

From the Zoological Museum, Copenhagen

## Ergebnisse der Forschungsreisen des FFS „Walther Herwig“ nach Südamerika

### XX. Additional notes on Atlantic Bathylaconidae (Pisces, Isospondyli) with a new genus

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with 5 figures and 3 tables

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#### A. Introduction

Until recently, representatives of the Bathylaconidae were considered very rare. In 1968 NIELSEN & LARSEN gave a synopsis of this family of which only a total of 12 specimens were known, caught during a period of more than 70 years. In 1968 the “Walther Herwig” caught eight and the “Discovery” one additional specimen. Based on this material a report was published by NIELSEN & LARSEN (2), including a new Atlantic species, *B. krefftii*, represented by two specimens. In 1971 the “Walther Herwig” made another Atlantic cruise, fishing a considerable number of times at depths between 1000 and 2000 m with the same large floating trawl as used in 1968. The result was surprising: 42 additional specimens, of which 14 belong to *B. krefftii*. One of the reasons for this publication is to show the specific variation of *B. krefftii*. As a matter of fact, it varies so greatly from *B. nigricans* that it is here referred to a new genus, *Herwigia*.

#### B. Remarks on the Bathylaconidae

The alizarin-stained specimen of *H. krefftii* (fig. 4) shows four, free, bony structures placed far anteriorly of the dorsal fin, just behind the head. Examination of several radiographs revealed a normal presence of three or four of these structures in both *H. krefftii* and *B. nigricans*. These are most probably supraneurals.

Distribution. — Fig. 1 shows the “Walther Herwig” stations from cruise 23 (1968) and cruise 36 (1971), at which the large pelagic trawl fished at depths below 1000 m; except for three stations (1000–1015, 1300 and 1550 m) the fishing depths varied between 1750 and 2200 m. Stations at which bathylaconids were caught are marked with a filled-in circle, while open circles signify no bathylaconids. Furthermore, six specimens of Bathylaconidae (all dealt with by NIELSEN & LARSEN (1 & 2) and shown in fig. 1 with a triangle) have been caught in the Atlantic Ocean: one at the “Walther Herwig” st. 11/III/68 (16°08' N, 22°22' W) 560–580 m, one at the “Discovery” st. 6695 (27°46.7' N, 14°00' W) 800–900 m, two from stomachs of *Aphanopus carbo* from off Madeira 800–1200 m, the holotype of *B. nigricans* taken by the “Blake” (17°56' N, 64°54' W) sounding 4376 m, and the holotype of *Macromastax gymnos* south of Bermuda.

Horizontal distribution: Fig. 1 shows that the Atlantic bathylaconids, most probably, are restricted to the warmer parts of the ocean, between 35° N lat. and 35° S lat. It may here be added that the southern transatlantic section was undertaken in March, late summer.

\* dedicated to Dr. G. KREFFT on the occasion of his 60th birthday

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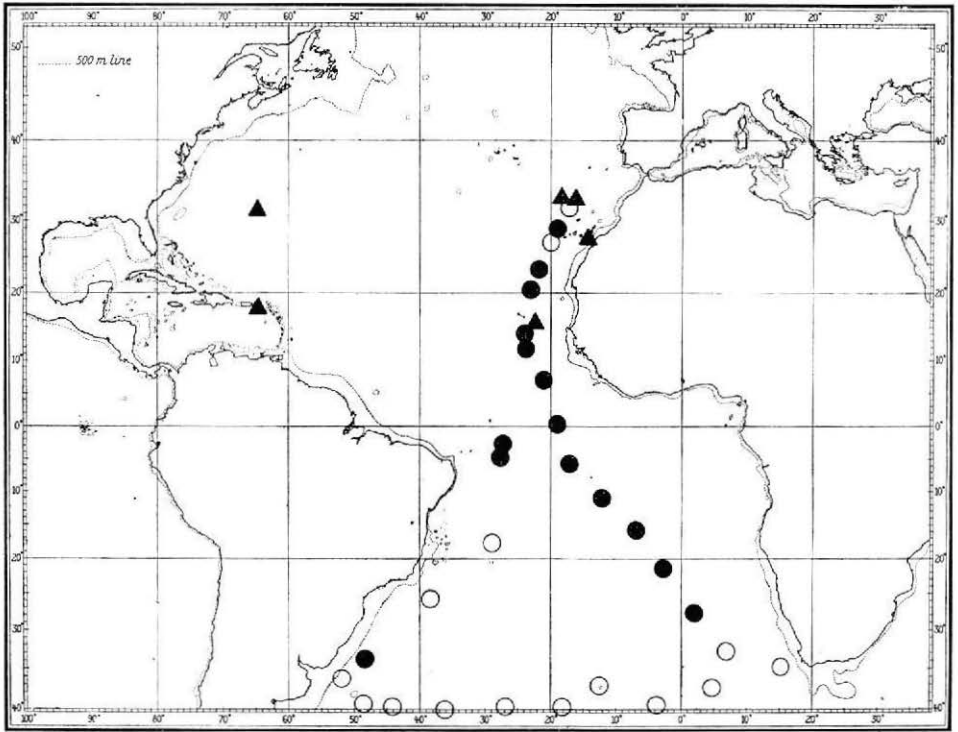


Fig. 1: "Walther Herwig" stations deeper than 1000 m with (●) and without (○) catch of Bathylaconidae. Other Atlantic catches of Bathylaconidae are marked with (▲).

Vertical distribution: NIELSEN & LARSEN (2:35) wrote regarding *B. nigricans* that it occurred meso- and bathypelagically, but the above data clearly show that only a minor part of the bathylaconids were caught mesopelagically, i. e. between c. 500 and c. 1000 m.

### C. *Herwigia* n. gen.

Type species *Bathylaco kreffti* Nielsen & Larsen, 1970:35. The holotype of *B. kreffti* was caught off Uruguay. This is the only known species of *Herwigia*.

The description of the type species was based on two specimens only, of which the paratype was in a poor condition. With the existence of 16 specimens, the variation of the characters of *B. kreffti* is now relatively well known. It is therefore possible to extract some characters which show such differences when compared to *B. nigricans* Goode & Bean, 1896 and *B. macrophthalmus* Nielsen & Larsen, 1968, that it seems reasonable to establish a new genus, *Herwigia*, for *B. kreffti*.

Generic diagnosis. — The diagnostic characters are shown in table 1 and compared with those of *Bathylaco*. Only when another species of *Herwigia* is described, it can be cleared up, which of the following characters are generic and which are specific.

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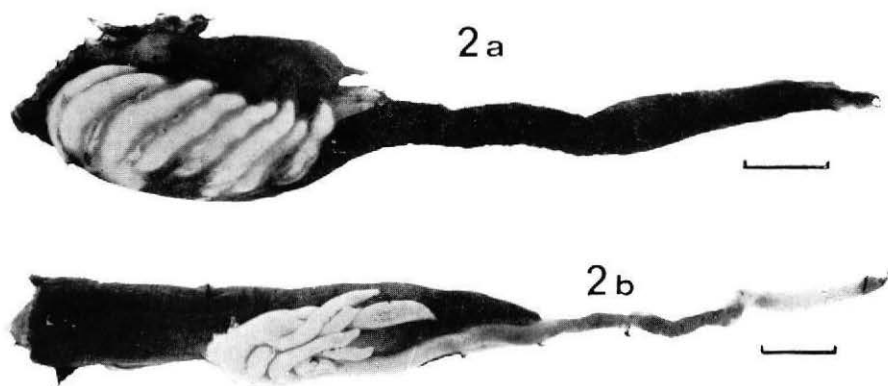


Fig. 2: Oesophagus, stomach, intestine and pyloric caeca from a) *Herwigia krefftii* SL 225 mm, "Walther Herwig" St. 494/71 and b) *Bathylaco nigricans* SL 220 mm, "Walther Herwig" St. 451/71. The line equals 10 mm.

Table 1 Comparison between *Herwigia* and *Bathylaco*, showing the diagnostic characters.

	<i>Herwigia</i>	<i>Bathylaco</i>
Number of pectoral fin-rays	16 (17.2) 18 [13 <sup>6</sup> ]	4 (7.2) 11 [31]
Number of gill rakers on anterior arch	21 (21.2) 23 [16]	11 (12.7) 17 [46]
Snout to posterior tip of stomach as % of SL	35.5 (39.0) 43.0 [16]	44.0 (52.0) 60 [31]
Width of lower jaw <sup>1</sup> ) as % of lower jaw length	22.0 (24.7) 27.0 [14]	12.5 (14.6) 17.0 [35]
Lower jaw	edentate	dentigerous
Shape of oesophagus and stomach <sup>2</sup> )	short, rounded	long, pointed
Pyloric caeca <sup>3</sup> )	in one group, equal in length	in two groups, unequal in length
Intestine	thick, black-pigmented	thin, pale
Ossification of vertebral column <sup>4</sup> )	fair	poor
General shape of fish <sup>5</sup> )	robust	slender

Comments to table 1:

- 1) Width of lower jaw is measured as the shortest distance from the angle of the mouth to the ventral edge of the lower jaw.
- 2) All specimens were opened, and the viscera examined. Even though the shape of the oesophagus and of the stomach is subject to variation, f. inst. according to the degree of filling, there was never any doubt about the generic value of this character (cf. fig. 2).
- 3) The pyloric caeca in *Herwigia* (fig. 2a) are almost uniform. None of them open into the first part of the intestine, but immediately after the bend of the intestine, the caeca are placed close to each other. In *Bathylaco* a few pyloric caeca (three in fig. 2b) open into the first part of the intestine, which is much longer here than in *Herwigia*. The remaining pyloric caeca are in connection with the intestine just after the bend.

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- 4) Vertebral column. — The following data are based on radiographs of all known specimens; besides, a specimen of *B. nigricans* and *H. krefftii* (fig. 4) were cleared and stained with alizarin. The ossification is generally poor, which makes it almost impossible to count the posteriormost vertebrae on radiographs. Since it is furthermore difficult to locate the transition between the precaudal and the caudal vertebrae, the number of vertebrae is left out of consideration.

*Herwigia*. The vertebral column is much better ossified than in *Bathylaco*. All radiographs showed ossified centra, even in a specimen with a standard length of 102 mm. Furthermore, all specimens exceeding 200 mm have sand-glass formed vertebral centra, which was never observed in *Bathylaco*.

*Bathylaco*. The vertebral column is very poorly ossified. In most cases the column appears as a continuous notochord. Only few radiographs show ossified centra; these are all rectangular, much higher than long. Naturally, all the small specimens (SL < 200 mm) belong to the first group, but there is no correlation between the degree of ossification and the standard length of the larger specimens. Only the largest specimen (SL 340 mm) has broad, but still rectangularly formed, vertebral centra.

- 5) Compare figs. 3 and 5.  
6) This is the number of specimens examined.

#### D. *Herwigia krefftii* (Nielsen & Larsen, 1970) (Fig. 3)

*Bathylaco krefftii* Nielsen & Larsen, 1970:35.

Material examined (14 specimens):

- 3 specimens (SL 160–340); “Walther Herwig” St. 435/71 (27°14' S, 2°56' E); 1900–2000 m. 1. Apr. 1971. ISH 1540/71.  
1 specimen (SL 275); “Walther Herwig” St. 443/71 (21°35' S, 2°00' W); 2000–2100 m. 3. Apr. 1971. ISH 1656/71.  
2 specimens (SL 102–325); “Walther Herwig” St. 451/71 (15°45' S, 6°06' W); 1800–1900 m. 5. Apr. 1971. ISH 1759/71.  
1 specimen (SL 165); “Walther Herwig” St. 478/71 (1°04' N, 18°22' W); 2100 m. 12. Apr. 1971. ISH 2256/71.  
7 specimens (SL 168–345); “Walther Herwig” St. 494/71 (14°05' N, 23°12' W); 1900 m. 16. Apr. 1971. ISH 2668/71.



Fig. 3: Holotype of *Herwigia krefftii* SL 212 mm, “Walther Herwig” St. 28/II/68.

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## Remarks:

Some of the meristic and morphometric characters are shown in tables 1 and 2. (See also the comments to table 1). — The number of recorded specimens of *H. krefftii* has increased from 2 to 16, so the specific variation is now relatively well known. When the characters of the present material are inserted in the frequency distribution tables from NIELSEN & LARSEN (2:29–30), it appears that there is still no overlap between *krefftii* and *nigricans*, except for the number of anal fin-rays (table 2). Gross examination of the gonads showed that the smallest recognizable male had a standard length of 262 mm, while females with a standard length down to 102 mm had distinct eggs. This indicates that males become adult at a larger size than do females (see table 3). All five males have a grey-spotted surface of the testes. The largest of the eight females (SL 340 mm) is the only specimen with un-divided ovaries; most of the eggs were c. 0.2 mm, and a minor part c. 2.5 mm in diameter. The remaining females all had the ovaries divided by up to 70 septa; the diameter of the eggs varied from 0.1 to 0.3 mm.

Apparently, there are no differences in the horizontal and vertical distribution of *H. krefftii* and *B. nigricans* in the Atlantic Ocean.

Table 2 Meristic and morphometric characters of *Herwigia* and *Bathylaco*.

	<i>H. krefftii</i>	<i>B. nigricans</i>	<i>B. macrophthalmus</i>	<i>B. specimen</i>
SL in mm	102–346	<sup>3)</sup> 70–340	203	252
<i>Meristic characters</i>				
Dorsal fin-rays	15 (16.7) 18 [12 <sup>2)</sup>	17 (18.9) 22 [26	17	17
Anal fin-rays	13 (13.8) 15 [16	10 (11.9) 13 [42	17	12
Pectoral fin-rays	16 (17.2) 18 [13	6 ( 7.3) 11 [29	4	7
<i>Morphometric characters</i>				
Head as % of SL	25.5 (29.6) 31.5 [14	23.5 (27.5) 32.5 [31	28.5	22.5
1) Width of lower jaw as % of lower jaw length	22.0 (24.7) 27.0 [14	12.5 (14.7) 17.0 [33	15.0	12.5
Post. edge of pigmented eye to post. edge of upper jaw as % of upper jaw	44.0 (46.2) 51 [9	53 <sup>4)</sup> (59.5) 63 [29	46.0	47.5
Snout to post. tip of stomach as % of SL	35.5 (39.0) 43.0 [16	45.0 (52.3) 60 [29	51	44.0
Predorsal as % of SL	60 (62) 63 [11	53 (56) 61 [23	61	56
Base of dorsal fin as % of SL	15.0 (16.5) 18.0 [15	20.0 (24.3) 29.0 [39	17.0	19.5

## Comments to table 2:

- 1) See the remark below table 1.
- 2) This is the number of specimens examined.
- 3) The 35 mm long holotype of *Macromastax gymnos* Beebe, 1933 is excluded.
- 4) Two specimens are excluded (SL 70 and 80 mm); the percentage for these are 43.0 and 44.5, respectively.

Compared to the corresponding tables in the two previous papers on Bathylaconidae by NIELSEN & LARSEN (1:224 and 2:32–33) this table mainly includes those characters which show specific and generic variations.

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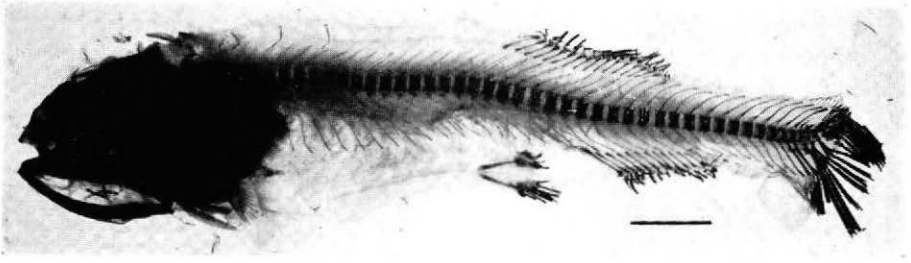


Fig. 4: *H. krefftii* SL 225 mm, "Walther Herwig" St. 494/71, stained with alizarin. The line equals 20 mm.

**E. *Bathylaco nigricans* Goode & Bean, 1896 (Fig. 5)**

Material examined (28 specimens):

- 1 specimen (SL 318); "Walther Herwig" St. 443/71 ( $21^{\circ}35' S$ ,  $2^{\circ}00' W$ ); 2000–2100 m. 3. Apr. 1971. ISH 1657/71.
- 2 specimens (SL 220–253); "Walther Herwig" St. 451/71 ( $15^{\circ}45' S$ ,  $6^{\circ}06' W$ ); 1800–1900 m. 5. Apr. 1971. ISH 1760/71.
- 3 specimens (SL 110–220); "Walther Herwig" St. 459/71 ( $10^{\circ}57' S$ ,  $11^{\circ}20' W$ ); 1800–1900 m. 7. Apr. 1971. ISH 1919/71.
- 2 specimens (SL 80–285); "Walther Herwig" St. 467/71 ( $5^{\circ}30' S$ ,  $16^{\circ}28' W$ ); 1850–1900 m. 9. Apr. 1971. ISH 2064/71.
- 3 specimens (SL 310–320); "Walther Herwig" St. 478/71 ( $1^{\circ}04' N$ ,  $18^{\circ}22' W$ ); 2100 m. 12. Apr. 1971. ISH 2257/71.
- 9 specimens (SL 110–280); "Walther Herwig" St. 486/71 ( $7^{\circ}32' N$ ,  $20^{\circ}54' W$ ); c. 1300 m. 14. Apr. 1971. ISH 2489/71.
- 3 specimens (SL 207–240); "Walther Herwig" St. 494/71 ( $14^{\circ}05' N$ ,  $23^{\circ}12' W$ ); 1900 m. 16. Apr. 1971. ISH 2667/71.
- 2 specimens (SL 110 + ? – 295); "Walther Herwig" St. 502/71 ( $20^{\circ}27' N$ ,  $21^{\circ}58' W$ ); 1900–2100 m. 18. Apr. 1971. ISH 2871/71.
- 3 specimens (SL 242–310); "Walther Herwig" St. 506/71 ( $23^{\circ}47' N$ ,  $20^{\circ}59' W$ ); 1800–2100 m. 19. Apr. 1971. ISH 2918/71.

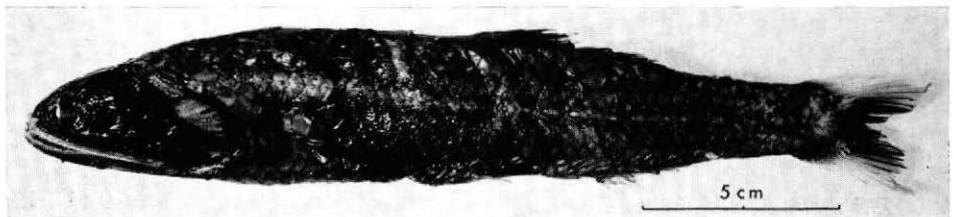


Fig. 5: *Bathylaco nigricans* SL 204 mm, "Discovery" St. 6695.

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## Remarks:

Very little can be added to the descriptions given by NIELSEN & LARSEN (1, 2). The variation of the characters in table 2 has become greater, but considering that the number of specimens increased from 16 to 44, the change in the variation is insignificant.

Table 3 Partition of males and females of *B. nigricans* and *H. krefftii* in size groups (standard length in mm).

	50—99			100—199			200—299			300—350		
	♂	♀	?	♂	♀	?	♂	♀	?	♂	♀	?
<i>B. nigricans</i>		1	1	1	4	6	11	13				7
<i>H. krefftii</i>					4	1	3	2	2	2	2	

Table 3 shows that there are more females than males, and that the females tend to grow to a larger size than do the males. A gross examination of the gonads was made of all the specimens. It showed that when the larger eggs had reached a diameter of 1.5—2.0 mm, the last signs of the numerous transversal septa, typical of ovaries containing smaller eggs, had disappeared. The largest eggs (5—6 mm in diameter) were observed in a 318 mm long specimen; there were two size groups of eggs corresponding to the previous observations by Nielsen & Larsen (1:229, fig. 6). In one of the males the testes were divided into c. 50 lobes, while there were c. 15 and c. 35 lobes in the previously examined males (NIELSEN & LARSEN (1:229)).

See also the remarks to table 1.

#### F. *Bathylaco* specimen

NIELSEN & LARSEN (2:38) described a 252 mm long specimen from St. 16/68 under the heading “*Bathylaco* specimen”. It is most closely related to *B. nigricans*, but differs slightly from this species in a number of meristic as well as of morphometric characters. It was not referred to a new species, partly because only one specimen was known, and partly because the variation of *B. nigricans* was insufficiently known. However, even with the addition of the present material of *B. nigricans*, the “*Bathylaco* specimen” still falls outside or is at the limit of the variation of *B. nigricans* in five of the six morphometric characters mentioned in table 2. The most conspicuous differences are the relatively small head- and jaw-length (cf. fig. 1 in NIELSEN & LARSEN (2:29)). The specimen is a normally developed female; the largest eggs in the ovary are c. 1 mm in diameter. Additional specimens would have justified the establishment of a new species of *Bathylaco*.

#### G. Summary

During cruise 36 of the “Walther Herwig” in the Atlantic Ocean a number of 42 specimens of Bathylaconidae were caught. Of these 14 belong to *Bathylaco krefftii* and 28 to *B. nigricans*. The inter- and intraspecific variation is now so well known that a new genus, *Herwigia*, based on *B. krefftii*, is established.

#### H. Zusammenfassung

Im Verlauf der 36. Reise von FFS „Walther Herwig“ wurden 42 Angehörige der Familie Bathylaconidae gefangen. Von diesen gehören 14 zu *Bathylaco krefftii* und 28 zu *B. nigricans*. Die an Hand des alten und neuen Materials beobachteten Unterschiede zwischen diesen beiden Arten rechtfertigen die Aufstellung einer auf *B. krefftii* basierenden neuen Gattung, *Herwigia*.

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**I. Acknowledgements**

I am indebted to G. Krefft, Institut für Seefischerei, Hamburg, for allowing me to borrow the "Walther Herwig" material, and to G. Brovad for taking the photographs.

**J. Literature**

- (1) NIELSEN, J. G.; LARSEN, V.: Synopsis of the Bathylaconidae (Pisces, Isospondyli) with a new eastern Pacific species. — *Galathea Rep.* 9: 221–238, 1968.
- (2) NIELSEN, J. G.; LARSEN, V.: Ergebnisse der Forschungsreisen des FFS "Walther Herwig" nach Südamerika. XIII. Notes on the Bathylaconidae (Pisces, Isospondyli) with a new species from the Atlantic Ocean. — *Arch. FischWiss.* 21 (1): 28–39, 1970.

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