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## Results of the Research Cruises of FRV "Walther Herwig" to South America. XLVII. Ceratioid Anglerfishes of the Family Oneirodidae collected by the FRV "Walther Herwig".

By E. BERTELSEN and T. W. PIETSCH

With 9 figures and 3 tables

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### Kurzfassung

Ergebnisse der Forschungsreisen des FFS „Walther Herwig“ nach Südamerika. XLVII. Tiefsee-Anglerfische der Familie Oneirodidae aus den Aufsammlungen des FFS „Walther Herwig“.

Tiefsee-Anglerfische der Familie Oneirodidae aus den Südamerikareisen der „Walther Herwig“ sind in einer Reihe von Publikationen berücksichtigt worden. In der hier vorgelegten Arbeit wird eine Übersicht über das gesamte, von „Walther Herwig“ erbeutete Oneirodiden-Material gegeben, ergänzt durch vom selben Schiff während der „Overflow '73-Expedition“ gesammelte Exemplare. Zusätzlich sind eine Reihe noch unveröffentlichter Fänge anderer Forschungsschiffe erwähnt.

Das „Walther Herwig“-Material umfaßt 9 der bisher beschriebenen 14 Gattungen der Familie; 11 Arten sind darin vertreten, darunter Typenmaterial von drei Arten. Die hier erstmalig veröffentlichten Neufunde stellen in mehreren Fällen einen Erstnachweis für verschiedene Meeresgebiete dar. Darüber hinaus ergeben sich neue Erkenntnisse über den Bau der Esca (*Oneirodes macrosteus* und *Phyllorhinichthys micractis*), welche beschrieben und abgebildet werden. Das Ovarium eines fast reifen Weibchens von *Microlophichthys microlophus* wird beschrieben.

### Abstract

Ceratioid anglerfishes of the family Oneirodidae from the collections of various "Walther Herwig" cruises to South America have been dealt with in a number of publications. The present paper summarizes the data for all oneirodid fishes collected by FRV "Walther Herwig" including those obtained during the "Overflow '73-Expedition". In addition a number of unpublished records obtained by various research vessels are given.

The oneirodid material collected by the "Walther Herwig" represents 9 of the 14 described genera and 21 species of the family including type material of 3 recently described species. The new records published here for the first time extend the known geographic range of some species considerably. In addition, supplemental diagnostic and descriptive data as well as figures of the esca (*Oneirodes macrosteus*, *Phyllorhinichthys micractis*) are given. The ovary of an almost mature female of *Microlophichthys microlophus* is also described.

### 1. Introduction

In the course of the last ten years, ichthyologists of the Institut für Seefischerei, Hamburg, aboard the FRV "Walther Herwig" have made a tremendous contribution to our knowledge of the deepsea vertebrate fauna through a program of exploratory midwater sampling over a broad geographic range in the Atlantic Ocean. Recent

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widespread and intensive use of a large commercial midwater trawl has provided material in quantity and individuals of a size heretofore only imagined. The ceratio anglerfish collections are of particular importance. Oneirodid anglerfishes captured during cruises of the "Walther Herwig" represent nine of the 14 described genera of the family. These are listed below with revised and supplemental diagnostic and descriptive data as well as notes on geographic distribution. In a few cases, material collected by other research vessels, representing recently described forms partially based on "Walther Herwig" specimens, is also included.

## B. Methods and Materials

Standard lengths (SL) were used throughout. Methods for taking counts and measurements follow PIETSCH (1974a). Terminology used in describing the various parts of the angling apparatus follows Bradbury (1967). Definition of terms used for the different stages of development follow BERTELSEN (1951). Material from the "Walther Herwig" (WH), deposited at the Institut für Seefischerei, Hamburg (ISH), was collected with an Engel Midwater Trawl (CMBT), having a rectangular mouth and 1600 mesh circumference. This gear is described more fully by SCHÄRFE (1966, 1969). Material collected by other research vessels is deposited at the Institute of Oceanology Academy of Sciences of the USSR, Moscow (IOAN); Institute of Oceanographic Sciences, Surrey, England (IOS); Los Angeles County Museum of Natural History (LACM); Museum of Comparative Zoology, Harvard University (MCZ); University of Miami Marine Laboratory (UMML); United States National Museum, Washington (USNM); and the Virginia Institute of Marine Science, Gloucester Point (VIMS).

## C. Spiniphryne Bertelsen, 1951

### 1. *Spiniphryne gladisfenae* (Beebe, 1932)

The 1971 cruise of the "Walther Herwig" to the South Atlantic provided the third and fourth known specimens of *S. gladisfenae*. These were included in a recently published osteological description of the genus (BERTELSEN and PIETSCH, 1975):

ISH 2131/71, 49.0 mm, WH Station 467/71.

ISH 2734/71, 63.0 mm, WH Station 494/71.

## D. Oneirodes Lütken, 1871

### 1. *Oneirodes carlsbergi* (Regan and Trewavas, 1932) (Fig. 1)

The "Walther Herwig" has provided nearly one-third of the known material of *C. carlsbergi*. The following specimens were previously reported by PIETSCH (1974a: 39):

ISH 394/66, 3 (25.0–107.0 mm), WH Station 182/66.

ISH 660/66, 85.0 mm, WH Station 187/66.

ISH 924/68, 63.0 mm, WH Station 16/68.

ISH 988/68, 23.5 mm, WH Station 18—I/68.

ISH 2478/71, 86.0 mm, WH Station 482—III/71.

ISH 2729/71, 52.5 mm, WH Station 494/71.

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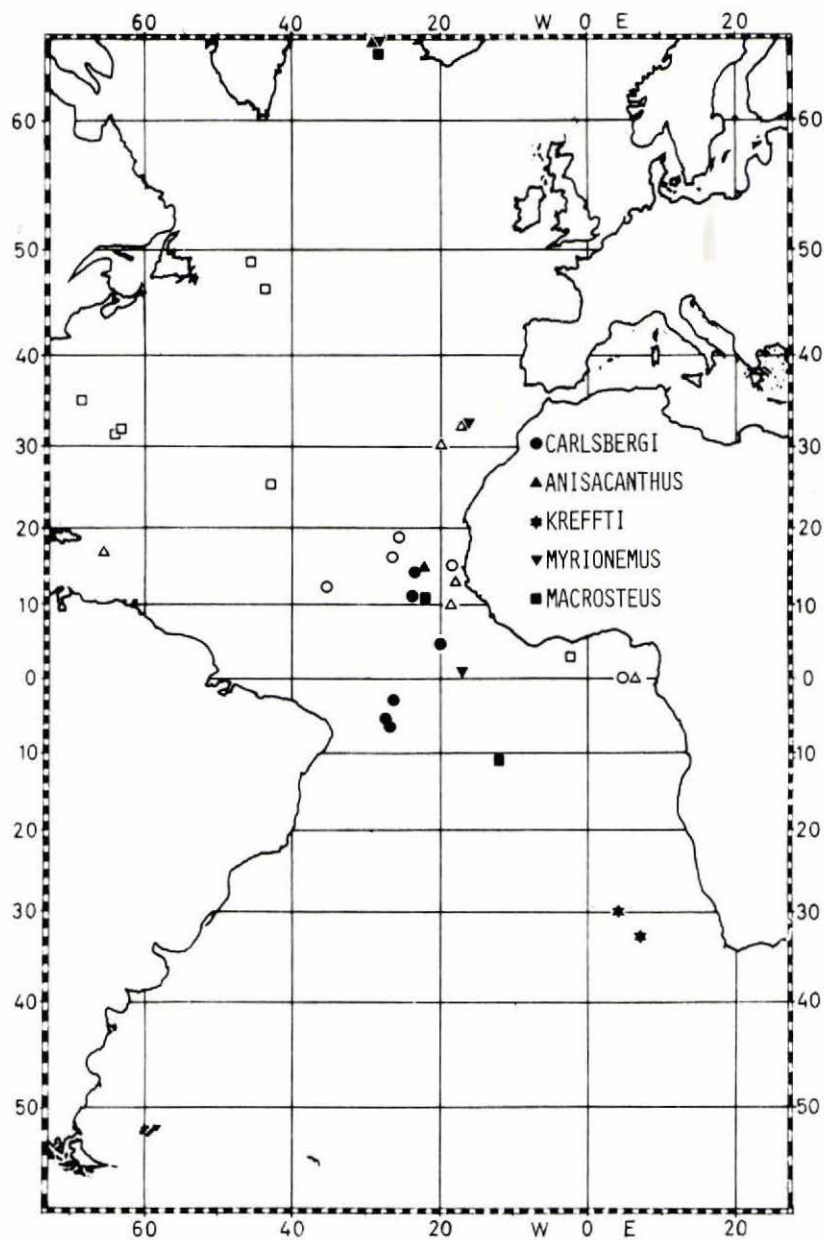


Fig. 1: Distributions of five species of *Oneirodes* in the Atlantic Ocean. "Walther Herwig" material in solid symbols, other material in open symbols.

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2. *Oneirodes eschrichti* Lütken, 1871

Four specimens of this species are in the "Walther Herwig" collections made in the South Atlantic: two collected during the 1971 cruise (reported by PIETSCH, 1974a: 44) and two previously unreported specimens collected in 1973:

ISH 2656/71, 26.0 mm, WH Station 490—II/71.

ISH 3101/71, 188.0 mm, WH Station 512/71.

ISH 333/73, 2 (62.0—115.0 mm), WH Station 678/73.

3. *Oneirodes anisacanthus* (Regan, 1925) (Figs. 1, 2)

*Oneirodes anisacanthus* was previously known from nine specimens collected in the eastern tropical Atlantic off Madeira, the Gulf of Guinea, and from the Caribbean Sea. One additional specimen was collected during the 1973 North Atlantic cruise of the "Walther Herwig" (Station 668/73; 65° N, 29° W), considerably outside this known range (Fig. 1). Counts, measurements and the shape of the suboperculum of this new specimen compare well with the known material of *O. anisacanthus*. The morphology of the esca, however, does not fit into the sequence of ontogenetic change described by PIETSCH (1974a: 55). In previously described material, the lateral esca appendage was less than one-third the length of the esca bulb in specimens 47.0 mm and smaller, nearly six times the length of the bulb in a 78.0 mm specimen (ISH 2730/71, Fig. 2 A) and nearly seven times the length of the bulb in a 173.0 mm specimen. The lateral appendage of the 98.0 mm specimen reported here is approximately one-third the length of the esca bulb (Fig. 2 B). Counts and measurements are provided in Table 1.

ISH 2730/71, 78.0 mm, WH Station 494/71.

ISH 235/73, 98.0 mm, WH Station 668/73.

Table 1 Counts, and measurements in percent of standard length for specimens of *Oneirodes* species

	<i>anisacanthus</i> ISH 235/73	<i>kreffti</i> MCZ 48 877	<i>myrionemus</i> ISH 236/73	UMML 22 918	<i>macrosteus</i> UMML uncatalogued	ISH 233/73
Standard length	98.0	101.0	76.0	21.0	153.0	182.0
Length						
Head	40.8	38.6	42.1	35.7	36.6	38.5
Lower jaw	48.0	45.5	47.4	45.2	39.9	40.1
Premaxillary	30.6	30.7	32.9	—	28.8	29.1
Illicium	24.0	22.3	—	23.8	36.6	29.7
Head depth	41.8	50.5	43.4	42.9	34.6	35.2
Teeth <sup>1)</sup>						
Vomer	3+3	4+4	4+4	3+3	4+4	2+3
Upper jaw	40	55	ca. 50	26	70	69
Lower jaw	36	46	52	27	62	65
Dorsal	6	6	6	6	6	6
Anal	4	4	4	4	4	4
Pectoral	15—16	16	16—17	15	15	16

<sup>1)</sup> Counts are sum of left and right sides.

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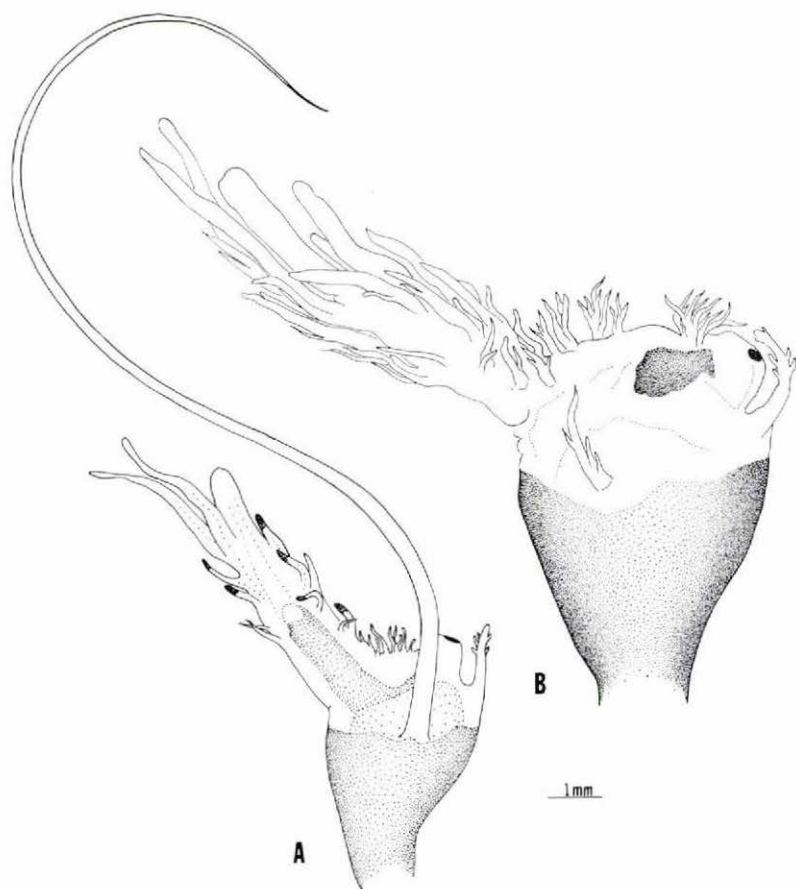


Fig. 2: Escae of *Oneirodes anisacanthus*, left sides: A. ISH 2730/71, 78.0 mm; B. ISH 235/73, 98.0 mm.

#### 4. *Oneirodes krefftii* Pietsch, 1974a (Figs. 1, 3)

*Oneirodes krefftii* was originally described from three specimens (21.0–53.5 mm): two collected by the “Walther Herwig” from the eastern South Atlantic, and one from the Indian Ocean off the Kerguelen Islands (MCZ 47554, “Anton Bruun” Station 160). A fourth specimen of this species was recently discovered in collections made by the “Anton Bruun” in the Indian Ocean (MCZ 48877, 24° S, 65° E). The esca of the new specimen differs slightly from previously known material in that the paired medial appendages bifurcate basally (compare Fig. 2 A and B). Counts and measurements are given in Table 1.

ISH 1536/71, 50.0 mm, WH Station 431—III/71 (holotype).

ISH 1463/71, 53.5 mm, WH Station 427/71 (paratype).

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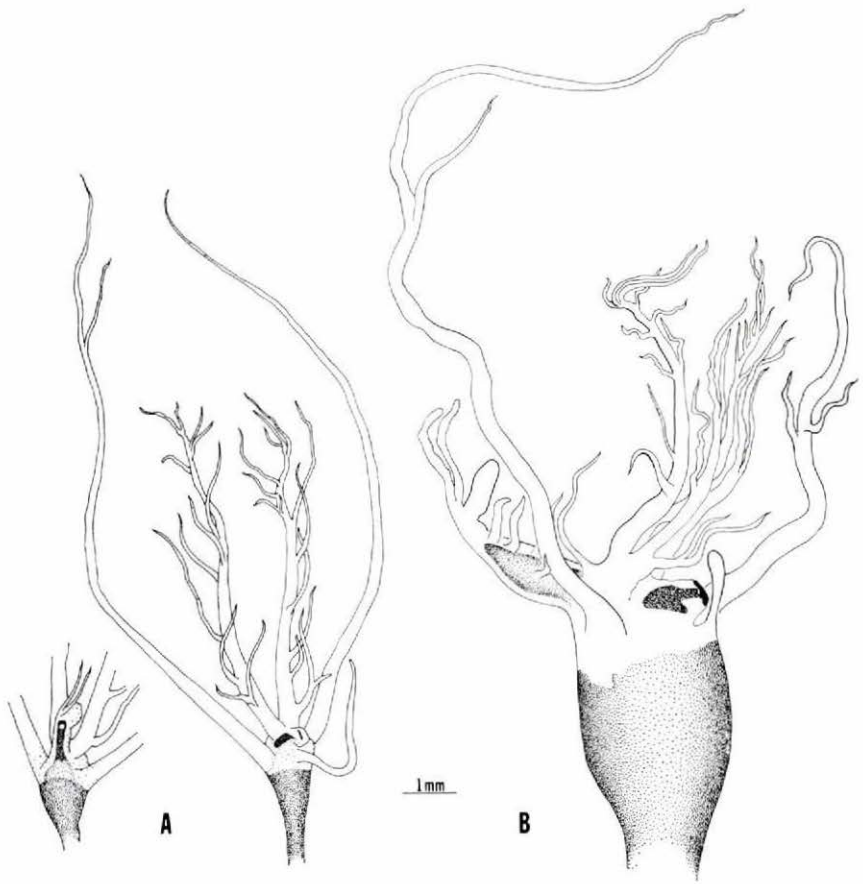


Fig. 3: Escae of *Oneirodes kreffii*: A. holotype, ISH 1536/71, 50.0 mm, anterolateral and posterolateral views; B. MCZ 48 877, 101.0 mm, left side.

##### 5. *Oneirodes myrionemus* Pietsch, 1974a (Fig. 1)

*Oneirodes myrionemus* was originally described from two specimens (43.0–121.0 mm) collected by the “Walther Herwig” from the same station (512/71) in the eastern North Atlantic (32° N, 16° W). A third specimen (WH Station 478/71, 1° N, 18° W) with a missing illicium was questionably referred to this species (Pietsch, 1974a: 58, 59). The 1973 North Atlantic cruise of the “Walther Herwig” (Station 668/73, 65° N, 28° W) collected a specimen of *Oneirodes*, without illicium, that is probably the fourth known specimen of *O. myrionemus*. All counts, measurements, and the shape of the suboperculum compare well with the type material (Table 1). The addition of these two questionably identified specimens would extend the known geographical range of *O. myrionemus* north, off the western coast of Iceland, and south to the equator in the eastern tropical Atlantic (Fig. 1).

ISH 3100a/71, 43.0 mm, WH Station 512/71 (holotype).

ISH 3100b/71, 121.0 mm, WH Station 512/71 (paratype).

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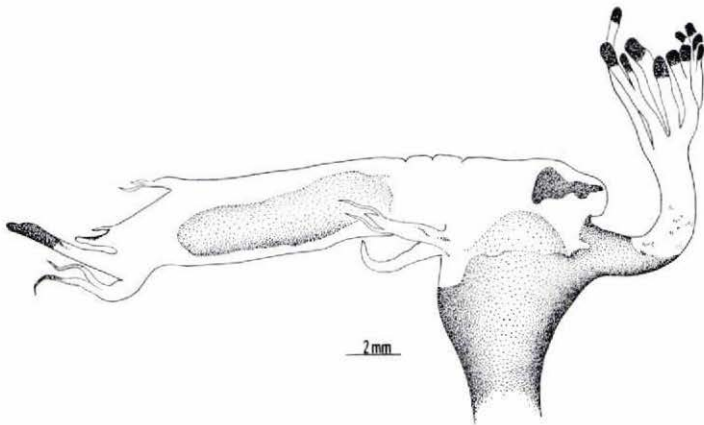


Fig. 4: Esca of *Oneirodes macrosteus*, ISH 233/73, 182.0 mm, left side.

ISH 2325/71, 137.0 mm, WH Station 478/71.

ISH 236/73, 76.0 mm, WH Station 663/73.

#### 6. *Oneirodes macrosteus* Pietsch, 1974a (Figs. 1, 4)

In the original description of *O. macrosteus* (Pietsch, 1974a: 61), two specimens collected by the "Walther Herwig" were questionably referred to this species. Although the illicium and escae of these specimens were lost, all counts, measurements, and the shape of the suboperculum compared well with the type material. Since that time a number of additional specimens of *O. macrosteus* have been collected: USNM uncatalogued, 11.0 mm, 31° N, 64° W; MCZ 50022, 12.5 mm, 26° N, 42° W; MCZ 50021, 23.0 mm, 35° N, 67° W; UMML 22918, 21.0 mm, 3° N, 2° W; UMML uncatalogued, 153.0 mm, 24° N, 77° W; and ISH 233/73, 182.0 mm, 65° N, 29° W. All of this new material compares well with the type material. The esca of the recently collected "Walther Herwig" specimen is shown in Figure 4. Counts and measurements are given in Table 1. This new material extends the known geographic range of *O. macrosteus* north, off the western coast of Iceland (WH Station 668/73) and east into the Gulf of Guinea (UMML, "Pillsbury" Station 36) (Fig. 1).

ISH 1956/71, 59.0 mm, WH Station 459/71.

ISH 2657/71, 110.0 mm, WH Station 490—II/71.

ISH 233/73, 182.0 mm, WH Station 668/73.

#### 7. *Oneirodes notius* Pietsch, 1974a

Three specimens of *O. notius* were collected during the 1971 cruise of the "Walther Herwig" to the South Atlantic, two of which were made paratypes in the original description (PIETSCH, 1974a: 70). Since that time, two additional specimens have been collected which compare well with the type material.

ISH 590/71, 150.0 mm, WH Station 354—II/71 (paratype).

ISH 648/71, 115.0 mm, WH Station 358—III/71 (paratype).

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ISH 141/76, 108.0 mm, WH Station 4—II/76.

ISH 822/71, 42.0 mm, WH Station 371—III/71.

ISH 689/76, 39.0 mm, WH Station 109—II/76.

#### 8. *Oneiroides theodoritissieri* Belloc, 1938

The 1968 cruise of the "Walther Herwig" to the eastern North Atlantic provided the second known specimen of *O. theodoritissieri*. This specimen was described by PIETSCH (1974a: 80).

ISH 659/68, 183.0 mm, WH Station 12—II/68.

### E. *Phyllorhinichthys* Pietsch, 1969

#### 1. *Phyllorhinichthys micractis* Pietsch, 1969 (Figs. 5—7)

*Phyllorhinichthys micractis* was originally described from a single specimen, 52.0 mm, collected from the eastern Pacific off Guadalupe Island, Mexico. Since that time, a second individual (96.0 mm), also from the eastern north Pacific, was found in the collections of the Institute of Oceanology of the Academy of Sciences of the USSR, Moscow, and compared with the holotype (PIETSCH, 1972a). Recently, three additional specimens of *P. micractis* have been discovered. One of these is the largest known female collected by the "Walther Herwig" in the eastern north Atlantic: ISH 536/73, 118.0 mm, WH Station 695/73. The remaining two specimens are recently metamorphosed females, one from the western north Atlantic (IOS uncatalogued, 10.8 mm, 31°51' N, 63°52' W), the other from the Indian Ocean (MCZ 49937, 11.8 mm, 0°24' S, 54°33' E).

This new material agrees with the holotype of *P. micractis* in having a short snout; well-developed sphenotic and articular spines, the quadrate spine much larger than the mandibular spine; a short and broad suboperculum, the lower part semicircular; and an esca of the same basic design. Both Atlantic specimens have been badly skinned; the large snout flaps, for which *Phyllorhinichthys* is named, are well-developed in the 10.8 mm specimen, but if once present, are now lost in the 118.0 mm specimen (Fig. 5 A, B). A few somewhat enlarged lateral line organs, however, remain in an area anterior to the eye of the larger specimen. The largest of these is 1.2 mm long and appears to correspond to the dorsal flap previously described (Pietsch, 1969, Fig. 4, 1972a, Fig. 1). In the 11.8 mm specimen from the Indian Ocean the snout flaps are present, but smaller (the largest are 0.25 mm) than in the 52.0 mm holotype and in the 10.8 mm specimen.

The escae of the four known specimens of *P. micractis* are similar in basic structure, but vary somewhat in the number and length of filaments and appendages. The escae of the two smallest specimens are well-developed for oneirodids of only 10.8 and 11.8 mm. They are essentially like the esca described for the 96.0 mm IOAN specimen (PIETSCH, 1972a: 337, Fig. 3), except that in the 10.8 mm specimen (Fig. 6 B, C), the unpigmented, tapering, medial and lateral filaments are not as yet developed, represented only on one side by a single, short filament. The esca of the 118.0 mm specimen differs in a number of ways from those of the four, smaller specimens (Fig. 6 A). The paired anterior appendages, well separated in other escae, share a common base and are separated only at the distal tip; circular transparent window-like openings at the tips of the pigmented internal tubes of these appendages are not found

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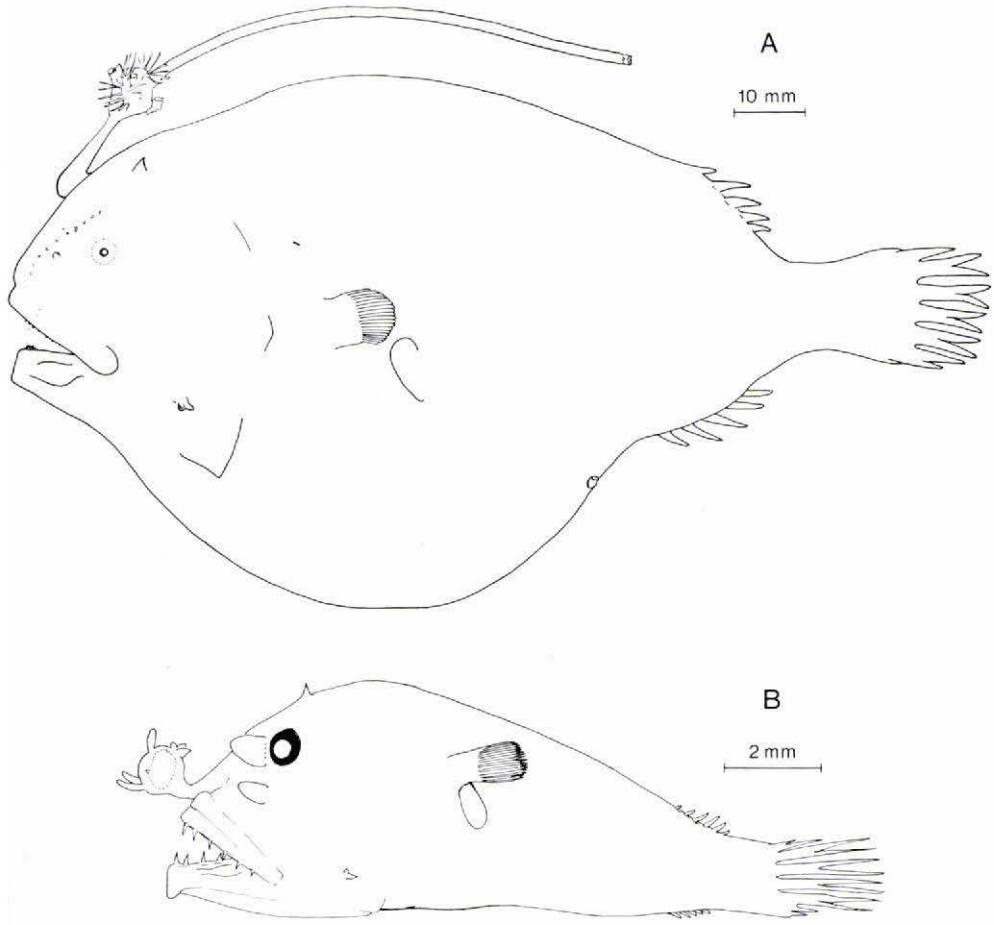
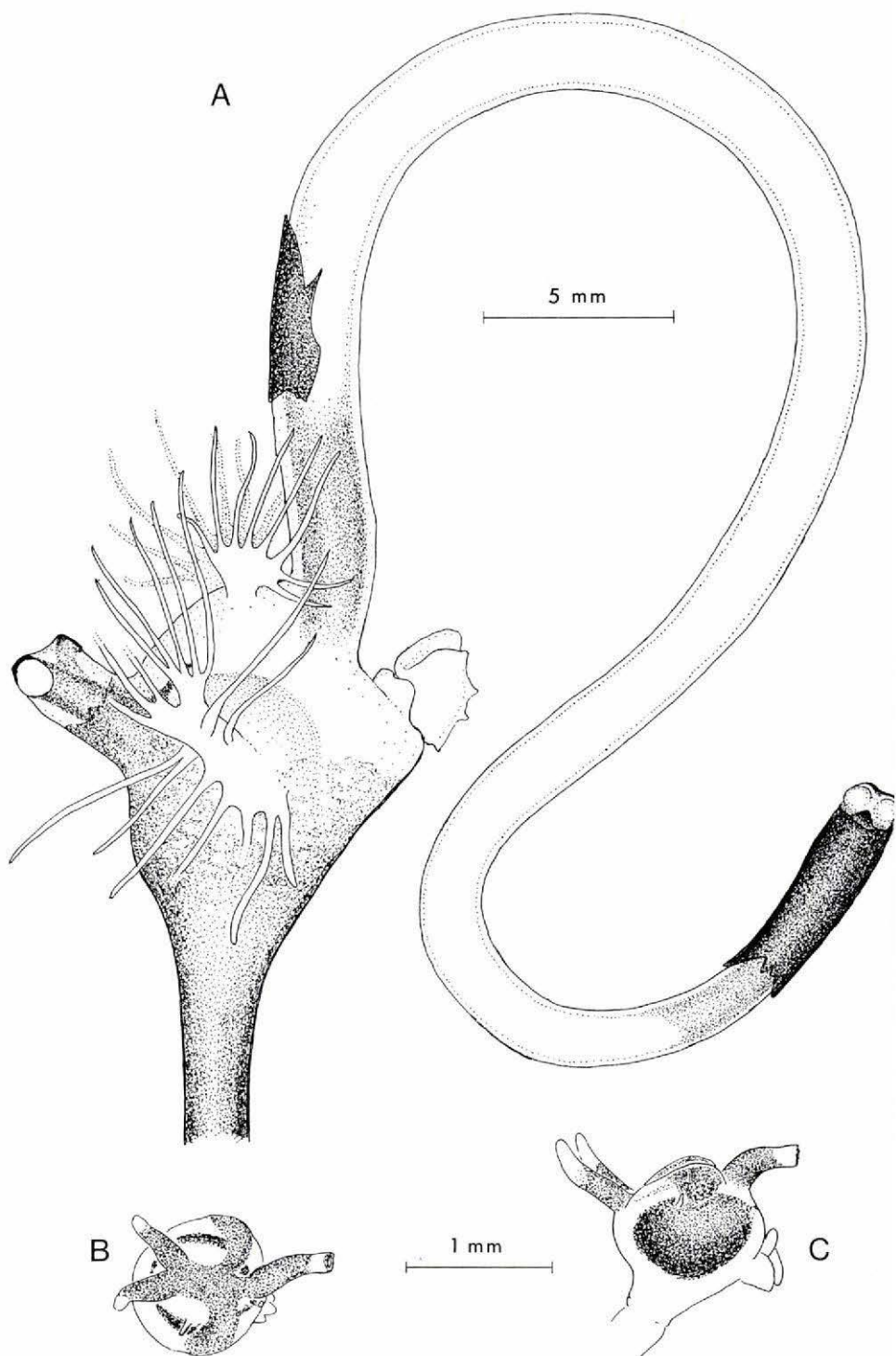


Fig. 5: *Phyllorhynchichthys micractis*: A. ISH 536/73, 118.0 mm; B. IOS uncatalogued, 10.8 mm.

on the escae of other specimens. The internally pigmented, distal appendage, less or approximately equal to the length of the esca bulb in smaller specimens, is 57.6 percent of SL in the 118.0 mm specimen. This extremely elongated appendage appears to have been entirely covered with darkly pigmented skin. Its pigmented internal tube terminates in a pair of small, lens-like, transparent bulbs which are partly covered distally by a V-shaped pigmented patch which in the unpreserved specimen was bright silvery. The lumen of the internal tubes of this as well as of the paired anterior appendages are filled with a completely transparent gelatinous tissue, and their inner walls are covered with a reflecting silky layer (possibly, as in several other ceratioids, silvery in the unpreserved fish). Most likely, they are able to transmit light from the photophore on the bulb of esca to and through the lens-like structures at the tip of the appendages, in the juvenile specimens to the corresponding unpigmented distal part of these organs. Light transmitted through the similar structures in the distal appendages of a live

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*Chimantolophus groenlandicus* was observed by one of the authors (E. B.) onboard the „Walther Herwig“ in 1973.

The pair of fan-shaped series of filaments on the distal part of esca is similar in length and number (eight and nine, respectively) to those of the 96.0 mm specimen (eight and ten), while the lateral pair, which in the smaller specimens consists of only one or two filaments on each side of esca, is developed into similar fan-shaped structures carrying 14 and 17 filaments respectively.

The opercular bones of the new material compare well with those of previous specimens except for some differences in the shape of the suboperculum (Fig. 7 A, B). The upper end of this bone is rounded in the 10.8 and 11.8 mm specimens as in the 52.0 mm holotype, but becomes pointed in larger specimens. Unlike the smaller specimens, the suboperculum of the 118.0 mm specimen is expanded posteriorly.

The pectoral lobe of the IOAN specimen of *P. micractis* (96.0 mm) was described as differing from that of all other neiroidid genera known, in having a greatly expanded distal margin as compared to the rather narrow proximal margin, with the uppermost radial considerably shorter than the second (PIETSCH, 1972a: 337, Fig. 4; 1974a: 89). Surprisingly, the pectoral lobes of the 10.8 mm and 118.0 mm specimens are typically neiroidid (Fig. 7 C, D).

Table 2 Counts, and measurements in percent of SL of *Phyllorhinichthys micractis*

	IOS uncatalogued	MCZ 49 937	Holotype LACM 9567—14	IOAN uncatalogued	ISH 536/73
Standard length	10.8	11.8	52.0	96.0	118.0
Length					
Head	37.0	34.6	44.2	44.2	45.7
Lower jaw	41.7	37.5	34.6	34.6	28.4
Premaxillary	23.1	24.0	15.4	17.7	16.9
Illicial bone (from X-ray)	—	—	5.0	9.0	13.1
Sphenotic spine	5.1	4.0	5.8	5.8	2.8
Quadrate spine	6.5	4.7	6.7	4.2	1.3
Distal esca filament	5.6	3.2	26.9	6.4	57.6
Upper snout flap	8.3	2.1	7.6	2.1	—
Lower snout flap	6.9	2.1	6.7	1.8	—
Longest tooth					
Upper jaw	—	2.6	1.9	1.6	1.9
Lower jaw	—	3.4	1.9	1.6	1.9
Head width	31.5	24.6	25.0	25.0	22.0
Head depth	37.0	32.4	38.5	35.4	30.9
Teeth <sup>1)</sup>					
Upper jaw	10	12	26	29	30
Lower jaw	9	8	17	19	15
Vomer	2—2	2—2	3—3	3—3	3—3
Dorsal	6	6	5	5	5
Anal	5	5	5	5	5
Pectoral	20	13	21	24	19

<sup>1)</sup> Counts are sum of left and right sides.

Fig. 6: Escae of *Phyllorhinichthys micractis*: A. ISH 536/73, 118.0 mm, left side; B. IOS uncatalogued, 10.8 mm, dorsal view; C. IOS uncatalogued, 10.8 mm, left side.

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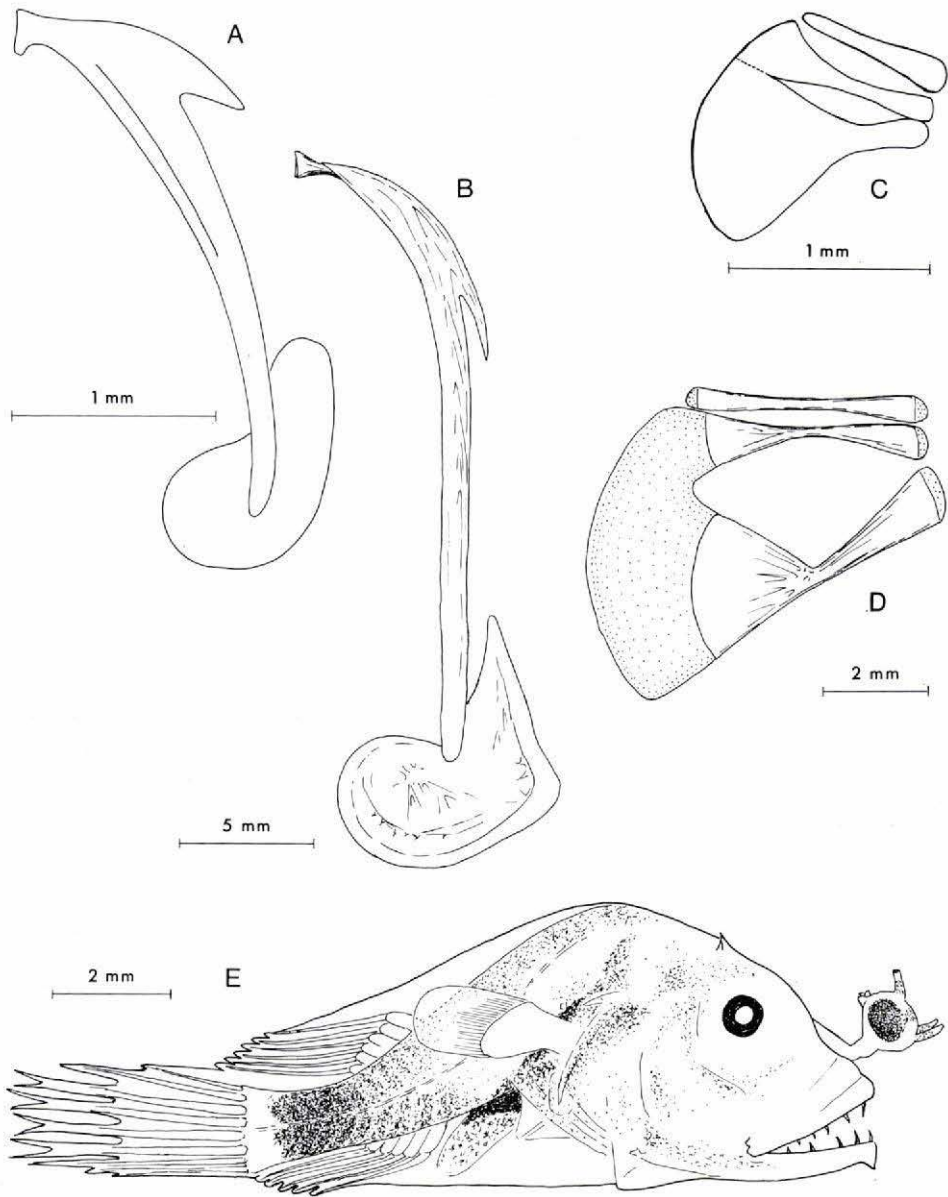


Fig. 7: *Phyllorhynchichthys micractis*. Opercular bones, left side: A. IOS uncatalogued, 10.8 mm; B. ISH 536/73, 118.0 mm. Pectoral radials, right side: C. IOS uncatalogued, 10.8 mm; D. ISH 536/73, 118.0 mm; E. IOS uncatalogued, 10.8 mm.

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The internal pigmentation of the partly skinned 10.8 mm specimen is shown in Figure 7 E. It has a very distinct band of pigment on the caudal peduncle, while the pigmentation on the head and anterior part of the body is diffuse and weak, and possibly developed after metamorphosis. The same internal pigment pattern can be observed through the faintly pigmented skin of the 11.8 mm specimen. The presence of this peduncular band, and the lack of opercular and dorsal pigment groups combined with the numbers of dorsal and anal fin rays (D. 5–6, A. 5) and the rounded suboperculum, will distinguish larval *Phyllorhinichthys* from all known larval ceratioids (BERTELSEN, 1951).

Counts and measurements of all known material of *P. micractis* are given in Table 2 (data for holotype and IOAN specimen taken from PIETSCH, 1969, 1972a).

## F. *Danaphryne Bertelsen, 1951*

### 1. *Danaphryne nigrifilis* (Regan and Trewavas, 1932) (Fig. 8)

This species was previously known from two specimens: the 24.0 mm holotype from the South China Sea and the 33.0 mm holotype of *Dolopichthys albifilosa* Waterman (1939) from the western north Atlantic. BERTELSEN (1951: 102) synonymized the latter with *D. nigrifilis* Regan and Trewavas (1932) and placed it in the new genus *Danaphryne*. The osteology of the largest specimen recorded here (ISH 2658/71, 32.0 mm) was described by PIETSCH (1974a).

Three specimens are in collections made by the “Walther Herwig”:

ISH 2658/71, 82.0 mm, WH Station 490—II/71.

ISH 2731/71, 73.0 mm, WH Station 494/71.

ISH 2963/71, 41.8 mm, WH Station 506/71.

In addition the following three previously unrecorded specimens have been made available: WIMS 04111, 45.5 mm, “Eastward” Station 6, 35°23.2' N, 74°43.4' W; LACM 31497—1, 29.0 mm, “Cyclone” III Station 4, 0°51.5' S, 170°04' E; USNM 216301, 20.0 mm, “Acre” 12—67, 32°04' N, 63°58' W.

The new material confirms that differences from the holotype of *D. nigrifilis* on which WATERMAN (1939) based *D. albifilosa* are within the individual and ontogenetic variations expected by BERTELSEN (1951; Table 3). As normal in ceratioids the relative size of the head decreases somewhat with age as indicated by the decrease in the length of the lower jaw from 41 to 45 percent of SL in the smallest to 37.6 to 39.5 percent in the larger specimens. The number of teeth increases with age from ten to 12 and 15 to 16 in each side of upper and lower jaws, respectively, of the 20.0 mm specimen to about 70 and 80 in that of the 73.0 mm specimen. Teeth in both jaws are arranged in a pattern similar to that described for *Pentherichthys* (see below): in an oblique transverse series of up to five teeth of increasing size. The number of dorsal fin rays varies from five to seven and those of the pectoral from 16 to 19. The variation in the relative length of the illicium is small and no change with age is indicated. That of the 27.0 mm holotype is somewhat longer (48 percent of SL) than those of the six other specimens (38 to 41 percent of SL). The basic pattern of esca is similar in all the specimens (Fig. 8). The bulb of the esca is anterodorsally conical, carries a distal pair of stout, posteriorly directed, tentacle-like filaments, and behind and between these, a large laterally compressed posterior appendage with a subspherical pigmented swelling on the ventral margin. The pore of the photophore is situated in the cleft between the bases of the tentacle-like filaments just in front of the base of the posterior appendage. Internal.

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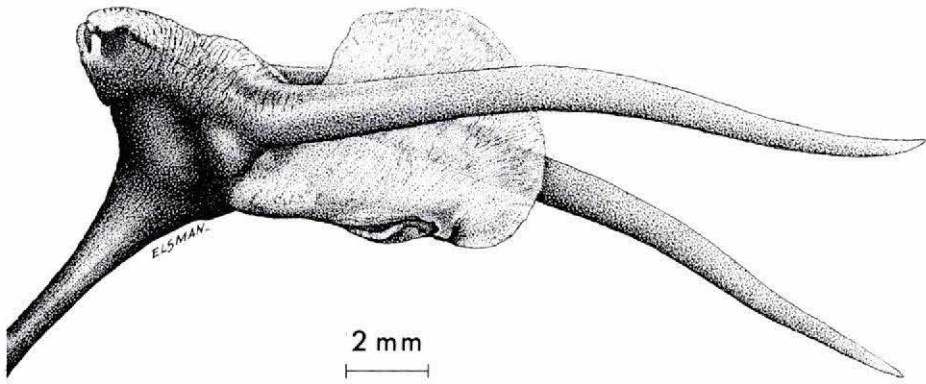


Fig. 8: Esca of *Danaphryne nigrifilis*, ISH 2731/71, 73.0 mm.

Table 3 Counts, and measurements in percent of SL of *Danaphryne nigrifilis*

	USNM 216 301	Holotype ZMUC P 92 102	LACM 31 497	MCZ <sup>1)</sup> 35 067	ISH 2963/71	VIMS 04 111	ISH 2731/71
Standard length	20.0	27.0	29.0	33.0	42.0	45.5	73.0
Length							
Lower jaw	45.0	42.0	44.0	41.0	39.5	39.0	37.6
Illicium	40.0	48.0	38.0	41.0	38.0	39.5	41.0
Escal filaments	11.0	21.0	4.5	10.0	11.7	11.0	22.5
Teeth <sup>2)</sup>							
Upper jaw	22	32	50	48	45	52	c.140
Lower jaw	31	38	52	48	75	75	c.160
Dorsal	7	6	7	5	7	7	6
Anal	5	5	5	5	5	5	5
Pectoral	16	16–17	17	17	19	16	18

1) Holotype of *Dolopichthys albifilosa* Waterman, 1939.

2) Counts are sum of left and right sides.

light-transmitting structures can be observed through the more or less transparent distal part of the bulb and its appendages. Under the skin of the anterior tip of the bulb reflecting tissue appears as a pair of white spots situated ventrolateral to a small white papilla. Between and above the white spots this tissue is overshadowed by pigmented lobes. Internal, more or less pigmented tubes with transparent lumen and reflecting inner walls lead from the distal part of the bulb into the filaments, as well as into the pigmented swelling in the ventral part of the posterior appendage. The pigmentation shape and relative size of the esca and its appendages varies, but no clear correlation with the size or distribution of the specimens appears. As normal in ceratioids the pigmentation tends to increase with size, but in the 27.0 mm holotype from the South China Sea the filaments are more pigmented and furthermore considerably longer than in specimens of similar size from the Atlantic as well as the only Pacific specimen.

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In the smallest of the available specimens (USNM, 20.0 mm), the subdermal larval pigmentation is preserved. The head and body are covered with melanophores except for the completely unpigmented caudal peduncle, the snout and the pectoral lobes. Concentrations of pigment are present on the margin of the gill-cover and on the interior part of the lower jaw. In these characters it fits the three larvae described by Bertelsen (1951: 123, Fig. 82) as "Oneirodid larva, gen. et sp.?" and differs from all other known ceratioid larvae. Furthermore, the shape of the opercular bones and numbers of fin rays of these larvae are in such good agreement with those of *Danaphryne nigrifilis* that they can now with little doubt be referred to this species. As confirmed by reexamination, one of these three larvae has 8 dorsal and 4 anal fin rays one more and one less, respectively, than previously observed in the species.

### G. *Microlophichthys* Regan and Trewavas, 1932

#### 1. *Microlophichthys microlophus* (Regan, 1925)

Nineteen metamorphosed females of this species (12.0 to 99.0 mm) have been previously reported from localities in the Atlantic, Indian Ocean and Pacific. The genus was revised by BERTELSEN (1951) who synonymized its four nominal species, described larvae and males of *M. microlophus*, and introduced a new species, *M. andracanthus*, on the basis of a single male specimen. The osteology of a 99.0 mm specimen was described by PIETSCH (1974a). Four specimens are in collections made by the "Walther Herwig":

ISH 660/68, 61.3 mm, WH Station 12—II/68.

ISH 1206/71, 61.5 mm, WH Station 412—III/71.

ISH 2326/71, 73.5 mm, WH Station 478/71.

ISH 2556/71, 106.0 mm, WH Station 486/71.

In the characteristic numbers of fin rays, the shape of the opercular bones and characters of the illicium and esca, the WH specimens fall within the observed variation of *M. microlophus*. They have all been nearly completely skinned in the net; remains of the esca are present only in the largest specimen. This largest known specimen (106.0 mm) is nearly mature. Its ovary, which is torn, is about 30 mm long and about 20 mm in greatest width. It is filled with eggs of 0.30 to 0.35 mm in diameter, situated in densely folded lamellae each containing a single layer of eggs.

### H. *Dolopichthys* Garman, 1899

"Walther Herwig" material of *Dolopichthys* was included in a recently published revision of the genus (PIETSCH, 1972b). Since that time, one additional specimen of *D. allector* has been collected which compares well with previously known material. Four of the six recognized species are represented:

#### 1. *Dolopichthys pullatus* Regan and Trewavas, 1932

ISH 244/66, 32.0 mm, WH Station 180b/66.

ISH 923/68, 2 (74.0—75.0 mm), WH Station 16/68.

ISH 2557/71, 2 (81.0—82.0 mm), WH Station 486/71.

ISH 2732/71, 115.0 mm, WH Station 494/71.

#### 2. *Dolopichthys longicornis* Parr, 1927

ISH 886/71, 87.0 mm, WH Station 376/71.

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- ISH 1005/71, 71.0 mm, WH Station 395/71.  
ISH 1098/71, 83.0 mm, WH Station 406/71.  
ISH 1205/71, 98.0 mm, WH Station 412—II/71.  
ISH 1464/71, 60.0 mm, WH Station 427/71.  
ISH 1710/71, 2 (64.0—125.0 mm), WH Station 443/71.  
ISH 2324/71, 159.0 mm, WH Station 473/71.  
ISH 2910/71, 80.0 mm, WH Station 502/71.

3. *Dolopichthys jubatus* Regan and Trewavas, 1932

- ISH 1064/71, 89.0 mm, WH Station 402—III/71.

4. *Dolopichthys allector* Garman, 1899

- ISH 884/71, 3 (69.0—154.0 mm), WH Station 376/71.  
ISH 3047/71, 101.0 mm, WH Station 395/71.  
ISH 1097/71, 92.5 mm, WH Station 406/71.  
ISH 142/76, 79.0 mm, WH Station 4—II/76.

### I. *Chaenophryne* Regan, 1925

Material of *Chaenophryne* collected by the "Walther Herwig" was included in a recent revision of the genus (PIETSCH, 1975). Two of the four recognized species are represented:

1. *Chaenophryne longiceps* Regan and Trewavas, 1932

- ISH 2323/71, 35.0 mm, WH Station 478/71.  
ISH 2962/71, 36.0 mm, WH Station 506/71.  
ISH 237/73, 102.0 mm, WH Station 668/73.  
ISH 607/73, 103.0 mm, WH Station 699/73.

2. *Chaenophryne ramifera* Regan and Trewavas, 1932

- ISH 765/68, 35.0 mm, WH Station 14—II/68.  
ISH 925/68, 2 (41.5—55.5 mm), WH Station 16/68.  
ISH 2057/71, 29.0 mm, WH Station 463—III/71.  
ISH 2247/71, 26.0 mm, WH Station 471—III/71.

### J. *Pentherichthys* Regan and Trewavas, 1932

1. *Pentherichthys venustus* Regan and Trewavas, 1932 (Fig. 9)

The holotype and only previously known specimen is a juvenile of 26.0 mm caught by the "Discovery" in the North Atlantic. NORMAN (1930) tentatively referred the specimen to *Dolopichthys allector* Garman, 1899, but noted that the structure of its esca was different from that of *D. allector* and gave a detailed description and illustration of this organ. REGAN and TREWAVAS (1932) made it the type of a new species *Dolopichthys venustus* and placed it together with another new species *D. atratus* in a new subgenus *Pentherichthys*. BERTELSEN (1951) raised this subgenus to generic level and described

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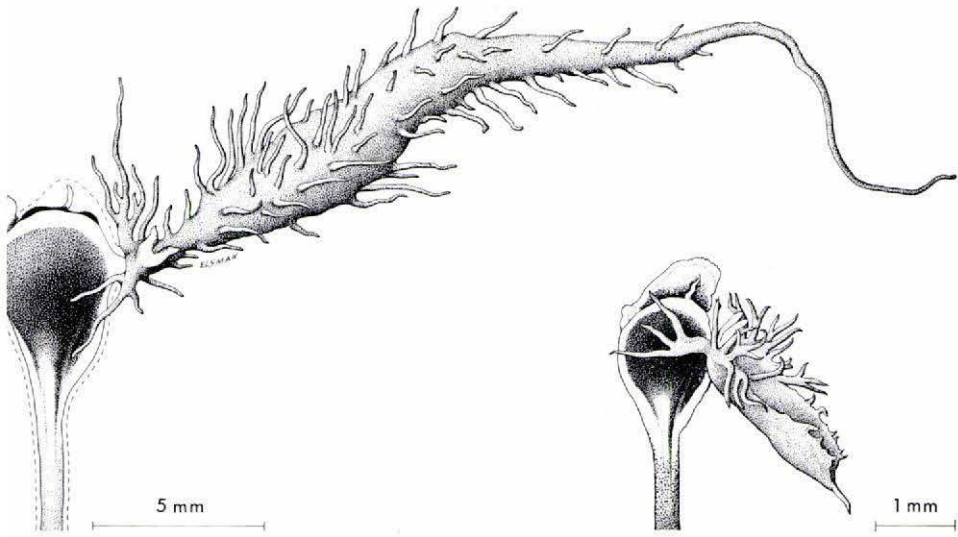


Fig. 9: Escae of *Pentherichthys venustus*, left sides: A. ISH 131/67, 92.0 mm; B. ISH 2058/71, 19.5 mm.

vac and males belonging to this genus. The osteology of the largest known specimen (ISH 130/67) was described by PIETSCH (1974a).

Three specimens are in collections made by the "Walther Herwig":

ISH 130/67, 119.0 mm, WH Station 196/67.

ISH 131/67, 92.0 mm, WH Station 211/67.

ISH 2058/71, 19.5 mm, WH Station 463—III/71.

Counts and measurements of the new specimens compare well with those of the holotype except that in the 19.5 mm and the 92.0 mm specimens the length of the illicium, including the bulb of the esca, is about 20 percent of SL or somewhat shorter than in the 26.0 mm holotype in which it is 30 percent of SL. In the cleared and stained specimen (ISH 130/67, 119.0 mm) the illicium is cut but seems to be only about 12 percent of SL. As is normal in ceratioids, the number of teeth increases with age. In each side of the upper jaw the numbers are about 25 in the 19.5 mm specimen, about 30 in the 26.0 mm holotype and about 110 in the specimens of 92.0 and 119.0 mm. Similarly the number in each side of the lower jaw increases from about 40 and 50 in the two smaller specimens to nearly one hundred in the two larger. They are arranged in a somewhat irregular, oblique, inverse series of up to seven teeth increasing in size towards the innermost and best developed.

The esca of the 19.5 mm specimen (Fig. 9 B) is well preserved. In the 92.0 mm specimen (Fig. 9 A) most of the skin of the bulb is lost and in the 119.0 mm specimen all the esca appendages are shrunken and damaged. Together with the 26.0 mm holotype they form an ontogenetic series and show some details which have not been previously described. The depth of the bulb of the esca decreases with increasing SL; it is about 11 percent of SL in the 19.5 mm specimen, 8 at 26.0 mm, 4.5 at 92.0 mm and 2.8 at 119.0 mm. The anterior distal papilla which is conical in the two smallest specimens, is compressed

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and leaf-shaped in the 92.0 mm specimen. In the two smallest specimens it is followed by a median distal transparent crest which is pigmented at base and is supported by internal white tapering papilla. In the 92.0 mm specimen the crest is torn and only the internal papilla is left. The length of the large tapering posterior appendage increases in relative length from nearly 15 percent of SL at 19.5 mm, nearly 20 percent at 26.0 mm and 32 percent at 92.0 mm. Similarly, the filaments on this appendage increase in number with length of fish. Most of the filaments are unbranched. In the two smaller specimens they are marginal on the somewhat flattened appendage while in the 92.0 mm specimen they are irregularly spread on the more conical appendage. Some of the proximal filaments are branched and in all the specimens there is an enlarged forward directed pair of stout branched filaments. They are relatively longest in the holotype (about three times the diameter of the bulb), but just slightly longer than the diameter of the bulb in the 19.5 mm and 92.0 mm specimens. In all the specimens the posterior appendage as well as its filaments have a very characteristic reddish-brown colour except for a pair of short, stout filaments at the upper margin of the bulb of the appendage. This pair of white, digitiform filaments is present in all the examined specimens including the holotype where it was not previously observed.

#### K. *Lophodolos* Lloyd, 1909

Material of *Lophodolos* collected by the "Walther Herwig" was included in a recently published revision of the genus (PIETSCH, 1974b). Both recognized species of the genus are represented:

##### 1. *Lophodolos acanthognathus* Regan, 1925

ISH 2733/71, 2 (40.0–63.0 mm), WH Station 494/71.

ISH 885/71, 70.0 mm, WH Station 376/71.

ISH 500/73, 46.0 mm, WH Station 693/73.

ISH 535/73, 61.0 mm, WH Station 695/73.

ISH 796/73, 55.0 mm, WH Station 709/73.

##### 2. *Lophodolos indicus* Lloyd, 1909

ISH 658/68, 2 (54.0–62.0 mm), WH Station 12–II/68.

ISH 1957/71, 75.0 mm, WH Station 459/71.

ISH 2558/71, 50.0 mm, WH Station 486/71.

ISH 2909/71, 36.0 mm, WH Station 502/71.

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