

NAGA REPORT

Volume 4, Part 3

Scientific Results
of Marine Investigations of the South China Sea
and the Gulf of Thailand
1959-1961



Sponsored by
South Viet Nam, Thailand
and the
United States of America

The University of California
Scripps Institution of Oceanography
La Jolla, California

1967

7 1967

EDITORS:

EDWARD BRINTON, MILNER B. SCHAEFER, WARREN S. WOOSTER
ASSISTANT EDITOR: VIRGINIA A. WYLLIE

Editorial Advisors:

Jorgen Knudsen (Denmark)

James L. Faughn (USA)

Le van Thoi (Viet Nam)

Boon Indrambarya (Thailand)

Raoul Serène (UNESCO)

Printing of this volume was made possible through the support of the National Science Foundation. The NAGA Expedition was supported by the International Cooperation Administration Contract ICAc-1085.

FRYE & SMITH LTD., SAN DIEGO, CALIFORNIA

CONTENTS

Nephtyidae (Polychaeta) from the Bay of Nha Trang, South Viet Nam by <i>Kristian Fauchald</i>	5
Polychaeta from the Bay of Nha Trang, South Viet Nam by <i>Victor A. Gallardo</i>	35

NEPHTYIDAE (POLYCHAETA) FROM THE
BAY OF NHA TRANG, SOUTH VIET NAM¹

by

KRISTIAN FAUCHALD²

¹Contribution No. 309 of the Allan Hancock Foundation.

²Present address: Allan Hancock Foundation, University
of Southern California, Los Angeles, California 90007.

NEPHTYIDAE (POLYCHAETA) FROM THE BAY OF NHA TRANG

CONTENTS

Systematics	7
Literature.....	21
Plates	23

NEPHTYIDAE (POLYCHAETA) FROM THE BAY OF NHA TRANG, SOUTH VIET NAM

by

KRISTIAN FAUCHALD

ABSTRACT

The following species were found in grab samples from the Bay of Nha Trang: *Aglaophamus dicirroides* n. sp., *A. orientalis* n. sp., *A. sinensis* (Fauvel, 1932b), *A. tepens* n. sp., *A. vietnamensis* n. sp., *Inermonephtys gallardi* n. gen. and n. sp., *I. inermis* (Ehlers, 1887) new combination, *Micronephtys sphaerocirrata* (Wesenberg-Lund, 1949), *Nephtys oligobranchia* Southern, 1921 and *N. polybranchia* Southern, 1921. The generic and specific characters used in the family are discussed.

INTRODUCTION

The present material was loaned to me by Dr. Victor A. Gallardo who collected it in Viet Nam in 1960 as part of the NAGA Expedition, 1959-1961. The bulk of the material was taken with Petersen and van Veen grabs with a surface area of one-tenth of a square meter and it contains mainly very small specimens. The lack of larger specimens must be due partly to the sampling with only one type of gear; however, it may also reflect the composition of the fauna. The other polychaetes, including a complete station list, are described by Gallardo in this volume of the NAGA series.

Until now the polychaete fauna of Viet Nam has been little known. Fauvel (1939), in the most important paper, mentions two species of Nephtyidae. One of these, called *Nephtys* sp. is doubtfully referred to as *Micronephtys sphaerocirrata* (Wesenberg-Lund, 1949). The other species mentioned by Fauvel, *Nephtys hombergi* Savigny, 1818, was not found in the present collection. It was too inadequately characterized by Fauvel to permit positive identification with any species present.

DISCUSSION OF GENERIC AND SPECIFIC CHARACTERS

The genera include *Aglaophamus* Kinberg, 1866 (sensu Hartman, 1950), *Inermonephtys*, described in this paper, *Micronephtys* Friedrich, 1939, and *Nephtys* Cuvier, 1817. They have until now been recognized mainly by the character of the interramal cirri, whether involute, recurved or absent (for a review, see Hartman, 1950). This character is absolutely reliable if care is taken during the examination of the specimens. The cirri are usually straight or only slightly curved in the first few and last 10 to 15 setigers, but in the middle of the range of setigers on which they occur they are easily recognized as being either involute or recurved. The curve of the cirri in both cases describes a fraction of a spiral. *Micronephtys* lacks interramal cirri.

The presence in the Vietnamese material of a new genus, *Inermonephtys* with involute cirri, has necessitated the inclusion of other characters in the generic classification. A survey of the main characters used in the family is given below. The validity of the generic characters is discussed in some detail. A complete discussion of the specific characters is not attempted.

The interramal cirri may be differentiated into several morphologically distinct parts. The base is often bulbous; in this paper it is called a basal swelling (fig. 48). The occurrence of this swelling in the different genera is not known in detail, but it seems to be confined to *Nephtys*. A small digitiform

cirrus may be found on the outer side of the interramal cirrus near its base (fig. 18). It is called an accessory cirrus which is not to be confused with the notopodial cirrus normally found on the dorsal side of the interramal cirrus and often dorsal to its base. The notopodial cirrus is nearly always present; the only exception known is *Aglaophamus vietnamensis* described in this paper. Little is known of the occurrence of the accessory cirrus, but it seems to be common in *Nephtys* and is also found in *Aglaophamus* and *Inermonephtys*. It is lacking in *Micronephtys* which has no interramal cirri. These morphological details do not seem to be useful for generic classification, but they furnish valid specific characters.

The first appearance of the interramal cirri on one of the first four setigers is a reliable specific character. If, on the other hand, the interramal cirri first start on a later setiger, there is some variation; the cirri may start on any of three to five setigers. The character should be used with some caution and a number of specimens examined in order to establish possible variations.

The tip of the aciculum is recurved in all species of *Aglaophamus*, *Inermonephtys* and *Micronephtys* examined. In *Nephtys* it is straight and often covered with a solid chitinous plaque or button.

Lyrate setae are usually present in the postacicular fascicles in *Aglaophamus* and have been found in *Inermonephtys* and *Micronephtys*. They are known to be present in only one species of *Nephtys*, viz. *N. oligobranchia*. The preacicular fascicles contain setae with a barred subdistal area. The majority of the postacicular setae have a bristled subdistal area. These two kinds of setae do not seem to be useful for generic classification. The distance between bars in the barred setae and the number and arrangement of bristles in the postacicular setae may be useful specific characters.

The number of rows of subterminal papillae on the proboscis is usually 14 in *Aglaophamus*, but 22 rows have been found in some species. The number of rows is 22 in both *Nephtys* and *Micronephtys*. The presence of an unpaired middorsal papilla is a good specific character. Both terminal and subterminal papillae are absent in *Inermonephtys*.

The jaws of the nephtyids have never been used for taxonomic purposes, but they seem to offer good generic and specific characters. A jaw of *Nephtys caeca* (Fabricius, 1780) *in situ* seen from the lateral side was shown by Ehlers (1868, p. 23, fig. 24) but both the illustration and descriptions of this and other jaws give only scant information as to their true shape. Ehlers mentioned that the tips of the jaws were recurved. Monro (1936) described the jaws of *Inermonephtys inermis* but did not compare them to those of other nephtyids.

The jaws are always concealed in the proboscidal sheath even when fully extended. They are situated at approximately the middle part of the muscular portion of the proboscis and are laterally placed with the long axis oriented dorsoventrally.

Details of the jaw of *Nephtys hombergi* Savigny, 1818, are shown in figs. 1-2. The specimen is from southern Norway and is included here to show the shape of the jaw in the type species of this genus. The base is roughly triangular with the pointed end located ventrally; a spur occurs on the posterior edge. The angle of this spur with the long axis of the jaw, as well as the size of the spur, furnish valid specific characters. The anterior surface of the jaw is always covered with a muscular fold when the proboscis is retracted. The tip of the jaw is recurved and directed posteriorly.

The jaw of *Aglaophamus dicirroides* n. sp. is shown in figs. 3-4. The jaws of all *Aglaophamus* species have the same general shape described for *Nephtys*, but they differ from them in the presence of an inner supportive ridge.

The jaws of *Micronephtys sphaerocirrata* (Wesenberg-Lund, 1949) have a more elongated base than the two described above (figs. 7-8). The supportive ridge is present, and the spur is poorly de-

veloped. A deep notch is present along the anterior edge. Such a notch has been found in some species of other genera which suggests only specific value for this character.

The jaws of both species of *Inermonephtys* (figs. 5-6) have a spindle-shaped base and a straight free edge. The recurved tip is absent. The spur is practically lacking but can be recognized by the presence of a notch in the posterior edge.

The location and general orientation of the jaws is similar in all four genera. They may be used mainly for holding or handling prey or possibly for crushing or churning up food material. A canal or perforation of the jaws or glands associated with the jaws have not been recognized.

The size and shape of the different parapodial lobes furnish good specific characters but will vary along the length of the animals. It is suggested that parapodia from the anterior third of the body, just posterior to its widest part, should be used for comparative purposes. This will commonly be at setigers 20 to 30. The presence and size of the notopodial and neuropodial cirri on the first setiger seems to be valuable specific characters.

The shape of the prostomium may sometimes be used as a taxonomic character, but it varies with the degree of extension of the proboscis so it must be used with caution (see figs. 36-37). All descriptions of prostomia given below are based on specimens which have the proboscis completely retracted. The descriptions may not fit the drawings in which I have attempted to show the proboscis rather than the prostomium. *Micronephtys sphaerocirrata* lacks a clearly marked border between the prostomium and the first setiger on the dorsal side.

Two pairs of antennae are present in *Aglaophamus*, *Micronephtys* and *Nephtys*, but only one minute ventrally placed pair is present in *Inermonephtys*.

Nuchal organs are present at the posterolateral corners of the prostomium. They are clearly delimited from the prostomium proper as two ovate depressions. Each is equipped with one long eversible digitiform process in *Inermonephtys*. Such processes are never found in the other genera.

The presence of eyespots has been used to identify certain subspecies (Hartman, 1950). The constancy of this character is not well known and since the pigment of the eyespots may be extracted by preservatives the character should be used with caution.

Clark (1957) described the relationship between size and brain structure within the genus *Nephtys* (sensu strictu) and concluded that the genus could be broken up into four subgroups on this basis. He correlated his groups with the geographic range of the different species and they seem to fall into a pattern. This may very well prove to be a valid attack on the rather unwieldy genus, but the differences Clark found will have to be correlated with other characters.

The present subdivision of the family into genera has been summarized in table 1. It must be emphasized that no single character can be used to distinguish any genus. A set of three or four characters is necessary and sufficient to describe all known genera.

KEY TO GENERA

1. Interramal cirri lacking.....*Micronephtys*
1. Interramal cirri present.....2
2. Interramal cirri recurved, proboscis with papilla.....*Nephtys*
2. Interramal cirri involute, proboscis with or without papilla.....3
3. Proboscis with papilla, two pairs of antennae present*Aglaophamus*
3. Proboscis lacking papilla, one pair of antennae present.....*Inermonephtys*

TABLE 1

	Aglaophamus	Inermonephthys	Micronephthys	Nephtys
Interramal cirri	involute	involute	absent	recurved
Acicular tip	recurved	recurved	recurved	straight, usually with plaque
Lyrate setae	present	present	present	usually absent
Subterminal proboscidal papillae	usually 14 rows, sometimes 22	absent	22 rows	22 rows
Shape of jaw base	triangular	spindle	elongate	triangular
Pairs of antennae	two	one	two	two
Eversible nuchal processes	absent	present	absent	absent

Aglaophamus Kinberg, 1866
(sensu Hartman, 1950)

This genus is rather well represented in the Nha Trang collections; five species are recognized, of which four are believed new.

KEY TO SPECIES

1. Neuropodium with a distinct superior lobe (fig. 11).....2
1. Neuropodium without a superior lobe (fig. 12).....4
2. Notopodial acicular lobe with a ventral digitiform lobe (fig. 18).....*A. sinensis*
2. Notopodial acicular lobe without a digitiform lobe (fig. 26).....3
3. Interramal cirri present from setiger 3.....*A. dicirroides*
3. Interramal cirri present from setiger 8.....*A. vietnamensis*
4. Both acicular lobes conical (fig. 19).....*A. tepens*
4. Notopodial acicular lobe conical, neuropodial lobe broadly rounded (fig. 12).....*A. orientalis*

Aglaophamus dicirroides, new species
(figs. 3-4, 9-11)

COLLECTION: Stas. 145I (1), 155II (1, holotype), 173 (3), 279 (fragment), 292 (2). The holotype is deposited in the Allan Hancock Foundation, University of Southern California, Los Angeles.

The holotype is a complete specimen with 88 setigers 43 mm long and 1.45 mm wide with setigers.

The rounded pentagonal prostomium has its widest part anterior to the middle. Both pairs of antennae are comparatively long and slender. A pair of conspicuous eyespots is present near the posterior corners. Nuchal organs are large and prominent and placed laterally to the eyespots.

The proboscis is clavate with 22 rows of subterminal papillae with six to eight papillae in each row. A distinct middorsal papilla is lacking. The proximal surface of the proboscis is covered with minute warts.

The acicular lobes in the first setiger are rudimentary and have very few setae. Pre- and post-acicular lobes are short; the notopodial and neuropodial cirri are well developed and both are long and slender. The notopodial acicular lobe in the fully developed parapodia at setiger 20 is bilobed, with the aciculum supporting the superior conical lobe; the inferior lobe consists of a broad base for the interramal and notopodial cirri. The preacicular lobe is low and obliquely rounded. The postacicular lobe is triangular, its base is superior to the acicular lobe. The notopodial cirrus is long and foliate. The

neuropodial acicular lobe is conical with a very well-developed foliate superior lobe. The pre- and postacicular lobes are short and rounded. The neuropodial cirrus is long and digitiform.

The interramal cirri are first present from setiger 3; they are reduced in the last 15 setigers to short, nearly straight processes. Where fully developed they are short, thickset and lack distinct basal swellings. Each has an accessory cirrus.

The setae are very long and flowing; those in the preacicular fascicles have a subdistal barred area. Setae in the postacicular fascicles are of two kinds; each fascicle has a few lyrate setae with one long and one very short spurlike limb, and a large number of very long setae with a subdistal area with denticles along the cutting edge.

A. dicirroides resembles *A. dicirris* Hartman, 1950; it may be distinguished by the following characters:

A. dicirroides:

1. Interramal cirri first present from setiger 3
2. Notopodial postacicular lobes triangular and superior to the acicular lobe
3. Foliate notopodial cirri
4. Neuropodial postacicular lobes shorter than the acicular lobes

A. dicirris:

1. Interramal cirri first present from setiger 5 to 6 or 7 to 8
2. Notopodial postacicular lobes rounded and directly behind the acicular lobes
3. Slender and tapering notopodial cirri
4. Neuropodial postacicular lobes longer than the acicular lobes

TYPE LOCALITY: Sta. 155III, 1 nautical mile northeast of Hon Ho, 35 m depth, coarse shelly sand.

DISTRIBUTION: *A. dicirroides* is known from five localities in the Bay of Nha Trang.

Aglaophamus orientalis, new species

(figs. 12-15)

COLLECTION: Stas. 268 (2, one of which is the holotype), 316 (1). All specimens are incomplete. The holotype is deposited at the Allan Hancock Foundation, University of Southern California, Los Angeles.

The holotype is an incomplete specimen with 26 setigers 9 mm long and 2 mm wide with setigers.

The prostomium is nearly rectangular, about twice as long as wide with nuchal organs at the posterior corners. First antennae are comparatively long and slender; second antennae are of approximately the same length but somewhat stouter. Eyespots are absent.

The proboscis (seen in dissection) has 14 rows of subterminal papillae with six to eight papillae in each row. A long middorsal papilla is present. The proximal surface of the proboscis is covered with low warts.

The acicular lobes of the first setiger are conical; pre- and postacicular lobes are rudimentary. The notopodial cirrus is lacking, the neuropodial cirrus is well developed and elongated triangular. The notopodial acicular lobe in the fully developed parapodia at setiger 25 is acutely pointed. The preacicular lobe is as long as the acicular lobe and triangular in shape. The postacicular lobe is approximately as long as the acicular lobe and triangular. The two outer lobes are placed so that the postacicular lobe is superior to and the preacicular lobe inferior to the acicular lobe. The notopodial cirrus is very long and foliate. The neuropodial acicular lobe is broadly rounded. The preacicular lobe is low with the outer edge parallel to the edge of the acicular lobe; on the superior side it is wrapped around the acicular lobe and continues directly in the postacicular lobe. This lobe is longer than the acicular lobe; the inferior part is broadly rounded with the outer edge roughly parallel to the edge of the acicular

lobe; the superior part has a marked foliate prolongation. The neuropodial cirrus is short and slender.

The interramal cirri are first present on setiger 3 and continue to the last setigers of the available incomplete specimens. Where fully developed they are comparatively short and stout, not much longer than the notopodial cirrus. Basal swellings and accessory cirri are absent.

The setae are rather long and pale yellow; those in the preacicular fascicles have a barred subdistal area; setae in the postacicular fascicles have fine denticles on the cutting edge. Lyrate setae are absent.

The prostomial and proboscidal characters of this species resemble the condition in *A. dibranchis* (Grube, 1878) but differ in the presence of warts on the proboscis. Warts on the proximal surface of the proboscis are known to occur in three species of *Aglaophamus* (*A. dicirris*, Hartman, 1950, *A. dicirroides* and *A. orientalis*). The combination of a pointed notopodial acicular lobe and a broadly rounded neuropodial one is unique in the genus.

TYPE LOCALITY: Sta. 268, 2½ nautical miles south of Hon Mot, Bay of Nha Trang, 24 m depth, coarse sand.

DISTRIBUTION: *A. orientalis* is known from two localities in the Bay of Nha Trang.

Aglaophamus sinensis (Fauvel, 1932)

(figs. 16-18)

COLLECTION: Stas. 252 (1); 26011 (1).

The description is based on a complete specimen from sta. 252, with 111 setigers 58 mm long and 3.1 mm wide with parapodia.

The prostomium is wider than long and nearly ovate in shape. First antennae are short and slender; second antennae are of the same shape, but somewhat longer. Eyespots are absent. Nuchal organs are small.

The proboscis is clavate with 22 rows of subterminal papillae with 20 to 30 papillae in each row; the proximal end of each row is divided into several rows of short papillae. A somewhat longer median papilla has been doubtfully identified as middorsal papilla. The proximal surface of the proboscis is smooth.

The acicular lobes in the first setiger are short and rounded, the pre- and postacicular lobes are rudimentary; the notopodial cirrus is absent, the neuropodial cirrus is well developed and slender. The notopodial acicular lobes in the fully developed parapodia at setiger 35 are rounded triangular with a large digitiform lobe ventral to the tip of the aciculum. The preacicular lobe is low and has a shallow bilobation. The postacicular lobe is low, nearly rectangular. The notopodial cirrus is long and foliate. The neuropodial acicular lobe is obliquely rounded and has a small superior lobe. The preacicular lobe is small and best developed on the superior side. The postacicular lobe is very long, nearly twice as long as the acicular lobe, and lingulate. The neuropodial cirrus is long and digitiform.

The interramal cirri are first present on setiger 2; in the last few setigers they are reduced to short, straight processes. Where fully developed they are long and slender. Each has a small accessory cirrus. Basal swellings are lacking.

The setae are long and flowing; those in the preacicular fascicles have a subdistal barred area. Setae in the postacicular fascicles are very long with a finely bristled subdistal area. Lyrate setae are absent.

The present specimens seem to vary somewhat in structural details from the specimens originally described by Fauvel (1932a). Both Fauvel (1932a, 1933) and Monro (1934) described the postacicular lobe in the notopodia as bilobed whereas neither mentioned the digitiform lobe on the acicular lobe.

Fauvel (1932a) described the neuropodial cirrus as foliate; in the Vietnamese specimens this cirrus is long and digitiform.

DISTRIBUTION: *A. sinensis* is known from several localities in the Yellow Sea (Fauvel, 1932a, 1933; Ushakov and Wu, 1963) and from Amoy, China (Monro, 1934). The present records represent the southernmost area in which it has been found.

Aglaophamus tepens, new species
(figs. 19-20, 27-28)

COLLECTION: Sta. 142 (1, holotype).

The holotype is deposited in the Allan Hancock Foundation, University of Southern California, Los Angeles.

The holotype is a complete specimen with 68 setigers 27.5 mm long and 2 mm wide with setae.

The prostomium is subpentagonal with prominent nuchal organs. Both pairs of antennae are short and conical. Eyespots are absent.

The proboscis is cylindrical with 14 rows of subterminal papillae with five to six weak and slender papillae in each row. A very long and slender middorsal papilla is present. The proximal surface of the proboscis is smooth.

The parapodia of the first setiger are rudimentary and have only a few setae. The pre- and post-acicular lobes are small and the notopodial and neuropodial cirri are short and slender. The acicular lobes in the fully developed parapodia at setigers 14 and 15 are conical but not pointed. The notopodial pre- and postacicular lobes are nearly as long as the acicular lobe and obliquely rounded; the superior part of the postacicular lobe is visible behind the acicular lobe. The notopodial cirrus is very long and has a finely tapering tip. The neuropodial preacicular lobe is short and evenly rounded. The post-acicular lobe is of about the same length as the acicular lobe and of a rounded square shape. The neuropodial cirrus is short and stout.

The interramal cirri are first present from setiger 3, in the first few setigers they are long, slender and nearly straight, but behind setiger 7 they become stouter and more distinctly involute. They are reduced after setiger 20 and disappear at setiger 25.

The setae are medium long and pale yellow. Setae in the preacicular fascicles have a subdistal barred area; most of the setae in the posticicular fascicles are long, slender and nearly smooth, but in each fascicle two or three lyrate setae are present.

A. tepens has a rather unique position in the genus. The combination of 14 rows of subterminal papilla with a long middorsal one on the proboscis; the lack of neuropodial superior lobe; the long and tapering notopodial cirrus and the distribution of interramal cirri give this species a habitus not found in any other *Aglaophamus*.

TYPE LOCALITY: Sta. 142, 1 nautical mile south of the eastern end of Hon Tam, Bay of Nha Trang, 12 m depth, mud.

DISTRIBUTION: *A. tepens* is known from one locality in the Bay of Nha Trang.

Aglaophamus vietnamensis, new species
(figs. 21, 26, 29-30)

COLLECTION: Stas. 060 (fragment), 082 (2), 088 (1), 1011 (1), 15811 (1, holotype), 1601 (1), 355 (1).

The holotype is deposited at the Allan Hancock Foundation, University of Southern California, Los Angeles.

The holotype is a complete specimen with 60 setigers 14 mm long and 2 mm wide with setigers.

The prostomium is subpentagonal and about twice as long as wide. First antennae are short and slender; second antennae are about twice as long as the first and slender. Nuchal organs are present. Eyespots are absent.

The proboscis is subcylindrical with 14 rows of subterminal papillae with seven to eight comparatively stout papillae in each row. A short middorsal papilla is present. The proximal surface of the proboscis is smooth.

The acicular lobes of the first setiger are short and blunt with poorly developed pre- and post-acicular lobes. Both notopodial and neuropodial cirri are well developed and slender. The acicular lobe in the fully developed parapodia at setiger 20 are conical; they even get somewhat pointed in the posterior part of the body. The pre- and postacicular lobes are very poorly developed. The notopodial cirrus is lacking; the neuropodial cirrus is short and conical. A large cirriform superior lobe is present on the neuropodia from setiger 12 to setiger 50.

The interramal cirri are present from setiger 8 to setiger 50. Where fully developed they are large, thickset and nearly fill the space between the notopodium and neuropodium. Each is equipped with a small accessory cirrus.

Three kinds of setae are present; those in the preacicular fascicles have a barred subdistal area. Setae in the postacicular fascicles are of two kinds: numerous slender ones with very fine denticles on the cutting edge and five to six lyrate ones in each fascicle.

A. vietnamensis is closely related to *A. dibranchis* (Grube, 1878); it may be distinguished by the following characters:

A. vietnamensis

1. Eyespots absent
2. Short middorsal papilla on the proboscis
3. Notopodial cirri absent
4. Rudimentary pre- and postacicular lobes

A. dibranchis:

1. Eyespots present
2. Long middorsal papilla on the proboscis
3. Notopodial cirri present
4. Well-developed pre- and postacicular lobes

A. vietnamensis also resembles *A. tepens* rather closely, but may be distinguished from it by the distribution of the interramal cirri which are present on setigers 8 to 50 in *A. vietnamensis* and on setigers 3 to 25 in *A. tepens*. The rudimentary pre- and postacicular lobes in *A. vietnamensis* and the complete lack of notopodial cirri on the fully developed parapodia are unique to this species.

TYPE LOCALITY: Sta. 158II, 3 nautical miles east of Hon Bac, Bay of Nha Trang, 24 m depth, mud.

DISTRIBUTION: *A. vietnamensis* is known from the Bay of Nha Trang only.

Inermonephtys, new genus

DIAGNOSIS: These Nephtyidae lack the first pair of prostomial antennae and all subterminal and terminal papillae on the proboscis. Nuchal organs are equipped with long eversible digitiform processes. The jaws have a straight free edge, a spindle-shaped base and a V-shaped cross section. The interramal cirri are involute. Lyrate setae are present.

The genus is based on two species, one of which, *Inermonephtys inermis* (Ehlers, 1887), is known to be widely distributed in tropical and subtropical waters. The unique position of this species has been recognized since it was first described. The author feels justified in establishing a new genus after finding another very characteristic species with the same general set of characters in the Vietnamese collection.

TYPE OF GENUS: *Inermonephtys inermis* (Ehlers, 1887).

Inermonephtys gallardi, new species
(figs. 5-6, 22-25)

COLLECTION: Stas. 104 (1 holotype), 108 (1), 123 (1), 334 (1).

The holotype is deposited at the Allan Hancock Foundation, University of Southern California, Los Angeles.

The holotype is a complete specimen with 114 setigers 52 mm long and 2.5 mm wide with parapodia.

The prostomium is small, nearly quadrangular with rounded frontal corners. One pair of minute antennae is found on the ventral surface. A pair of nuchal organs with long eversible processes is situated near the posterior corners of the prostomium, but not on the prostomium proper.

The proboscis (seen in dissection) is completely smooth without traces of papillae.

The notopodium and neuropodium of the first setiger are placed close together and are directed forwards along the sides of the prostomium. The notopodial acicular lobe is well developed and blunt. The preacicular lobe is rudimentary; the postacicular lobe is somewhat longer than the acicular lobe and rounded. The neuropodial acicular lobe is rudimentary; the other lobes are small. The notopodial and neuropodial cirri are well developed and stout. The notopodial acicular lobe in the fully developed parapodium at setiger 25 is pointed, conical and has a large digitiform lobe located ventral to the tip of the aciculum. The preacicular lobe is divided into two parts, one superior and one inferior to the main axis of the notopodium. The superior part is present only as a small fold enveloping the base of the setae; the inferior part is foliate and about as long as the acicular lobe. The postacicular lobe is about as long as the acicular lobe and rounded; it is visible as a broad lobe on the superior side of the notopodium. The notopodial cirrus is long and slender; it gets longer than the interramal cirrus in the hindmost setigers. The neuropodial acicular lobe is conical and has a long centrally placed, erect digitiform lobe. The preacicular lobe is divided into two parts in a similar fashion as in the notopodium. The superior part is completely reduced and can be traced only as a faint line at the base of the setae; the inferior part is better developed and forms a low fold covering the base of the setae. The postacicular lobe is visible as a short and thickset superior lobe; the inferior part of the lobe is nearly rudimentary. The neuropodial cirrus is long and digitiform.

The interramal cirri are first present from setiger 15; they are reduced in the 20 last setigers but are present even in the last ones. Where fully developed they are slender and involute. Each has a small accessory cirrus but lacks basal swelling.

The setae are present in three fascicles, two preacicular and one postacicular. All setae in the two preacicular fascicles have a subdistal area with narrow crossbars. Two kinds of setae are present in the postacicular fascicles: numerous slender and long setae with fine denticles on the cutting edge and a few short lyrate ones occur in both the notopodial and neuropodial fascicles.

The species has been named after Dr. Victor A. Gallardo who collected these animals in Vietnam and gave me the opportunity to study them.

I. gallardi differs from *I. inermis* in the following characters:

I. gallardi:

1. Digitiform lobes on the acicular lobes
2. Bipartite preacicular fascicles
3. Low and rounded notopodial postacicular lobes

I. inermis:

1. Digitiform lobes absent on the acicular lobes
2. Entire preacicular fascicles
3. High and triangular notopodial postacicular lobes

Other differences can be seen in the illustrations (figs. 23 and 35). See also the discussion of *I. inermis*.

TYPE LOCALITY: Sta. 104, north of Hon Tam, Bay of Nha Trang, 12 m depth, mud.

DISTRIBUTION: *I. gallardi* is known from four localities in the Bay of Nha Trang.

Inermonephtys inermis (Ehlers, 1887), new combination
(figs. 31-35)

COLLECTION: Stas. 053 (1), 072 (1), 1471 (fragment), 1521 (1), 190 (fragment), 211 (2), 2321I (1), 253 (1), 278 (1).

The description is based on the specimen from station 253, a complete specimen with 129 setigers 42 mm long and 1.7 mm wide with parapodia.

The rounded pentagonal prostomium has a well-marked posterior prolongation. First antennae are lacking; second antennae are small and slender and ventral in position. The nuchal organs are very well developed and each is equipped with one long digitiform eversible process.

The proboscis (seen in dissection) lacks all traces of papillae; it is short and clavate.

The acicular lobes in the first setiger are conical; the preacicular lobes are small. The neuropodial postacicular lobe is small; a long and well-developed neuropodial cirrus is present. The notopodial postacicular lobe is well developed and quadrangular; a well-developed notopodial cirrus is present. The notopodial acicular lobe in the fully developed parapodia at setiger 25 is conical; the preacicular lobe is somewhat shorter than the acicular lobe and best developed on the inferior side; it is rounded. The postacicular lobe is about twice as long as the acicular lobe and triangular. The notopodial cirrus is long and digitiform. The neuropodial acicular lobe is conical with an obtuse tip. The preacicular lobe is somewhat shorter than the acicular lobe and rounded. The postacicular lobe is nearly rudimentary. The neuropodial cirrus is very large and digitiform. It sometimes takes a nearly posterior position and may look like a displaced postacicular lobe.

The interramal cirri are first present from setiger 4 and are present even in the last setigers. Where fully developed they are comparatively long, slender and lack basal swellings and accessory cirri.

The setae are rather coarse and stiff. Two kinds are present in the preacicular fascicles: a few setae with a barred structure, and more numerous short bristly setae with a few coarse teeth on the cutting edge. Two kinds of setae are also present in the postacicular fascicles; most of the setae are rather long with a subdistal structure of fine denticles on the cutting edge; a few lyrate setae are found in both notopodial and neuropodial fascicles.

Fauvel (1953) reported *I. inermis* from the Maldivé Archipelago; his description is for all practical purposes a direct citation of the original description from Florida by Ehlers (1887), and his illustrations are copies of the illustrations in that paper. One is thus unable to decide whether Fauvel really had this

species or may have had some related undescribed species. The outstanding character of this genus, the lack of proboscoidal papillae, may easily have lead earlier workers to overlook differences in parapodial structures.

Most earlier authors have mistaken the everted nuchal processes for a pair of dorsally placed antennae and have consequently described this species as having two pairs of antennae. However, the nuchal organs are clearly set off from the prostomium in the area where nuchal organs are found in this family.

DISTRIBUTION: *I. inermis* has wide distribution in tropical and subtropical waters (Fauvel, 1923; Hartman, 1940), but, as mentioned above, more than one species may be involved.

Micronephthys Friedrich, 1939

The genus is accepted as defined by Friedrich (1939) with additional notes by Hartman (1950) and Banse (1959).

Micronephthys sphaerocirrata (Wesenberg-Lund, 1949) (figs. 36-40)

? *Nephtys* sp., Fauvel, 1939, p. 332.

COLLECTION: Stas. 047 (1), 050 (1), 072 (1), 138I (3), 170 (1), 252 (1), 265 (1), 266 (1), 268 (2), 296 (1), 310 (1), 311 (2), 325 (3), 329 (fragment), 347 (2).

The description is based on the specimen from station 50, an incomplete specimen in very good state of preservation with 28 setigers 7 mm long and 0.5 mm wide with parapodia.

The prostomium is subquadrangular and longer than wide with two pairs of long and slender antennae; there is no marked border between the prostomium and the first setiger on the dorsal side. A pair of eyespots is present on the second setiger.

The proboscis is clavate with 22 rows of subterminal papillae with 12 to 16 papillae in each row. The middorsal subterminal papilla is absent, but a short middorsal terminal papilla is present. The proximal surface of the proboscis is smooth.

The first setiger is directed forwards along the sides of the prostomium. The acicular lobes are rounded, pre- and postacicular lobes are low and rounded. The notopodial cirrus is lacking, the neuropodial cirrus is well developed and slender. The notopodial acicular lobe in the fully developed parapodia at setiger 25 is bluntly conical. The preacicular lobe is of the same length as the acicular lobe and rounded; the postacicular lobe is very low, but distinct and rounded. The notopodial cirrus is large and nearly spherical in shape. The neuropodial acicular lobe is also bluntly conical; the preacicular lobe is obliquely rounded and as long as the acicular lobe with the highest part on the superior side. The postacicular lobe is low and rounded. The neuropodial cirrus is nearly spherical.

The setae are of three kinds. Short setae with a barred subdistal area are found in the preacicular fascicles. Most of the setae in the postacicular fascicles are very long with a subdistal area with denticles on the cutting edge. In addition, a few lyrate setae are present in each fascicle.

M. sphaerocirrata was originally described by Wesenberg-Lund (1949) from the Persian Gulf. It is closely related to *M. stammeri* (Augener, 1932) from the Adriatic Sea as redescribed by Banse (1959). The difference between the two are in the higher number of subterminal papillae on the proboscis in *M. sphaerocirrata* and in the shape and size of the preacicular lobes.

Day (1953) described the proboscis of *M. sphaerocirrata* as having 22 rows of subterminal papillae with nine papillae in each row. The number in each row was never smaller than 12 and normally

between 14 and 16 in the present specimens. Day (1953) also stated that the preacicular lobes in his specimens were absent; this is not the case in the present specimens. Wesenberg-Lund (1949) stated that the proboscis was so densely covered with papillae that it looked pilose. The description and illustrations suggest that the specimens at her disposal were poorly preserved. The state of development of the different parapodial lobes is therefore unknown for the type specimen. These facts suggest to the author that Day (1953) must have had another species of the genus than the one present in the Vietnamese material. It is impossible to say which one of the two, if either, is the true *M. sphaerocirrata* without comparing both with the type specimen.

The relations between this species and other species of the genus have been analyzed by Banse (1959).

DISTRIBUTION: Persian Gulf (Wesenberg-Lund, 1949); South Africa (Day, 1953, see comment above); Viet Nam.

Nephtys Cuvier, 1817

The genus is accepted as restricted by Hartman (1950).

Nephtys oligobranchia Southern, 1921 (figs. 41-44)

COLLECTION: Stas. 023 (1), 045 (1), 075 (1), 135II (1), 136II (1), 174II (1), 184 (1), 240 (2), 271 (1), 278 (1), 306 (1), 328 (1).

The description is based on the specimen from station 136II, a complete specimen with 36 setigers 15 mm long and 2 mm wide with parapodia.

The rounded pentagonal prostomium has two pairs of comparatively short and slender antennae. Eyespots are absent. Nuchal organs are present but not prominent.

The proboscis is cylindrical with 22 rows of subterminal papillae with seven to nine papillae in each row. A long and slender middorsal papilla is present. The proximal surface of the proboscis is smooth.

The notopodial acicular lobe in the first setiger is conical; pre- and postacicular lobes are low but distinct. The neuropodial acicular lobe is somewhat longer than the notopodial one and bluntly conical; pre- and postacicular lobes are well developed and rounded. The notopodial and neuropodial cirri are present, both are short and slender. The notopodial acicular lobe in the fully developed parapodia at setiger 20 is conical; the precicular lobe is somewhat shorter than the acicular lobe and has a comparatively well-developed rounded inferior part and a lower, obliquely rounded superior part. The postacicular lobe is shorter than the acicular lobe and rounded. The neuropodial acicular lobe is conical; the pre- and postacicular lobes are similar; both are somewhat shorter than the acicular lobe and rounded. The neuropodial cirrus is very short and slender.

The interramal cirri are first present from setiger seven or eight; they are lacking in the 20 last setigers. Where fully developed they are short and only slightly recurved, thickset with poorly marked basal swellings. Accessory cirri are absent.

The setae are comparatively short and stiff; those in the preacicular fascicles have a barred subdistal area. Three kinds of setae are present in the postacicular fascicles: slender setae with very fine denticles on the cutting edge, shorter somewhat coarser setae with coarse denticles, and a few lyrate setae in the superior end of the neuropodial fascicles.

N. oligobranchia is discussed below together with the closely related *N. polybranchia*.

DISTRIBUTION: India (Southern, 1921, Fauvel, 1953); China (Fauvel, 1932a, Uschakov and Wu, 1963); Gulf of Siam (Fauvel, 1932a); Viet Nam.

Nephtys polybranchia Southern, 1921
(figs. 45-48)

Nephtys polybranchia, Rullier, 1957, p. 159

COLLECTION: Stas. 217 (2); 262 (1).

The description is based on the specimen from station 262, a complete specimen with 113 setigers 36 mm long and 2 mm wide with parapodia.

The prostomium is rounded quadrangular and has two pairs of rather stout antennae of approximately the same size and shape. Nuchal organs are present but not prominent. Eyespots are absent.

The proboscis (seen in dissection) has 22 rows of subterminal papillae with six to ten papillae in each row. The middorsal papilla is absent. The proximal surface of the proboscis is covered with tiny warts.

The neuropodial acicular lobe in the first setiger is blunt. The pre- and postacicular lobes are well developed. The neuropodial cirrus is digitiform. The notopodial acicular lobe is smaller and more rounded than the neuropodial one; the pre- and post-acicular lobes are small but distinct. The notopodial cirrus is well developed and digitiform. The acicular lobes in the fully developed parapodia at setiger 20 are rounded. The preacicular lobes are low and rounded; the postacicular lobes are of the same length as the acicular lobes and rounded. The notopodial cirrus is small and slender; the neuropodial cirrus is large and digitiform.

The interramal cirri are first present from setiger 4 and are present to the end of the body; they are somewhat reduced in size in posterior setigers. Where fully developed they are thickset with well-marked basal swellings, and only slightly recurved. Accessory cirri are absent.

The setae are of two kinds; those in the preacicular fascicles have a barred subdistal area. Setae in the postacicular fascicles are very long with denticles arranged in transverse rows. Lyrate setae are absent.

Rullier (1957) recorded *N. polybranchia* from Vietnamese rice paddies in fresh or nearly fresh water. The present specimens are the first that have been found under fully marine conditions in Viet Nam, but Ikuda (1940) recorded the species from the Ryukyu Islands (one of which is Okinawa). *N. polybranchia* and *N. oligobranchia* seem both to be extremely euryhaline; they have been recorded from fresh water, from brackish and from fully marine areas; quite often they are found together.

Fauvel (1932a) and later Rullier (1957) and Ushakov and Wu (1962) have all stressed the close similarity between the two species, but they differ as follows:

N. polybranchia:

1. Interramal cirri first present from setiger 4
2. Middorsal papilla on the proboscis absent
3. Lyrate setae absent

N. oligobranchia:

1. Interramal cirri first present from setigers 6 to 8
2. Middorsal papilla on the proboscis present
3. Lyrate setae present

There are also differences in the relationship between the different parapodial lobes. The author feels that these differences are sufficient to retain the two species despite their close morphological and ecological similarities.

DISTRIBUTION: India (Southern, 1921, Fauvel, 1953); Gulf of Siam (Fauvel, 1932a); Viet Nam (Rullier, 1957); China (Fauvel, 1932a, Ushakov and Wu, 1963); Ryukyu Islands (Okuda, 1940).

Nephtyidae, species indeterminable

COLLECTION: Stas. 075 (fragment), 241 (fragment), 260II (1), 300 (fragment), 337 (fragment).

These samples contain poorly preserved fragments and one complete, but damaged specimen.

ACKNOWLEDGEMENTS

The author wished to express his gratitude to Dr. Victor A. Gallardo for giving him the opportunity to study this collection and for helpful criticism and suggestions during the study; and to Dr. Olga Hartman for many helpful suggestions and discussions of the taxonomic problems in this family.

The Allan Hancock Foundation, University of Southern California, Los Angeles, gave the author material support and furnished the collections used for comparison with species not present in the material.

LITERATURE

AUGENER, H.

1932. Die Polychaeten und Hirudineen des Timavogebietes in der Adriatischen Karstregion. Zool. Jb. Syst. 63 : 657-681.

BANSE, K.

1959. Polychaeten aus Rovinj (Adria). Zool. Anz. 162(9-10) : 295-313.

CLARK, R. B.

1957. The influence of size on the structure of the brain of *Nephtys*. Zool. Jb. Allg. Zool. Physiol. 67 (2) : 261-282.

DAY, J. H.

1953. The Polychaet fauna of South Africa. Pt. 2 Errant species from cape shores and estuaries. Ann. Natal Mus. 12 (3) : 397-441.

EHLERS, E.

1868. Die Borstenwürmer (Annelida Chaetopoda) nach systematischen und anatomischen Untersuchungen dargestellt. Wilhelm Engelmann, Leipzig : 1-748, 24 plates.
1887. Report on the annelids of the dredging expedition of the U.S. coast survey steamer *Blake*. Mem. Mus. Comp. Zool. Harv. 15 : i-vi, 1-355.

FAUVEL, P.

1923. Polychètes errantes. Faune Fr. 5 : 1-488.
- 1932a. Annelida Polychaeta of the Indian Museum. Mem. Indian Mus. 12 (1) : 1-262.
- 1932b. Polychètes nouvelles de Che-Foo (Chine). Bull. Mus. Hist. Nat., Paris. Sér. 2, 4 (5) : 536-538.
1933. Annélides polychètes du Golfe du Pei Tcheu Ly de la collection du Musée Hoang ho-Pai ho. Publs. Mus. Hoang ho-Pai ho. 15 : 1-67.
1939. Annélides polychètes de l'Indochine recueillies par M. C. Dawidoff. Commentat. Pontif. Acad. Scient. 3 (10) : 243-368.
1953. Annelida Polychaeta. The fauna of India, including Pakistan, Ceylon, Burma and Malaya. The Indian Press, Ltd., Allahabad : i-xii, 1-507.

FRIEDRICH, H.

1939. Polychaeten-Studien IV. Zum Polychaeten-Fauna der Barentz-See. Kieler Meeresforsch. 3 (1) : 122-132.

GALLARDO, V. A.

1967. Polychaeta from the Bay of Nha Trang, South Viet Nam. Scripps Instn. Oceanogr., Univ. Calif., NAGA Exped. Rep. 4 (pt. 3) : 35-279.

HARTMAN, O.

1940. Polychaetous annelids II. Chrysopetalidae to Goniadidae. Allan Hancock Pacif. Exped. 7 (3) : 171-287.
1950. Goniadidae, Glyceridae and Nephtyidae. Allan Hancock Pacif. Exped. 15(1) : 1-181.

MONRO, C.C.A.

1934. On a collection of Polychaeta from the coast of China. *Ann. Mag. Nat. Hist. Ser. 10*, 13 : 353-380.

1936. Polychaete worms II. 'Discovery' Rep. 12 : 59-198.

OKUDA, S.

1940. Polychaetous annelids of the Ryukyu Islands. *Bull. Biogeogr. Soc. Japan* 10(1) : 1-24.

RULLIER, F.

1957. Quatre annélides polychètes des rizières du Viet-Nam. *Bull. Soc. Zool. Fr.* 81 (2-3) : 158-163.

SOUTHERN, R.

1921. Polychaeta of the Chilka Lake and also of fresh and brackish waters in other parts of India. *Mem. Indian Mus.* 5 (8) : 563-659.

USCHAKOV, P., AND B. L. WU.

1962. The polychaetous annelids of the families Chrysopetalidae, Glyceridae and Nephthydidae from the Yellow Sea. (In Russian and Chinese.) *Studia Mar. Sin.* 1 : 1-28.

1963. Ecological and zoogeographical studies on Polychaeta Errantia of the Yellow Sea. (In Russian and Chinese.) *Studia Mar. Sin.* 3 : 1-50.

WESENBERG-LUND, E.

1949. Polychaetes of the Iranian Gulf. *Dan. Scient. Invest. Iran* 4 : 247-400.

PLATES WITH LEGENDS

Plate 1.

Nephtys hombergi:

1. Left jaw seen from the free edge, Southern Norway, 50x
2. The same jaw lying on its anterior surface, 50x

Aglaophamus dicirroides:

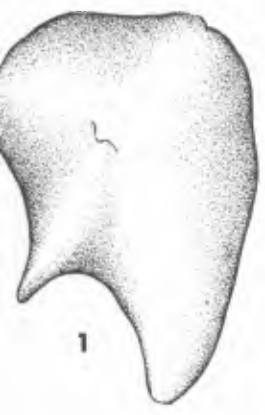
3. Left jaw seen from the free edge, sta. 156III, 240x
4. The same jaw lying on its anterior surface, sta. 156III, 240x
9. Proboscis, prostomium and first setiger, sta. 156III, 50x
10. Lyrate seta, sta. 268, 2800x
11. Parapodium 25, anterior view, sta. 156III, 98x

Inermonephtys gallardi:

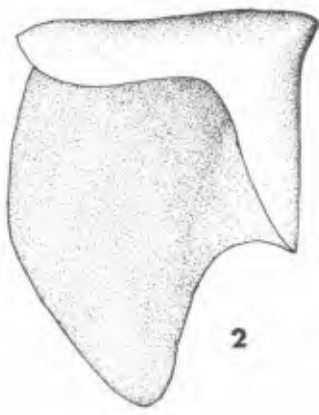
5. Right jaw seen from the free edge, sta. 104, 240x
6. The same jaw lying on its anterior surface, sta. 104, 240x

Micronephtys sphaerocirrata:

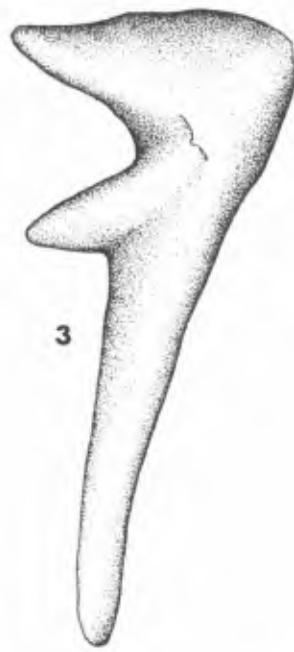
7. Left jaw seen from the free edge, sta. 306, 240x
8. The same jaw lying on its anterior surface, sta. 306, 240x



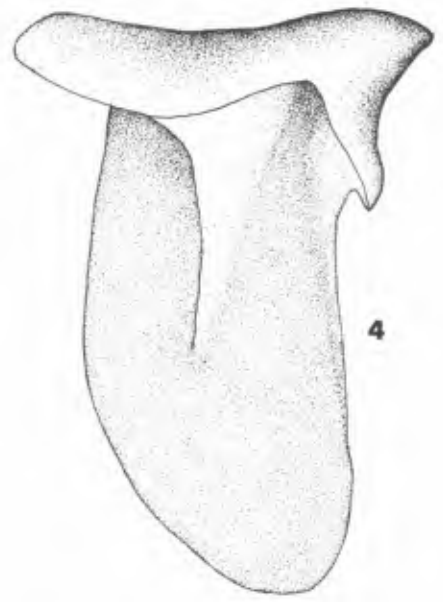
1



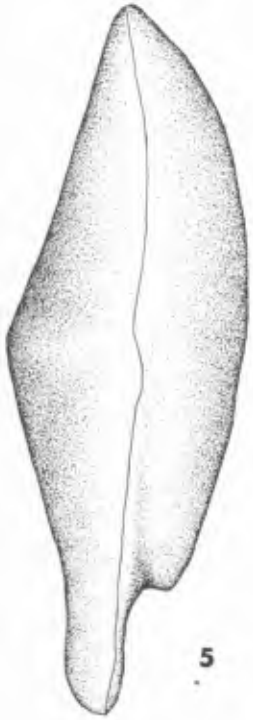
2



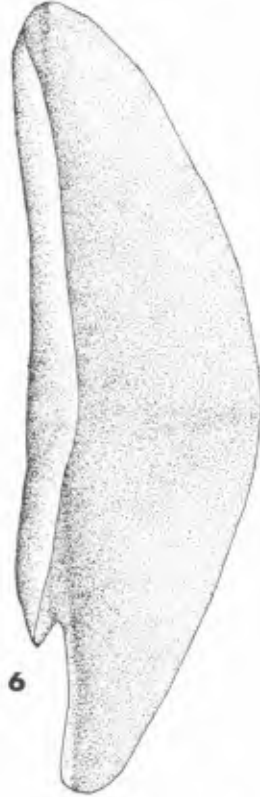
3



4



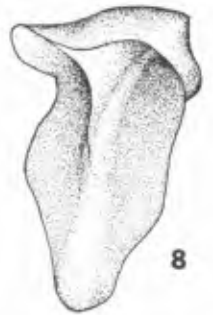
5



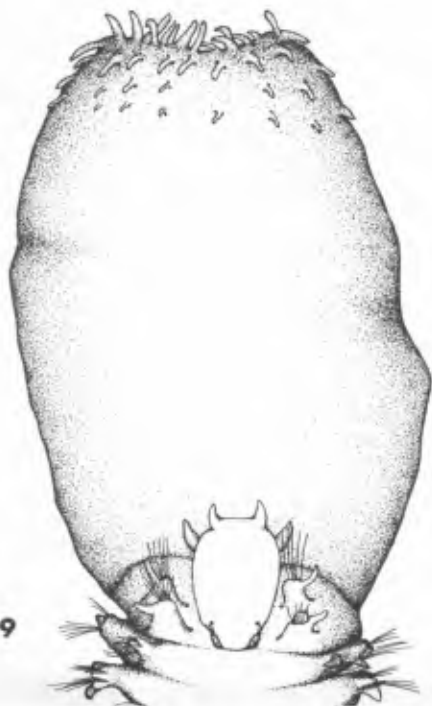
6



7



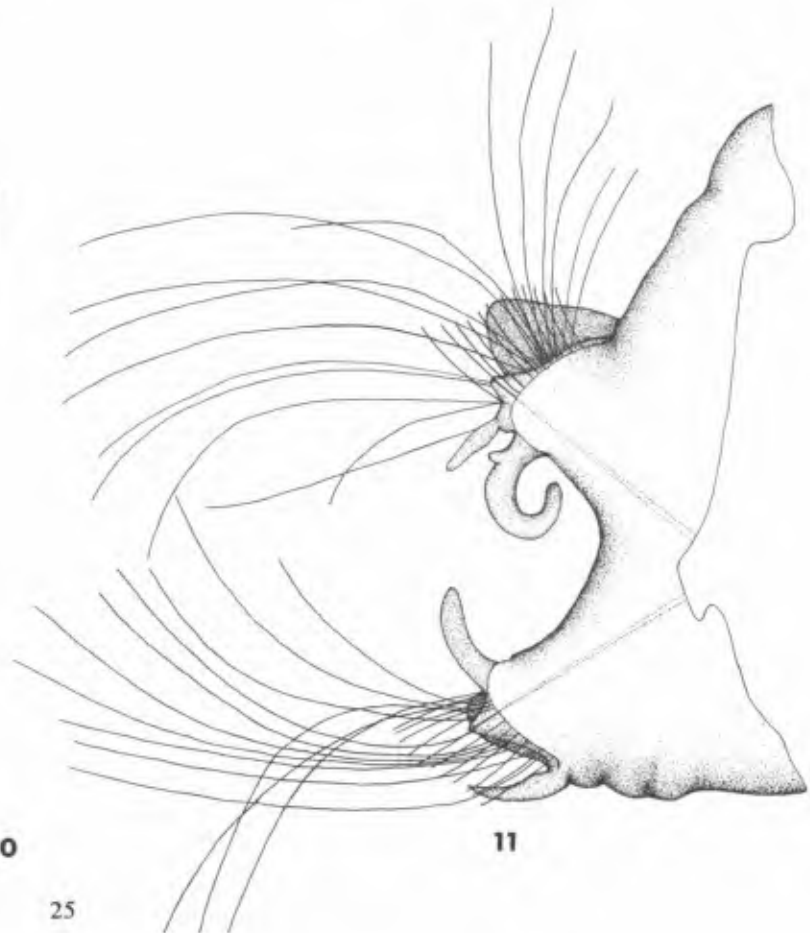
8



9



10



11

Plate 2.

Aglaophamus orientalis:

12. Parapodium 25, anterior view, sta. 268, 560x
13. Subdistal area of preacicular seta, side view, sta. 268, 2800x
14. Subdistal area of postacicular seta, side view, sta. 268, 2800x
15. Prostomium (proboscis half extended) and first setigers, sta. 268, 125x

Aglaophamus sinensis:

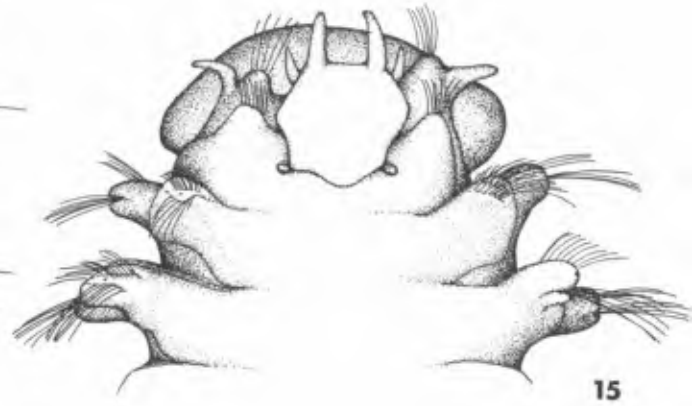
16. Proboscis, prostomium and first setigers, sta. 252, 24x
17. Subdistal area of postacicular seta, side view, sta. 252, 550x
18. Parapodium 35, anterior view, sta. 252, 45x



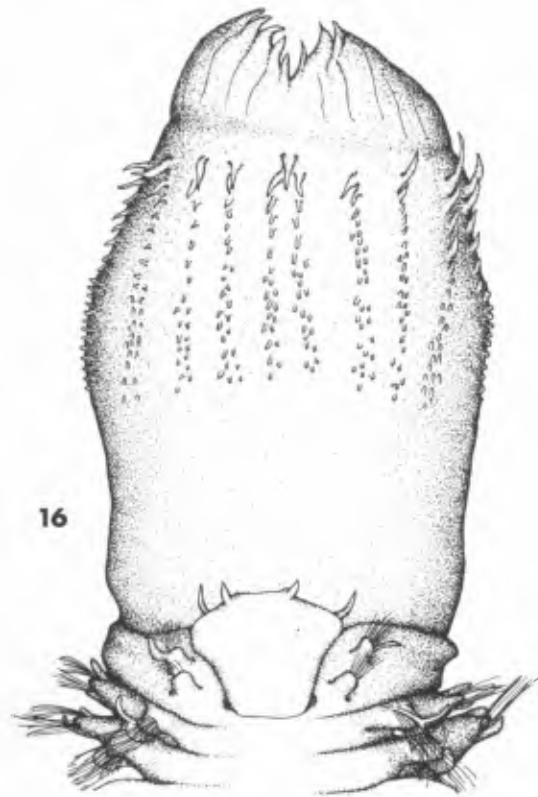
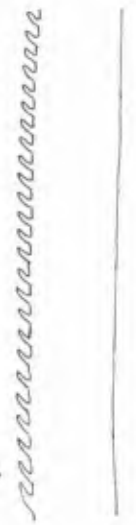
12

13

14

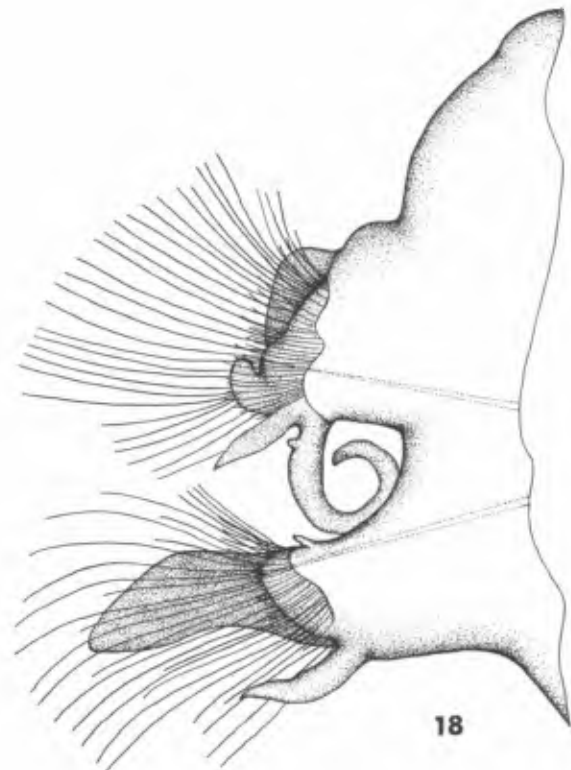


15



16

17



18

Plate 3.

Aglaophamus tepens:

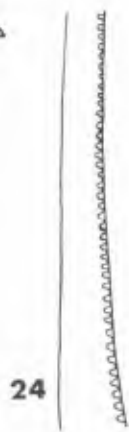
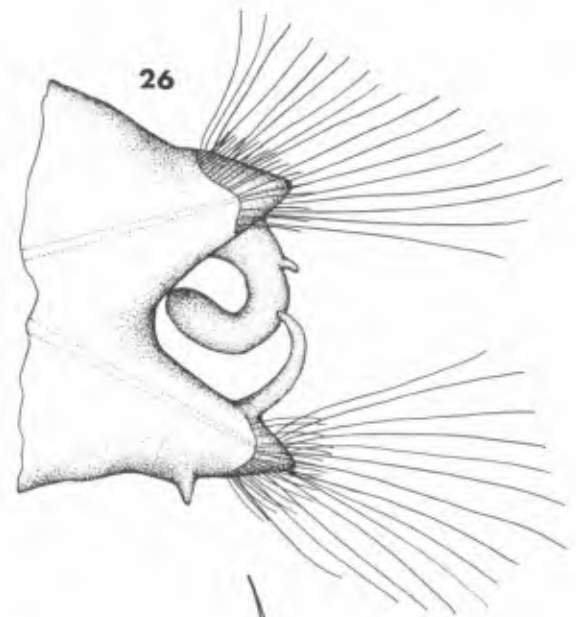
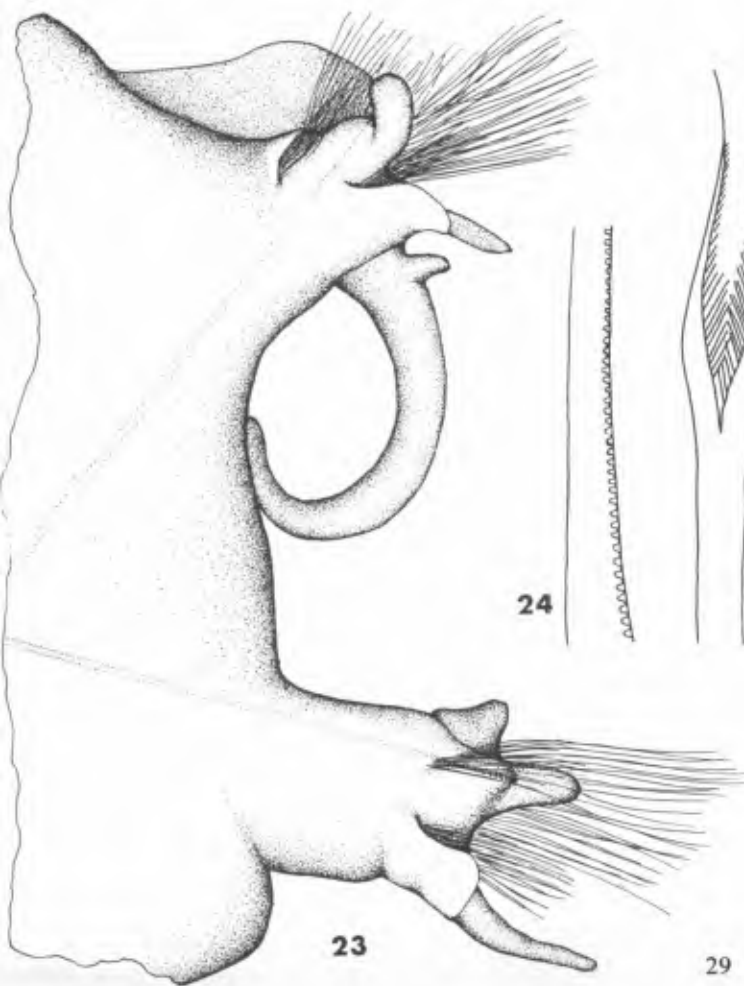
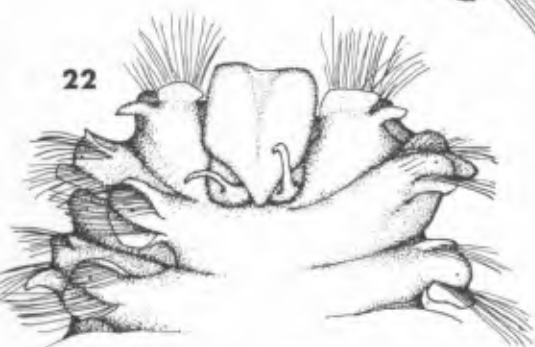
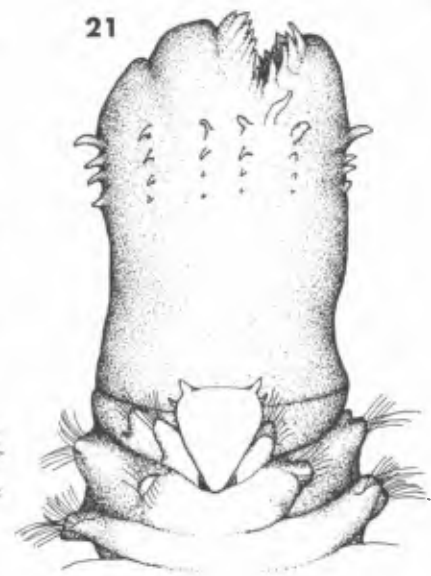
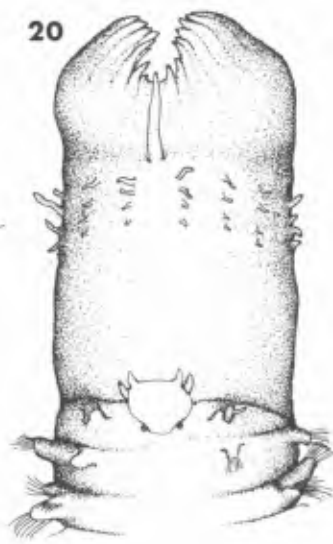
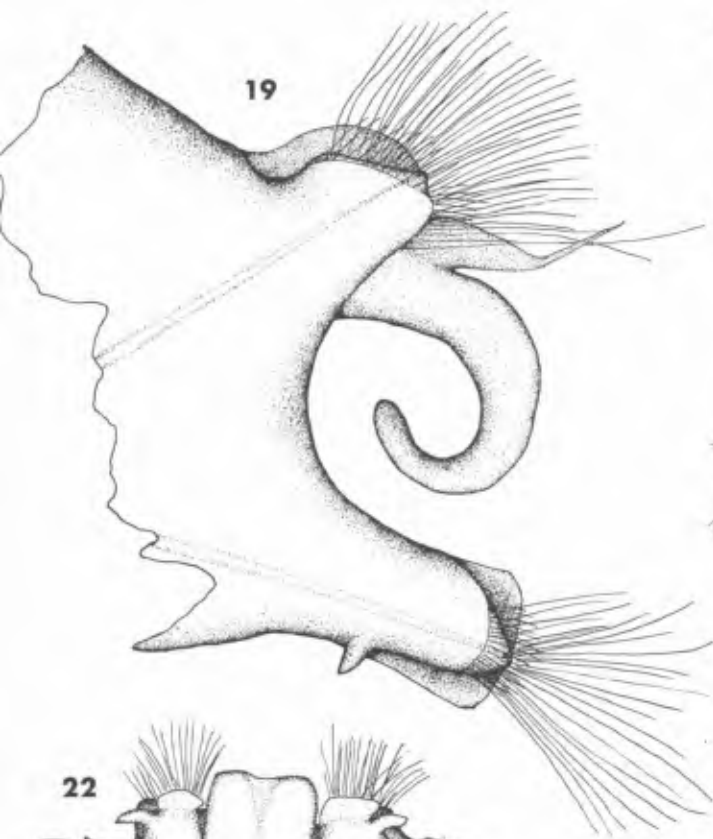
19. Parapodium 25, anterior view, sta. 142, 245x
20. Proboscis, prostomium and first setigers, sta. 142, 30x
27. Lyrate seta, sta. 142, 1200x
28. Subdistal area of preacicular seta, side view, sta. 142, 1200x

Aglaophamus vietnamensis:

21. Proboscis, prostomium and first setigers, sta. 158II, 45x
26. Parapodium 25, anterior view, sta. 158II, 250x
29. Lyrate seta, sta. 158II, 1200x
30. Subdistal area of preacicular seta, side view, sta. 158II, 1200x

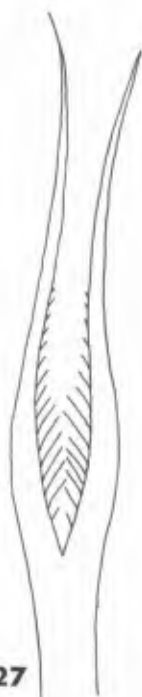
Inermonephtys gallardi:

22. Prostomium and first setiger, sta. 334, 25x
23. Parapodium 25, anterior view, sta. 104, 10x
24. Subdistal area of preacicular seta, side view, sta. 104, 550x
25. Lyrate seta, sta. 104, 550x



29

27



28

29



30

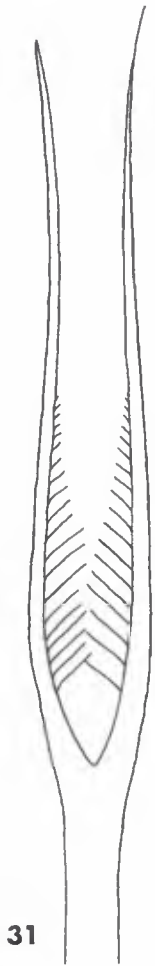
Plate 4.

Inermonephtys inermis:

31. Lyrate seta, sta. 253, 1200x
- 32-33. Subdistal area of postacicular setae, side view, sta. 253, 1200x
34. Prostomium and first setigers, sta. 253, 25x
35. Parapodium 26, anterior view, sta. 253, 50x

Micronephtys sphaerocirrata:

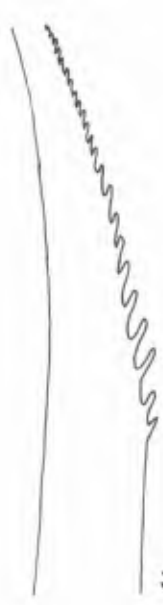
36. Prostomium and first setiger, sta. 312, 70x
37. Proboscis, prostomium and first setigers, sta. 50, 30x
38. Parapodium 25, anterior view, sta. 50, 125x
39. Subdistal area of postacicular seta, sta. 50, 1200x
40. Lyrate seta, sta. 50, 1200x



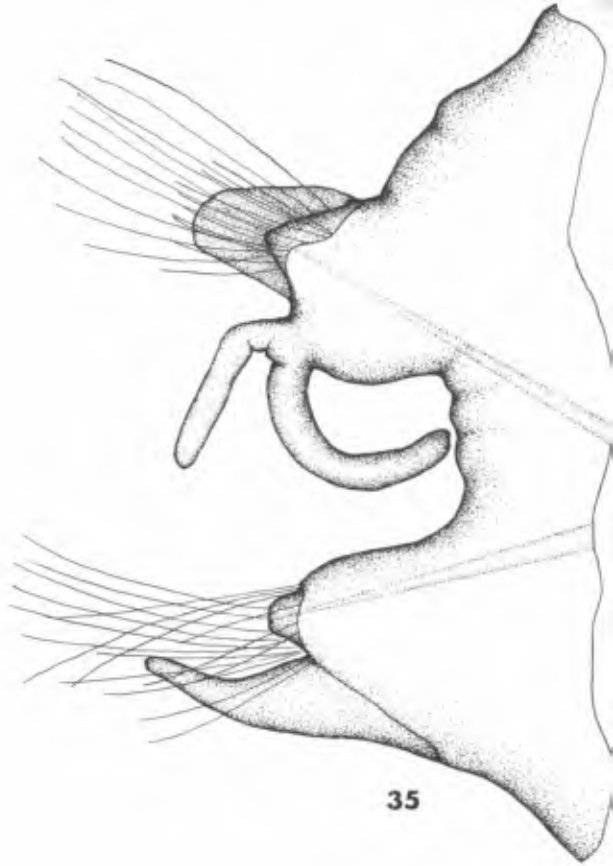
31



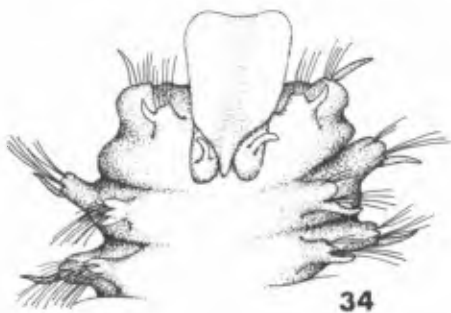
32



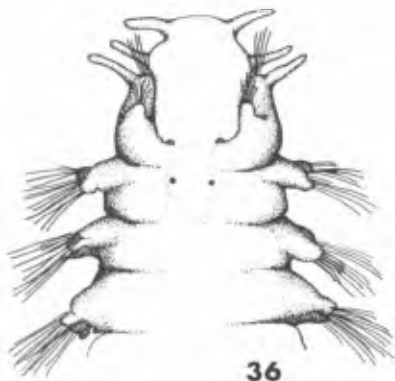
33



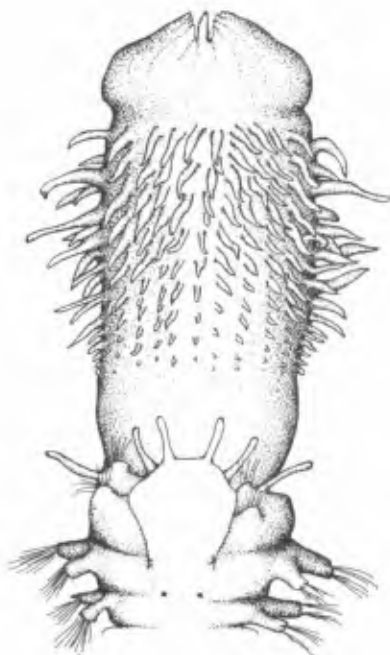
35



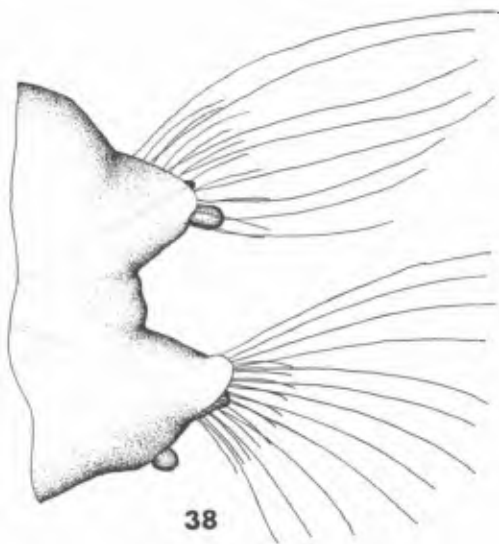
34



36



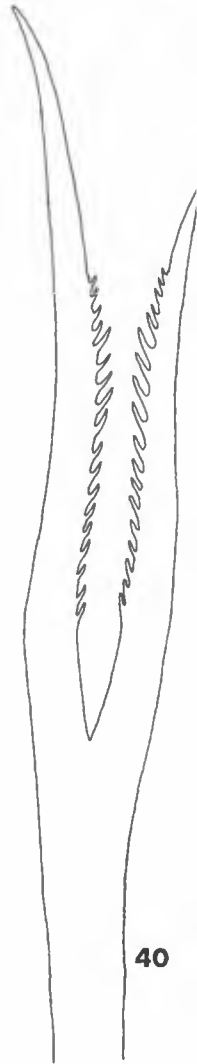
37



38



39



40

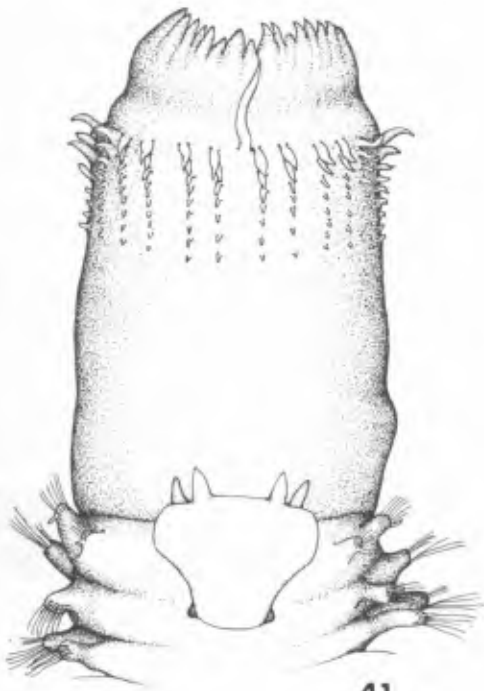
Plate 5.

Nephtys oligobranchia:

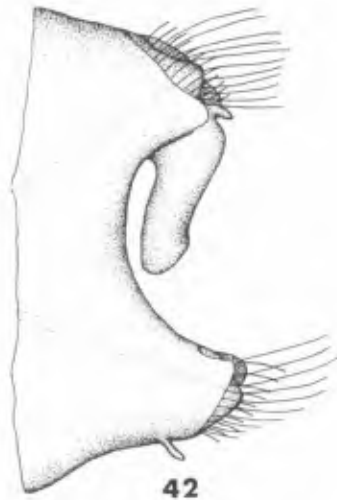
41. Proboscis, prostomium and first setigers, sta. 1361I, 50x
42. Parapodium 25, anterior view, sta. 1361I, 95x
43. Subdistal area of preacicular seta, sta. 1361I, 1200x
44. Subdistal area of postacicular seta, sta. 1361I, 1200x

Nephtys polybranchia:

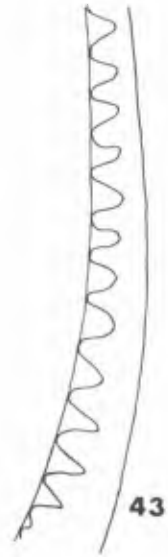
45. Prostomium (proboscis half extended) and first setigers, sta. 262, 50x
46. Subdistal area of preacicular seta, sta. 262, 1200x
47. Subdistal area of postacicular seta, sta. 262, 1200x
48. Parapodium 25, anterior view, sta. 262, 145x



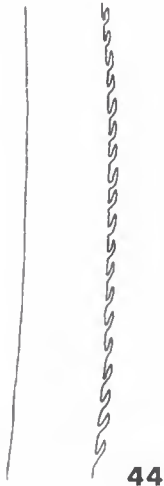
41



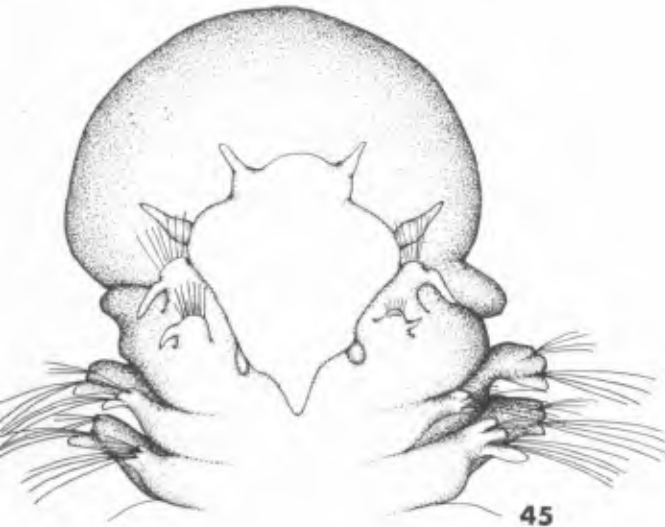
42



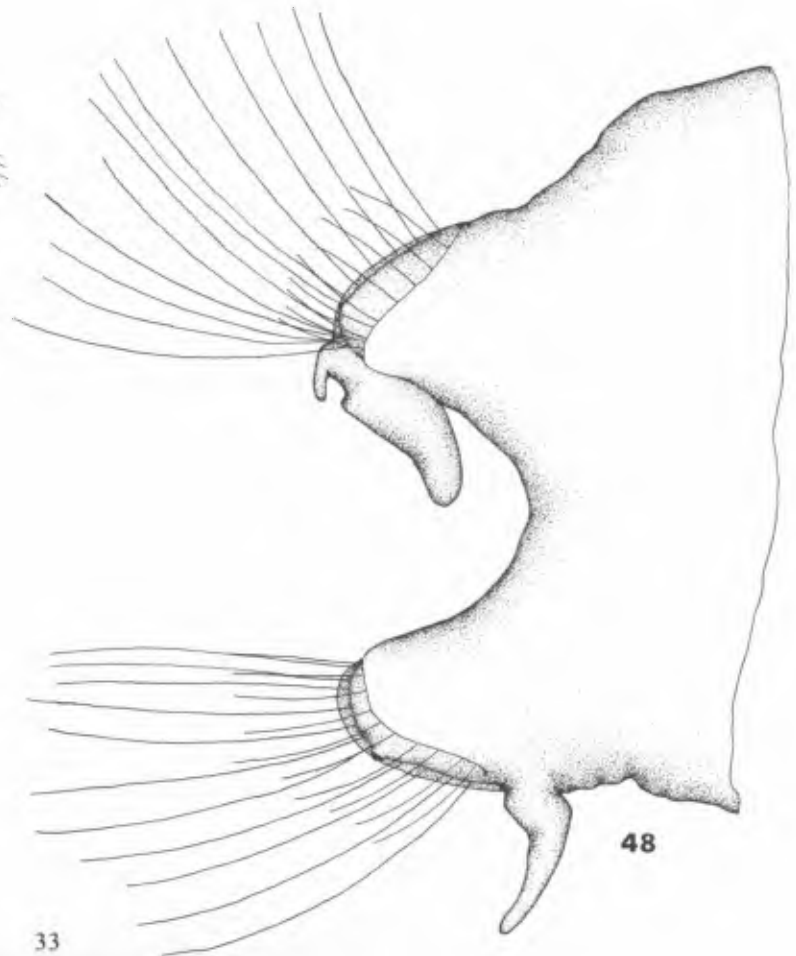
43



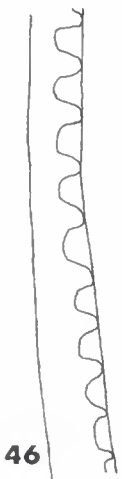
44



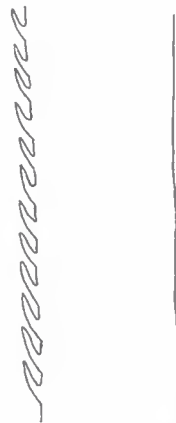
45



48



46



47

