertes mollis Coe, 1926

Body wall transparent because of reduced muscles, males without protruding phalli, oesophagus reduced, body strongly flattened dorso-ventrally. The length/width ratio is $3^1/_2$-6 (average 4.8), in the type specimen this ratio is 4.0. There are 23-31 pairs of ovaries and 4-9 pairs of spermaries, there are usually 3-4 ripe eggs in each ovary. The proboscis extends to 2/3 of the body length or slightly farther. There are 40-56 pairs of intestinal diverticula without any branching. Body length 21-45 mm, width 4-10 mm. The proboscis measures 10 mm in specimens of 30 mm.

Dinonemertes investigatoris Laidlow, 1906

This large species is easily identified by its light red colour and transparent appearance. The 73 intestinal diverticula are simple with very small ventral branches. A male (ZMA.NE.59) from the Cirrus Cruises shows 15 pairs of spermaries closely set along the proboscis sheet between the first nine diverticula; they are not arranged in rows. The body is dorso-ventrally flattened. Body length 107 (♀)-157 (♂) mm width 20 (♀)-45 (♂) mm.

Phallonemertes murrayi (Brinkmann, 1912)

Two groups of specimens were recognized, generally agreeing with the description of the present species by Brinkmann (1917). There is a group of larger slender specimens comprising a male with distinctly freely projecting phalli and females with well-developed body-wall muscles. The second group is composed of smaller and broader specimens among which

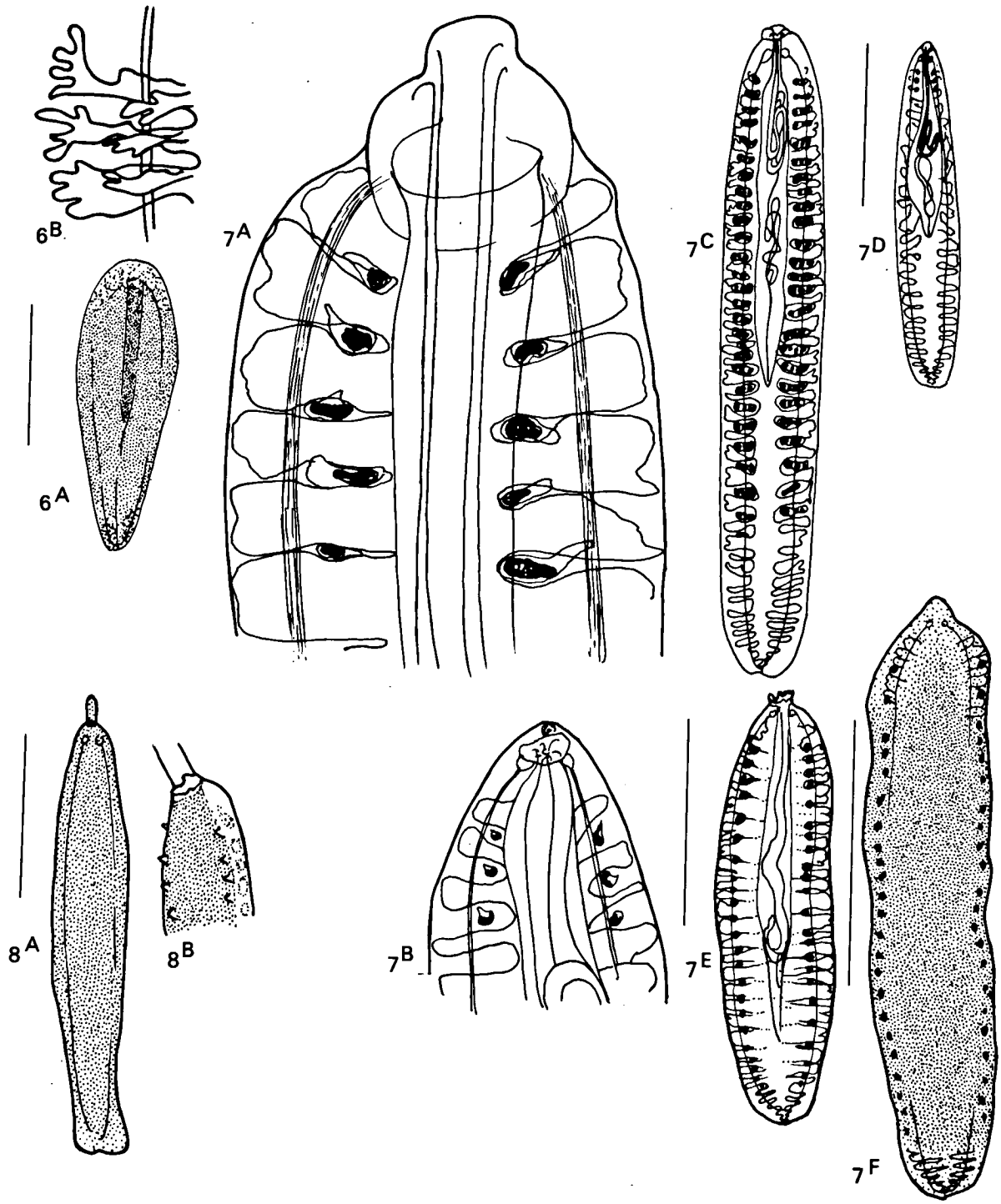
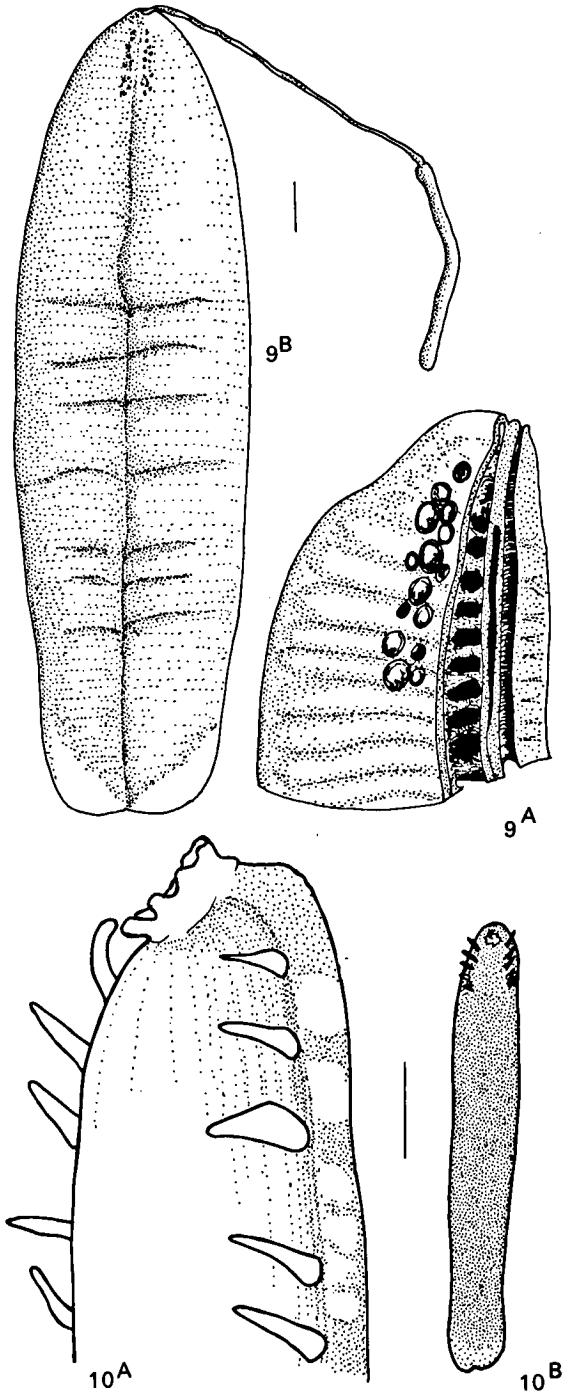


Fig. 6-8. Fig. 6. *Buergeriella notabilis*, a—from ventral, b—intestinal diverticula
Fig. 7. *Dinonemertes mollis*, a—frontal part of male from ventral, b—frontal part of young male from ventral, c—female from ventral, d—male from ventral, e, f—two other females from ventral; except for f all the animals were drawn after clearing. Fig. 8. *Dinonemertes mollis* specimen with slightly protruding phalli, a—from ventral, b—frontal part from ventral. The scale lines represent 10 mm.



Figs. 9-10. Fig. 9. *Dinonemertes investigatoris*, a—section of frontal body part with spermaries after clearing, b—animal from ventral. Fig. 10. *Phallonemertes murrayi*, a—frontal part of male from latero-ventral, b—male from ventral. The scale lines represent 10 mm.

males without phalli, and specimens with reduced body wall muscles. Though *Dinonemertes mollis* was not yet reported for the Atlantic Ocean and Brinkmann (1917) did not mention this species in relation to *Ph. murrayi*, the smaller and broader specimens were assigned to *D. mollis* (see above). The body length/width ratio in *Ph. murrayi* is 5.3-7 (average 6.1), in the type material this ratio is 5.77. There are 25-30 pairs of ovaries and 5-6 pairs of spermaries with phalli and the intestinal diverticula are slightly branched at the tips. The body wall muscles are normally developed. Body length 34-48 mm, width 5-9 mm.

Chuniella spec. (probably *lanceolata* Brinkmann, 1917)

Proboscis sheet reaches the end of the body, mouth and proboscis pores separate, 24 proboscis nerves, muscles of proboscis sheet form a thin layer and do not interlace. Body wall muscles ventrally and dorsally well-developed but absent at the lateral sides. There are about 37 intestinal diverticula at both sides. Body length 18 mm, width 3 mm.

Nectonemertes mirabilis Verrill, 1892

The large amount of specimens of this species made identification easy. With regard to the generic difference between *Phallonemertes* and *Dinonemertes* it is interesting to note that full-grown mature males of *N. mirabilis* develop small phalli above each spermary and full-grown females develop small collarets around the pores of the ovaries.

As this species is highly variable in shape, especially with regard to tentacles and caudal fin, the size distribution was studied (fig. 11). This graph shows a homogeneous size distribution in the population. The body sizes of the two other species of this genus, described from the present material, also fall within the variation of the present species, which does not favour the separate status of these two species.

There are 6-25 pairs of spermaries and 13-26 pairs of ovaries, with three ripe eggs each. Body length in mature specimens is 10-48 mm, width 2-8 mm.

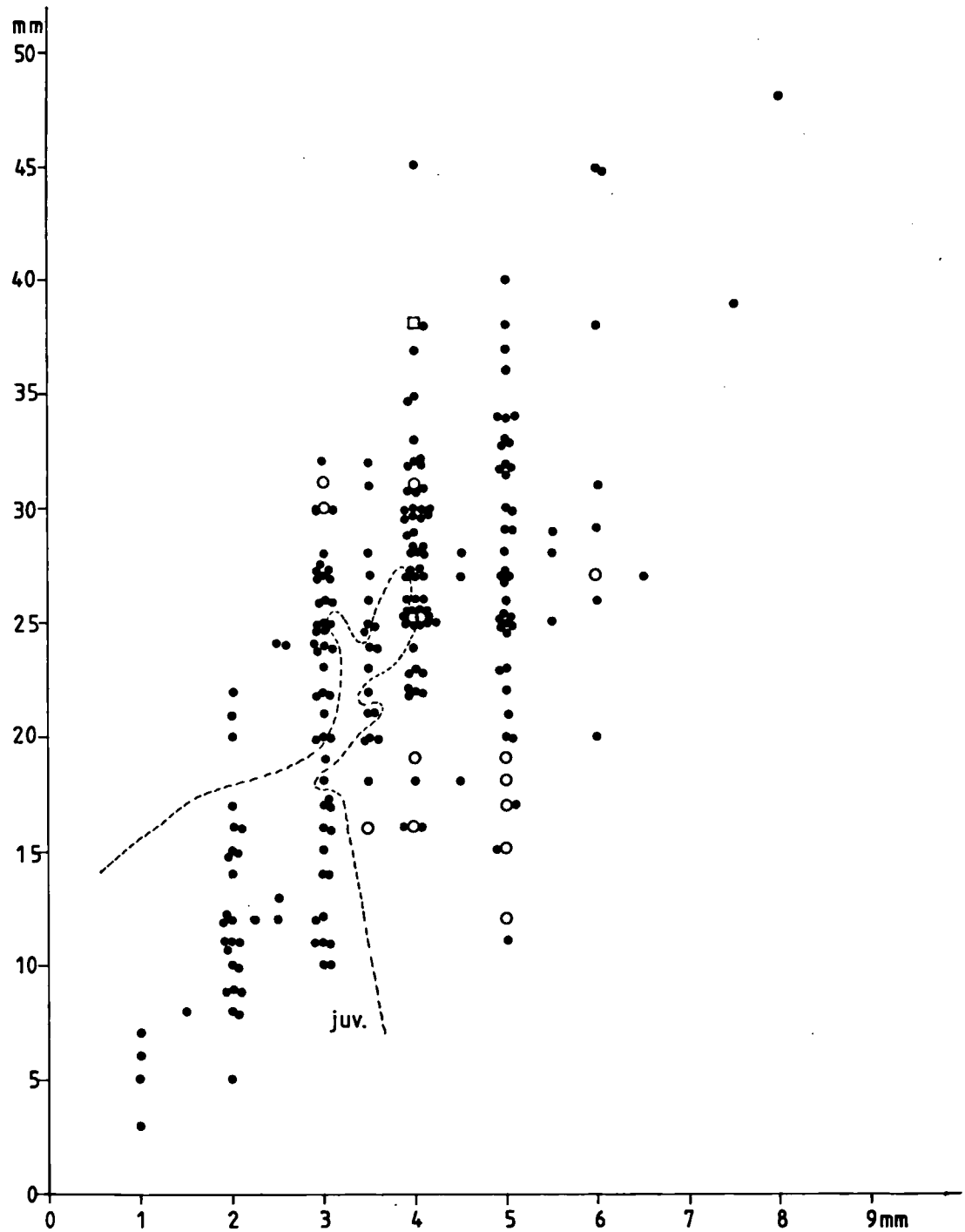


Fig. 11. Graph of body length (vertical axis) and body width (horizontal axis) in *Nectonemertes mirabilis* (black dots), *N. minima* (squares) and *N. primitiva* (open circles).

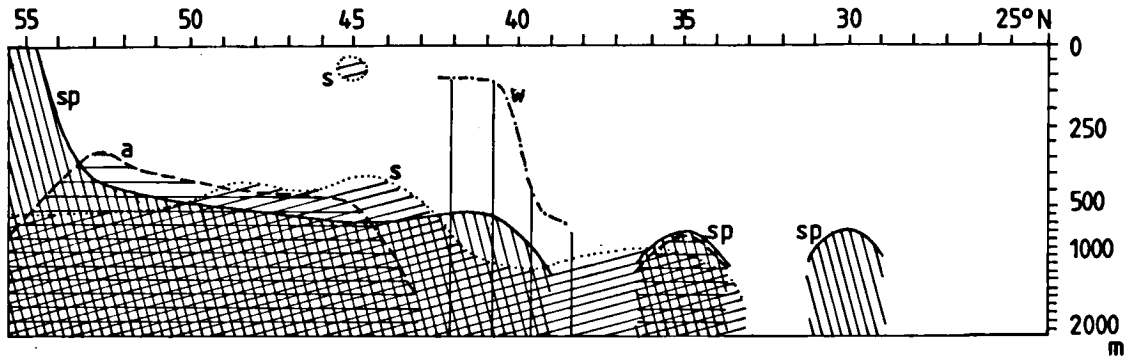


Fig. 12. Profile of depth distribution of *Nectonemertes mirabilis* spring (sp), summer (s), autumn (a) and winter (w)

Nectonemertes primitiva Brinkmann, 1917

This species is identified on the basis of its tail shape which is broader than in *N. mirabilis*, the number of spermaries (4-6 pairs) and the number of ovaries (10-20 pairs). Body length 12-31 mm, body width 3-6 mm.

Nectonemertes minima Brinkmann, 1915

This species is distinct by the 6-7 pairs of spermaries. Body length 38 mm, width 4 mm.

cf. **Armaueria rubra** Brinkmann, 1917

Proboscis restricted to anterior body half, no tentacles, dorsal blood vessel to body end, with caudal fin. The identification is dubious as there is no histological material available. Body length 15 mm, width 7 mm.

Pelagonemertes joubini Coe, 1926

This species is distinct by its transparency, the widely separated intestinal diverticula, 18 in number, and its body shape (cf. Friedrich, 1969). Body length 20-25 mm, width 12-18 mm.

Pelagonemertes moseleyi Bürger, 1895

The appearance, the reduction of the intestinal diverticula to six pairs, and the size distinguish the species. Body length 8 mm, width 4 mm in this juvenile specimen.

Ten specimens could not be identified.

VERTICAL DISTRIBUTION

Most nemerteans are known from incidental catches only and usually from great depths (Brinkmann, 1917; Coe, 1945, 1956). For *Nectonemertes mirabilis* and *Phallonemertes murrayi*, collected more frequently, Brinkmann (1917) stated that the first occurs at depths > 1000 m, at temperatures < 6°C and salinities < 35‰ S, for *Ph. murrayi* these values are > 1333 m, < 4° < 35‰, resp. The present material proves that *N. mirabilis* occurs below 500 m (in winter below 300 m) and at temperatures < 9°C.

All the species except for *N. mirabilis* were collected below 500 m; *N. aurantiaca* and *B. notabilis* are from open hauls to a depth of 2000 m. *Paradinonemertes wheeleri* and *Dinonemertes investigatoris* are from hauls between 1000 and 1750 m. The number of specimens in each species is too low to allow of conclusions. It is, however, clear that the nemerteans, as a group, are bathypelagic animals with an upper limit of distribution between 500 and 1000 m depth.

The records of *Neuronemertes aurantiaca* and *Dinonemertes mollis* are new for the Atlantic Ocean and *Calonemertes hardyi*, *Pelagonemertes moseleyi*, *P. joubini*, and *Planktonemertes vanhoeffeni* are recorded for the first time in the North Atlantic.

LIST OF RECORDS

(st. = station, h. = haul)

The temperatures and salinities given in the list are averages for the haul. The data on known distributions are from Coe (1945), except for those of *Pelagonemertes*.

Plotonemertes cf. *adhaerens*

1 juv., st. 10 h. 3, 480-1010 m depth, 54°54.0'N 30°32.3'W, 4.45°C. This species is abundant near Bermuda between 1100 and 2000 m, one specimen is known from 47°34'N 43°11'W. The present record enlarges the range to the north.

Calonemertes hardyi

1 ♀, st. 55 h. 4, 570-1000 m depth, 27°02.5'N 20°17.7'W, 9.15°C, 35.73‰ S. This species was only known from the eastern South Atlantic off Cape of Good Hope from an open haul to 1000 m (1 ♀).

Pendonemertes levensini

1 ♀, st. 18 h. 1, 520-1130 m depth, 39°58.5'N 36°24.9'W, 9.85°C.
1 ♀, st. 20 h. 3, 770-1250 m depth, 35°22.7'N 31°44.9'W, 8.20°C.
1 ♀, st. 39 h. 14, 500-1020 m depth, 47°39.1'N 30°13.8'W, 6.9°C, 35.10‰ S.
1 juv., st. 45 h. 10, 505-1010 m depth, 37°08.8'N 35°01.0'W, 9.8'C, 35.42‰ S.
1 ♀, st. 51 h. 12, 500-1050 m depth, 28°07.0'N 29°52.8'W, 10.45°C, 35.87‰ S.
1 ♀, st. 65 h. 20, 490-1010 m depth, 29°59.4'N 29°39.8'W, 10.30°C.
1 ♀, st. 78 h. 39, 500-1000 m depth, 45°02.3'N 30°01.3'W, 8.15°C, 35.41‰ S.
1 ♀, st. 84 h. 77, 1000-1750 m depth, 35°09.6'N 31°31.7'W, 6.15°C, 35.55‰ S.
This species had only been reported from the eastern North Atlantic between 1000 and 2260 m depth in the area 35°-50°N and 7°-11°W, (3 ♀).

Planktonemertes vanhoeffeni

1 juv., st. 66 h. 1, 515-995 m depth, 30°00.2'N 29°29.1'W. 10.20°C.
This species was only known from an open haul to 3000 m in the eastern South Atlantic off Cape of Good Hope (1 ♀).

Neuronemertes aurantiaca

1 ♀, st. 62 h. 13, 0-2000 m depth, 40°53.3'N 35°39.3'W.
This species was only known for the Pacific Ocean.

Buergeriella notabilis

1 juv., st. 62 h. 13, 0-2000 m depth, 40°53.3'N 35°39.3'W.
This species was known from 48°29'N 13°53'W (1 ♂) and the present record therefore slightly enlarges the known range.

Paradinonemertes wheeleri

1 ♂, st. 74 h. 10, 1000-1750 m depth, 54°20.9'N 29°53.7'W, 3.45°C, 35.03‰ S.
This species was only known from 17°28'N 29°42'W (2 ♂).

Dinonemertes investigatoris

1 ♀, st. 84 h. 77, 1000-1750 m depth, 35°09.6'N 31°31.7'W, 6.15°C, 35.55‰ S.
1 ♂, Leg. C. L. Bekkering, 0-3200 m depth, 62°N 33°W.
This species was only known by two females from the Mid North Atlantic and Indian Oceans, so that here the first male is reported from a locality more north than the known range.

Dinonemertes mollis

1 juv., st. 20 h. 3, 770-1250 m depth, 35°22.7'N 31°44.9'W, 8.20°C.
1 juv., 2 ♂, st. 78 h. 39, 500-1000 m depth, 45°02.3'N 30°01.3'W, 8.15°C, 35.41‰ S.
4 ♀, 2 ♂, st. 78 h. 60, 1002-1752 m depth, 45°03.3'N 29°59.1'W, 4.35°C, 35.12‰ S.
2 ♀, 2 ♂, st. 84 h. 77, 1000-1750 m depth, 35°09.6'N 31°31.7'W, 6.15°C. 35.55‰ S.
This species was only known from the Pacific Ocean.

Phallonemertes murrayi

2♂, 4♀, st. 78 h. 60, 1002-1752 m depth, 45°03.3'N 29°59.1'W, 4.35°C, 35.12‰ S.
The large material described by Brinkmann (1917) was collected between 35°N and the southern point of Greenland between 1600 and 2000 m.

Chuniella spec.

1♂, st. 39 h. 14, 500-1020 m depth, 47°39.1'N 30°13.8'W, 6.9°C, 35.10‰ S.
Ch. lanceolata was described from 48°N 29°W and from the Bermuda area.

Nectonemertes mirabilis

For the depth distribution see fig. 12, below only the total numbers of specimens are given in parenthesis.
St. 10 h. 3 (20), st. 11 h. 1 (17), st. 13 h. 9 (14), st. 14 h. 5 (13), st. 20 h. 3 (3), st. 36 h. 12 (32), st. 36 h. 15 (1), st. 37 h. 9 (13), st. 38 h. 8 (24), st. 38 h. 11 (9), st. 39 h. 14 (9), st. 43 h. 5 (1), st. 47 h. 9 (1), st. 47 h. 12 (1), st. 50 h. 2 (1), st. 62 h. 34 (1), st. 62 h. 39 (1), st. 63 h. 28 (4), st. 74 h. 10 (23), st. 74 h. 15 (3), st. 76 h. 26 (3), st. 78 h. 1 (2), st. 78 h. 39 (2), st. 78 h. 53 (1), st. 78 h. 57 (2), st. 78 h. 60 (44), st. 84 h. 77 (3).
The range given by Coe (1945) covers the whole northern and southern Atlantic Ocean. From the present data (fig. 12) it is clear that, at least north of 41°N, *N. mirabilis* lives at rather shallow depth (300 m) in winter (fig. 12 w), while it descends to 500 m in the other seasons. Above approx. 1750 m there is a more southward penetration in spring than in summer; the strongest regression to the north is seen in the autumn. This can be explained by a shift in northward direction of the distribution from spring to summer season or by a downwards movement of the upper level of occurrence especially south of 41°N. This last conclusion is in agreement with the deeper records all over the Atlantic Ocean and with the fact this species seems more stenothermous than stenobathic as shown by the shallow occurrence near 55°N where the upper limit of distribution seems to follow the 9°C isotherm.

The shallow night sample from 45°N (fig. 12 s) with only few specimens may illustrate vertical migration. Other indications for diurnal migration, however, are not known.

Nectonemertes minima

1♂, st. 78 h. 60, 1002-1752 m depth, 45°03.3'N 29°59.1'W, 4.35°C, 35.12‰ S.
The range of this species is from 57°N to 35°S in the Atlantic Ocean.

Nectonemertes primitiva

4♀, st. 13 h. 9, 480-1005 m depth, 49°00.8'N 29°18.5'W, 6.70°C.
1♀, st. 18 h. 1, 520-1130 m depth, 39°58.5'N 36°24.9'W, 9.50°C.
2♀, st. 36 h. 12, 0-1140 m depth, 55°07.4'N 30°05.4'W, 7.25°C, 34.96‰ S.
4♂, st. 38 h. 11, 0-520 m depth, 50°53.8'N 29°43.9'W, 9.65°C, 35.15‰ S.
1♀, 1 juv., st. 39 h. 14, 500-1020 m depth, 47°39.1'N 30°13.8'W, 6.9°C, 35.09‰ S.
2♀, st. 43 h. 5, 500-995 m depth, 41°10.3'N 35°42.4'W, 9.7°C, 35.35‰ S.
1♀, st. 78 h. 36, 400-503 m depth, 45°00.4'N 29°57.0'W, 11.90°C, 35.70‰ S.
This species was known from 3°55'S 7°48'W and 31°N 35°W; the present rich material enlarges the range far to the north.

cf. *Amaueria rubra*

1♀, st. 42 h. 6, 460-870 m depth, 41°44.4'N 34°20.5'W, 10.25°C, 35.59‰ S.
This record is slightly south of the known range between 45°-55°N and 25°-43°W.

Pelagonemertes joubini

1♀, st. 38 h. 8, 0-1005 m depth, 50°57.8'N 29°50.0'W, 9.35°C, 35.14‰ S.
1 juv., st. 78 h. 60, 1002-1752 m depth, 45°03.3'N 29°59.1'W, 4.35°C, 35.12‰ S.
This species was so far only reported from 15°05'S 9°26'E and from the Pacific Ocean (Friedrich, 1969).

Pelagonemertes moseleyi

1 juv., st. 78 h. 39, 500-1000 m depth, 45°02.3'N 30°01.3'W, 8.15°C, 35.41‰ S. This species was so far known from 0°-4°S 10°-7°E and from the Pacific (Friedrich, 1969).

The unidentified specimens came from the following hauls: st. 10 h. 3; st. 13 h. 9; st. 21 h. 9; st. 38 h. 8, 11; st. 50 h. 2, 5; st. 55 h. 4 and st. 987.

Coe (1945) reported 57 known species, 70% of which is endemic to the Atlantic Ocean (7% to the South Atlantic and 58% to the North Atlantic), 19% is endemic to the Pacific Ocean, 7% is endemic to the Indian Ocean and 4% is endemic to the Atlantic plus Indian Oceans. The new records cause the endemism of the South Atlantic to drop to 4% and the endemism to the Pacific Ocean to drop to 12%.

The great diversity of Nemertinea in the Atlantic and the low endemism in the Indo-Pacific Oceans points to an Atlantic origin of the group. For deepwater taxa and taxa related to benthic or littoral taxa, which is certainly the case in nemerteans, the Atlantic is considered the area of origin (Pierrot-Bults & Van der Spoel, 1979) which is merely confirmed by the distributions found to date.

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