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XVI. Redescription of the genus *Selachophidium* (Pisces, Brotulidae) with two new species

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with 14 figures and 6 tables

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A. Introduction

As is true of many of the genera described long ago, *Selachophidium* Gilchrist, 1903 also needs to be redescribed in order to make possible comparisons between genera and to find relationships within the family Brotulidae. Until now only the type species, *S. guentheri*, was known; furthermore, only a few specimens have been described. In this paper an examination is made of 56 specimens, so it is possible to learn about specific variation. Also information on generic variation is now available, as two additional species are described in this paper.

B. *Selachophidium* Gilchrist, 1903

Generic diagnosis. — Owing to the description in this paper of two new species the following diagnosis differs in some respects from those given by GILCHRIST (2: 209) and NORMAN (12: 81): Oviparous brotulids with a compressed body, a fully scaled head, a protruding snout, large eyes, a bifurcated spine on the operculum, no fangs developed, 2–6 pseudobranchial filaments, about 20 long, dentigerous rakers on the anterior gill arch, a well developed swimbladder, a single ventral fin-ray in each fin, the dorsal fin-rays 2–3 times longer than the anal fin-rays, continuous vertical fins, eight branchiostegal rays, anteriorly 3–4 long, broad parapophyses and 13–18 pre-caudal vertebrae.

Relationships. — GILCHRIST (2: 209) wrote that *Selachophidium* appears to be most closely allied to *Cataetyx* Günther, 1887. However, this is not correct as *Selachophidium* is oviparous while *Cataetyx* belongs to the viviparous group. — About 35 genera of oviparous brotulids are known, but the bulk of these descriptions are not adequate for generic comparisons. I have examined representatives of a number of these genera. The most closely related genus seems to be *Homostolus* Smith & Radcliffe, 1913, of which the type species, *H. acer* Smith & Radcliffe, 1913, was compared to *Selachophidium* spp. Agreement was found between the two genera in a number of important characters: Form of lateral line, opercular spine, snout, body, eye, dentition, gill rakers and vertebrae. Other, but not so close relatives, are *Neobythites* Goode & Bean, 1886 and *Dicrolene* Goode & Bean, 1883.

Generic description. — The characters mentioned in this section are common to all three *Selachophidium* spp., but I do not find them generically diagnostic. The head is cavernous with mucous chambers. The large eyes are provided with a thick dermal

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cornea. The interorbital width is very large. The posterior nostril is situated relatively close to the eye and the anterior one midway between the tip of the snout and the eye. The maxillary ends well behind the eye; its posterior part is expanded. Two pairs of otoliths are visible on the radiographs of all newly caught specimens (fig. 11). Fig. 14 shows the shape of the dentigerous vomer and palatines in *S. vitiazi*; these bones are similar in the other two species. The premaxillaries and dentaries have many, equal sized, pointed teeth. They are close-set and placed in irregular rows, but are smaller and less variable in size than those of the vomer and palatines, which are also arranged in irregular rows. The dentigerous basibranchials consist of a single oblong plate. There are five upper pharyngeal tooth-plates in each side (fig. 10). Prolonged gill rakers are found only in the outer row of the anterior arch.

Table 1 Total number of gill rakers from the right side.

		<i>S. guentheri</i>		<i>S. americanum</i>		<i>S. vitiazi</i>
1st	gill arch with	26 (28)	31	27 (29.7)	33	24
2nd	— — —	18 (20.3)	21	20 (22.1)	24	20
3rd	— — —	16 (17.9)	19	15 (17.2)	19	14
4th	— — —	13 (13.6)	15	11 (13.4)	15	11
5th	— — —	7 (9)	11	8 (8.5)	10	6

Remarks on table 1: The variation for *S. americanum* and for the posterior four arches of *S. guentheri* is based on 19 specimens while the variation for the anterior arch is based on 54 specimens. The numbers in parentheses indicate the mean-value.

There are 13–18 precaudal vertebrae. The anterior neural spine is only half the length of the second neural spine. The anterior 3–4 parapophyses are long and broad, the following 2–3 are very short; subsequent ones are progressively becoming longer and broader. There are no pleural ribs on the anterior two vertebrae. There is a distinct transition between the precaudal and the caudal vertebrae. Anteriorly in the caudal part the ratio of the number of dorsal fin-rays to the number of corresponding vertebrae is 1.7–1.8:1 while near the posterior end there are relatively more fin-rays (the ratio is 2.0–2.2:1).

Biology. — The different types of gear in which the specimens of the three species were caught all worked on the bottom at depths between 274 and 982 metres, viz. at bathyal depths. Except for a few vertebral columns and scales of fishes very little was found in the stomachs and intestines. The species seem to be oviparous, i.e. judging from the lack of an intromittent organ. Furthermore, spawning seems to be seasonal.

Distribution. — Fig. 1 shows the localities for the material treated in this paper. I know of additional localities from South Africa, but they all fall within the area indicated by fig. 1.

C. Species

The literature contains few references to the genus *Selachophidium*, and despite the fact that the type species, *S. guentheri*, is common, little is known about variation in this species. Therefore, a number of meristic and morphometric characters are given below. One of the species, *S. vitiazi*, seems to be rare, but this may be due to the fact that very little bathyal fishing has taken place off West Australia.

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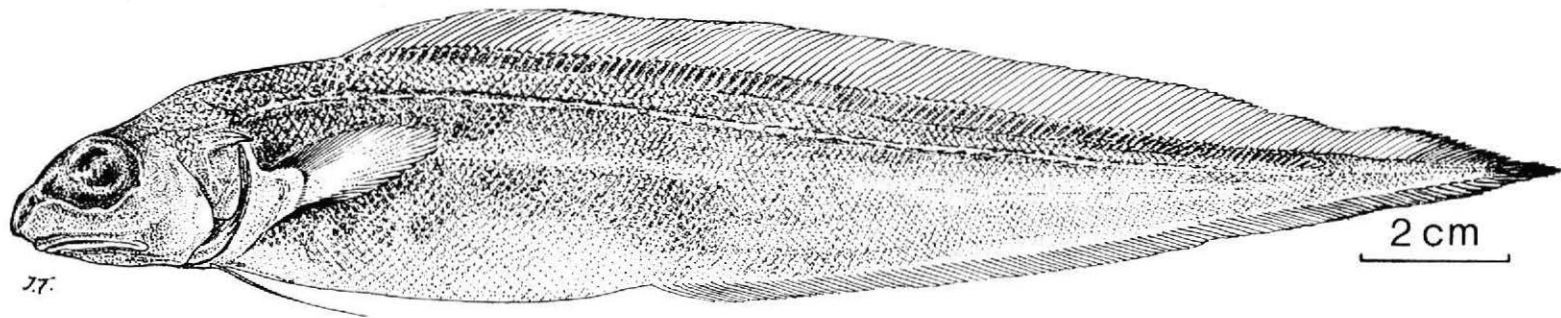


Fig. 2: Drawing of lectotype of *S. guentheri* Gilchrist, 1903. SL 199 mm. SAM. 12081.

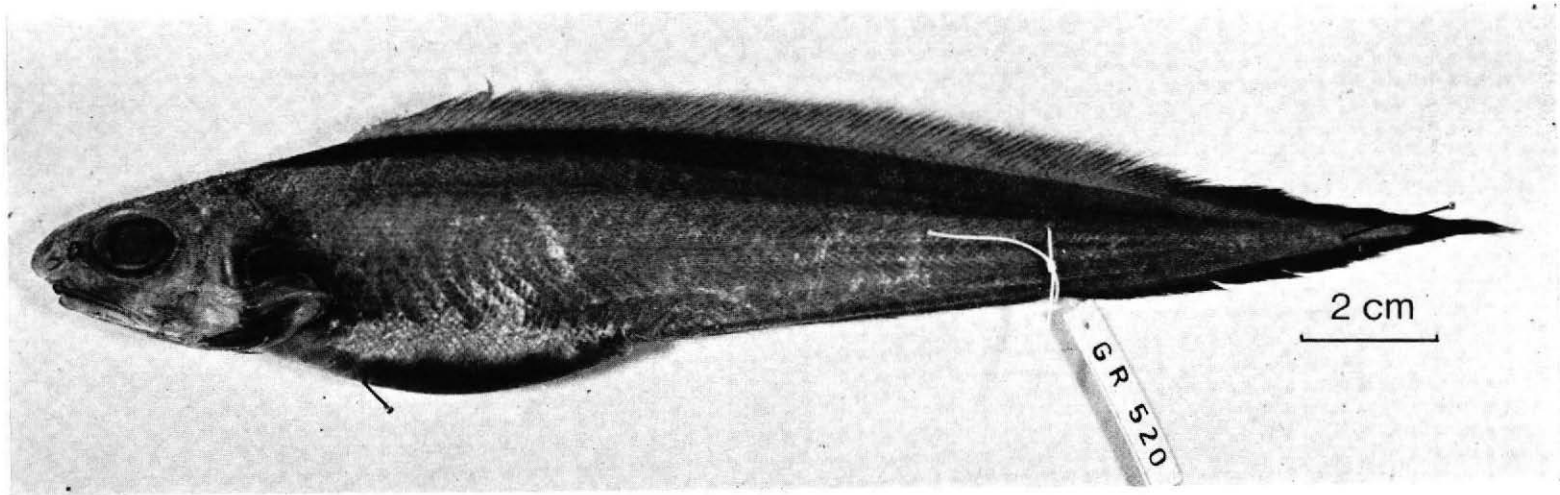


Fig. 3: Photograph of *S. guentheri*, SL 200 mm. ZMUC. P77491.

Table 6 Depth at anterior anal fin-ray in % of SL

	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5
<i>S. guentheri</i>	1	4	9	3	2	2	.	.	.	.	.	.	.
<i>S. americanum</i>	.	.	.	.	3	3	3	6	3	1	.	.	.
<i>S. vittazi</i>	.	.	.	.	.	.	.	.	.	.	.	.	1

Key to the *Selachophidium* spp.:

1. Number of dorsal fin-rays more than 112. Pyloric caeca not developed. Pseudo-branchial filaments 3–6. Vertebrae 67–71. Head-length less than 20% of SL. Upper jaw-length less than 10% of SL..... *S. guentheri* Gilchrist, 1903
2. Number of dorsal fin-rays less than 109. Number of pyloric caeca c. 10. Pseudo-branchial filaments 2. Vertebrae 56–63. Head-length more than 20% of SL. Upper jaw-length more than 10% of SL.
 - a. Number of dorsal fin-rays 100–108. Vertebrae 59–63. Depth at anterior anal fin-ray 14.5–17.0% of SL..... *S. americanum* n. sp.
 - b. Number of dorsal fin-rays 93. Vertebrae 56. Depth at anterior anal fin-ray 18.5% of SL..... *S. vittazi* n. sp.

1. *Selachophidium guentheri* Gilchrist, 1903 (Fig. 2)*S. guentheri*: Gilchrist, 1903, p. 209–210, pl. XVII.*S. guentheri*: GILCHRIST & THOMPSON 1915, p. 88–89.*S. guentheri*: GILCHRIST & THOMPSON 1917, p. 416.*S. guentheri*: THOMPSON 1918, p. 152.*S. guentheri*: GILCHRIST 1922, p. 77.*S. guentheri*: BARNARD 1927, p. 876.*S. guentheri*: SMITH 1953, p. 362–363, fig. 1018.

Material (56 specimens):

Lectotype (SL 199 mm); off Cape Peninsula (Table Mountain bearing N. 79° E., distant 40 miles); 457 m; green sand; shrimp net. 18. Apr. 1900. SAM. Cat. No. 12081.

Paralectotype (SL 225 mm); same data. BMNH. Cat. No. 1902. 5. 28. 7.

13 specimens (SL 115–230 mm); „Galathea“ St. 137 (20°04' S, 11°56' E); 537 m; sledge trawl, 3 m wide. 23. Dec. 1950. ZMUC. Cat. Nos. P 77488–500.

4 specimens (SL 163–252 mm); „Galathea“ St. 197 (29°57' S, 31°26' E); 495 m; shrimp otter trawl. 14. Febr. 1951. ZMUC. Cat. Nos. P 77501–504.

26 specimens (SL¹) 197–275 mm); „Galathea“ St. 202 (25°20' S, 35°17' E); 590 m; herring otter trawl. 21. Febr. 1951. ZMUC. Cat. Nos. P 77505–530.

3 specimens (SL 186–265 mm); „Pieter Faure“ field No. 12082 (N 1/2 E off Bashee River, northeast of East London). USNM. Cat. No. 188824.

1 specimen (SL 284 mm); field No. 23186 (bought in Cape Town, most probably from Saldanha Bay). USNM. Cat. No. 188828.

1 specimen (SL 253 mm); „Anton Bruun“ St. 397C (26°07' S, 34°11' E); 600–665 m. 29. Sept. 1964. USNM. Cat. No. 204850.

6 specimens (SL 140–157 mm); „Undaunted“ St. 68–267 (17°23' S, 11°20' E); 366–411 m. 24. Mar. 1968. USNM. Cat. No. 204849.

¹) 2 specimens are smaller, but they both have a regenerated caudal part.

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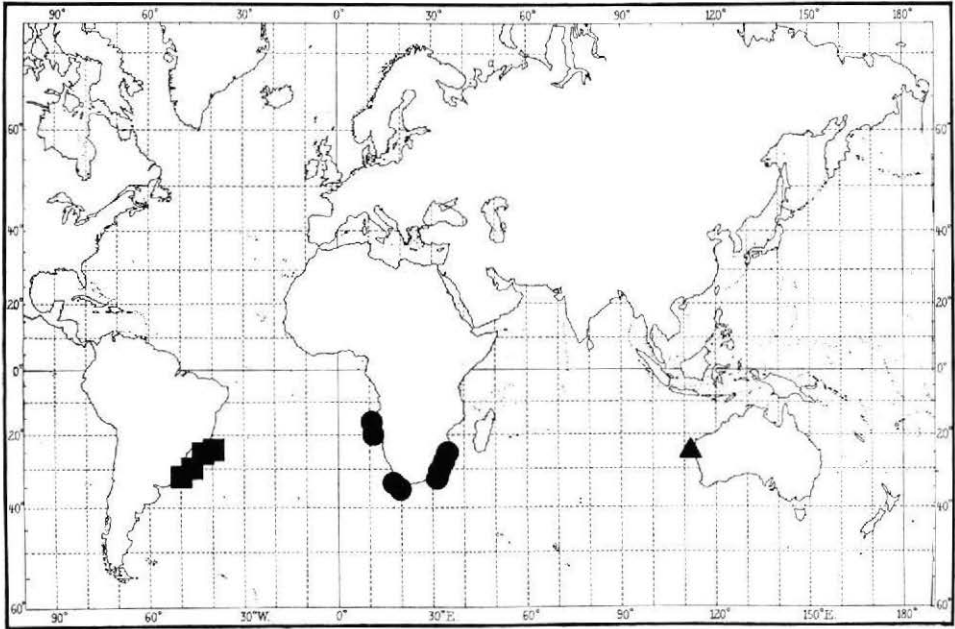


Fig. 1: Records of the *Selachophidium* spp.: *S. guentheri* ●, *S. americanum* ■, *S. vitiazi* ▲.

Frequency distribution for some of the characters of *Selachophidium* spp.:

Table 3 Number of dorsal fin-rays

	93	100	1	2	3	4	5	6	7	8	112	13	14	15	16	17	18	19	20	21
<i>S. guentheri</i>	.	.	.	.	.	.	.	.	.	.	.	1	3	7	10	12	7	5	2	1
<i>S. americanum</i>	.	1	3	7	2	4	2	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>S. vitiazi</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 4 Number of anal fin-rays

	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
<i>S. guentheri</i>	.	.	.	.	.	.	.	.	.	.	.	1	3	9	12	12	5	3	.	1
<i>S. americanum</i>	.	.	.	1	5	5	2	.	5	.	.	.	.	.	.	.	.	.	.	.
<i>S. vitiazi</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5 Total number of vertebrae (incl. urostyle)

	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
<i>S. guentheri</i>	6	19	21	3	1
<i>S. americanum</i>	.	.	3	1	7	8	1
<i>S. vitiazi</i>	1

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Table 2 Meristic and morphometric characters of *Selachophidium* spp.¹⁾

	Lectotype	<i>S. guentheri</i>			Holotype	<i>S. americanum</i>			<i>S. vitiazi</i> Holotype
		Range	Mean	No. of spms.		Range	Mean	No. of spms.	
Standard length (SL)	199	115–284		56	235	182–250		20	123
<u>Meristic characters</u>									
Dorsal fin-rays	115	113–121	116.8	48	102	100–108	103	20	93
Caudal fin-rays	8	8–8	8	43	8	8–8	8	17	8
Anal fin-rays	91	89–97	92.6	46	83	82–89	85.3	19	78
Ventral fin-rays	1–1	1–1	1	56	1–1	1–1	1	20	1
Pectoral fin-rays	—	—	—	—	29	28–32	29.6	14	29
	28	26–29	27.4	55	30	28–32	29.9	16	28
Pseudobranchial filaments (right/left) ²⁾	5/4	3–6	4.6	52	2/2	2/2–2/2	2/2	20	2/2
Gill rakers on anterior right arch	1+5/1/15+6				1+6/1/15+6				1+4/1/12+6
Branchiostegal rays	8–8	8–9	8.1	47	8–8	8–8	8	15	8–8
Vertebrae (incl. urostyle)	18	17–18	17.1	56	14	13–14	13.9	20	13
	50	50–53	51.4	50	48	45–49	47.5	20	43
total number	68	67–71	68.3	50	62	59–63	61.2	20	56
Anterior anal-ray below dorsal-ray No.	26	25–30	27.4	54	23	21–23	22	20	16
Anterior anal-ray below vertebra No.	21	19–22	20.5	55	17	16–18	17.5	20	15
Anterior dorsal-ray above vertebra No.	7	5–8	6.5	54	5	5–6	5.4	20	6
<u>Morphometric characters as % of SL</u>									
Head	17.0	16.5–19.0	17.5	46	21.0	20.0–22.5	21.5	20	23.0
Depth at anterior anal-ray	14.5	12.5–15.0	13.5	21	14.5	14.5–17.0	15.5	19	18.5
Snout	5.1	4.0–5.7	4.6	45	5.5	5.2–6.0	5.6	20	6.1
Upper jaw	9.5	8.1–9.7	8.9	45	11.0	10.0–11.5	11.0	20	12.0
Horizontal diameter of dermal cornea	6.2	5.0–6.7	5.8	43	5.6	5.2–6.0	5.5	20	5.3
Preanal	41.0	39.0–45.5	42.5	46	41.5	40.0–45.5	43.5	20	40.0
Predorsal	24.5	20.5–25.0	23.0	46	24.0	23.5–27.0	25.0	20	28.0
Distance from basis of ventral fins to anterior anal-ray	27.5	26.5–33.5	29.0	46	27.5	25.5–29.5	27.5	20	22.0

¹⁾ Counts and measurements are taken in accordance with HUBBS & LAGLER (9:19) with the following exceptions: The upper jaw symphysis is used as the most anterior point of the fish as the tip of the protruding snout may become deformed during preservation. The depth of the body is measured at the anterior anal-ray and not at the maximum depth which is much influenced by the state of preservation of the viscera and by the stomach contents. As a substitute for "diameter of the eye" is here used "horizontal diameter of the dermal cornea".

²⁾ The number of filaments given for *S. guentheri* is an average between those on the two sides.

Selection of lectotype. — GILCHRIST (2: 210) did not designate a holotype, but wrote “Several specimens procured along with other deep sea Gadidae and Macruridae . . .”. He gave some measurements and an illustration of one specimen, which here is selected as the lectotype. M.-L. PENRITH has informed me that only the abovementioned specimen of the syntypes (now the lectotype) is kept in the South African Museum. A. C. WHEELER wrote me that there are two syntypes (now paralectotypes) in the British Museum.

Remarks on the lectotype. — Table 2 column 1 gives some of the meristic and morphometric characters of the lectotype. They fit well into the total variation of *S. guentheri*. GILCHRIST (2: 210) noted that the body of the measured specimen was less deep than most of the other specimens of the type material. This is not the case when the depth is measured at the anterior anal fin-ray. Fig. 2. shows the lectotype in its present state.

Diagnosis and relationships. — Most of the diagnostic characters are mentioned on p. 27 where *S. guentheri* is compared to the closest relative, *S. americanum*.

Condition. — The 26 specimens from “Galathea” St. 202 are in a bad condition being hard and shrunken, while the rest of the material is well preserved.

Description. — The meristic and morphometric characters are given in tables 2–6. The snout seems to be more pointed than in *S. americanum*. The horizontal diameter of the dermal cornea is larger than the snout. The distinct lateral line runs rather close to the dorsum and continues to the base of the caudal fin. The dorsal fin originates above the distal half of the pectoral fin. The anterior anal fin-ray is placed below the 25th–30th dorsal fin-ray. The ventral fins are situated well in front of the pectoral fins. Very few scales remain. Both processes of the bifurcated opercular spine are well ossified. The otoliths are shown on fig. 4. Fig. 3 gives an impression of the colouration of a specimen, which has been preserved for about 20 years. The eye, operculum and peritoneum are blue. The body is light brown below the lateral line and more dark above. Common for all 56 specimens of *S. guentheri* are the black rays posteriorly in the dorsal and anal fins and in the caudal fin. This species is generally more coloured than *S. americanum*, in spite of the fact that the material of the latter species has been preserved

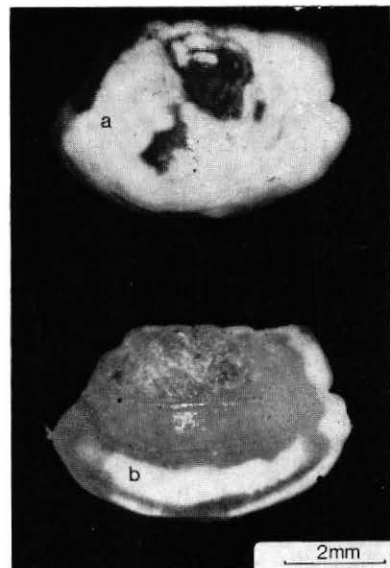


Fig. 4: Otoliths from *S. guentheri*, SL 157 mm. USNM. 204849. a) Lateral side of left sagitta. b) Median side of right sagitta.

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for a much shorter period. (The material of both species were originally preserved in formalin).

Dentition. — See the generic description on p. 18 and fig. 14.

Gill cavity. — The number of rakers in the outer row of the anterior gill arch varies from 5–8 on the upper and from 20–24 on the lower branch. (See also table 1). In 50 specimens the number of pseudobranchial filaments varies from 4–6; only two specimens had but three filaments in each side.

Axial skeleton. — Almost all the following information are based on radiographs. There are 17–18 precaudal and 50–53 caudal vertebrae including the urostyle. The anterior neural spine is very short, but in contrast to the other two *Selachophidium* species, the length of the anterior and posterior neural spines on the precaudal part is almost the same. The anterior spines are broader than the posterior ones. The parapophyses on the anterior three vertebrae are long and broad, those on the following three vertebrae are very small while those on the posterior 11–12 precaudal vertebrae gradually become longer and broader. Pleural ribs are found on all but the anterior two precaudal vertebrae and are only rarely developed on the last one. Epipleural ribs are observed on Nos. 5–9. No details of the caudal skeleton could be seen on the radiographs.

A 230 mm long cleared and alizarin-stained specimen showed that there are four radials on the pectoral fin-base, two branchiostegal rays on the upper and six on the lower ceratohyale.

Viscera. — The posterior blind end of the thick-walled stomach ends midway between the anus and the bases of the pectoral fins. Pyloric caeca are not developed. The length of the intestine forms about 50% of the SL, thus is shorter than the intestine of *S. americanum*. Posteriorly, the intestine is thickened, forming a rectal part. The liver usually ends anteriorly to the tip of the stomach. The anterior part of the thick-walled swim-bladder is more narrow than the posterior part (fig. 7), which ends close to the anus.

Gonads. — The gonads were examined in 53 specimens of the total material. In 25 specimens they were definitely ovaries which varied in length from 13–45 mm. Three of the 16 specimens with a SL less than 250 mm contained eggs with a diameter of about 0.1 mm while the eggs in all the remaining 13 specimens were less than 0.1 mm. All the specimens more than 250 mm in SL had more or less transparent eggs with a diameter varying from 0.1–0.2 mm. The smallest female (SL 135 mm) had an ovary-length of 16 mm and the ovaries in the largest specimen (SL 275 mm) were about 40 mm long. Fig. 6b shows the slender form of ovaries containing eggs less than 0.1 mm in diameter. Ovaries of *S. americanum* with the same size eggs are much broader and shorter (cf. fig. 6a).

Only one specimen proved to be a male. A part of the 7 mm long testes was examined histologically, showing very unripe testicular tissues.

In 26 specimens the gonads were very small (8–18 mm in length) and ribbon-like. From three specimens parts of the gonads were sectioned and the 8- μ sections showed poorly differentiated tissues of undeterminable sex. It is difficult to explain these thin gonads. They occur in specimens with a SL varying from 115–243 mm; it is unlikely that these are juveniles. Considering that only one male could be found, it is tempting to postulate that the testes degenerate completely after the breeding season. All specimens of *S. guentheri* with thin gonads were caught in the summer period (December–March). This hypothesis is especially attractive since it would make the number of males and females equivalent.

Biology. — The material from "Galathea" St. 137 comprises 10 specimens which can be sexed macroscopically and only three of undetermined sex. This lot was caught in

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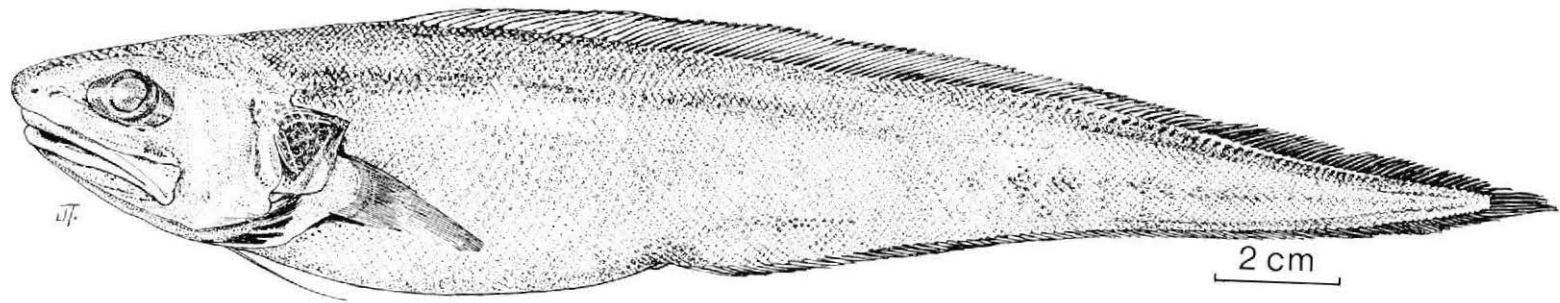


Fig. 5: Drawing of holotype of *S. americanum* n. sp. SL 235 mm. ISH. 1803/68a.

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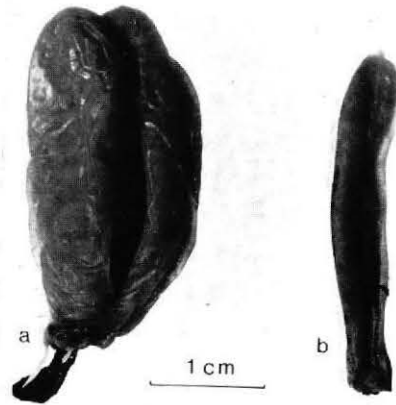


Fig. 6: Ventral view of the ovaries from: a) Paratype of *S. americanum*, SL 232 mm. Egg-dia. 0.5 mm. b) *S. guentheri*, SL 245 mm. Egg-dia. < 0,1 mm ZMUC. P77502.



Fig. 7: Dorsal view of the swimbladders from: a) *S. guentheri*, SL 245 mm (♀). ZMUC. P77502. b) Paratype of *S. americanum*, SL 232 mm (♀).

December off Angola. Of the 30 specimens from "Galathea" Sts. 197 and 202, caught in February off Southeast Africa, only eight can be identified to sex. They all contain unripe 0.1-mm eggs. This indicates that spawning is seasonal in *S. guentheri*. (See also p. 24).

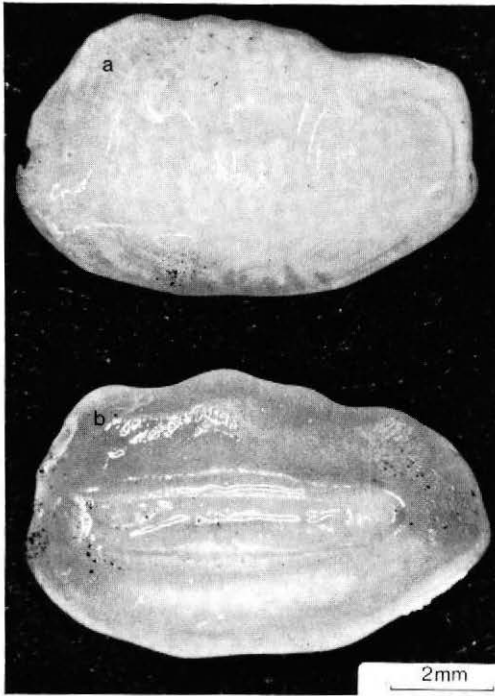


Fig. 8: Otoliths from *S. americanum*, SL 235 mm. ISH. 1895/68. a) Lateral side of left sagitta. b) Median side of right sagitta.

Distribution. — Fig. 1 shows the horizontal distribution. One may expect that this area will be expanded when the Continental Slope off Africa has been more thoroughly explored. There is apparently no natural explanation for the present limited distribution. *S. guentheri* was caught at the bottom at depths from 366–665 m.

GILCHRIST (3: 77) reported that specimens of *S. guentheri* were caught at 19 stations made by the S/S "Pickle" at depths varying from 274–982 meters in the Cape and Natal waters.

2. *Selachophidium americanum* n. sp. (Fig. 5)

Material (20 specimens):

Holotype (SL 235 mm); „Walther Herwig“ St. 64/68 (30°03' S, 47°44' W); 800 m; 140'-trawl. 27. Febr. 1968. ISH. Cat. No. 1803/68a.

5 paratypes (SL 218–233 mm); „Walther Herwig“ St. 64/68. Same data. ISH. Cat. No. 1803/68b–f.

5 specimens (SL 182–240 mm); „Walther Herwig“ St. 438/66 (33°41' S, 51°12' W); 600 m; 140'-trawl. 31. July 1966. ISH. Cat. No. 1579/66a–e.

6 specimens (SL 209–250); „Walther Herwig“ St. 84/68 (25°18' S, 44°48' W); 800 m; 140'-trawl. 1. Mar. 1968. ISH. Cat. No. 1895/68a–f.

3 specimens (SL 222–235 mm); „Walther Herwig“ St. 91/68 (24°28' S, 43°43' W); 800 m; 140'-trawl. 2. Mar. 1968. ISH. Cat. No. 1934/68a–c.

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Relationships and diagnosis. — Tables 2–6 show that *S. americanum* is intermediate between the other two species. The important differences between *S. americanum* and *S. vitiazi* have been pointed out in the description of *S. vitiazi* (p. 30). Therefore, only the specific differences between *S. americanum* and *guentheri* will be dealt with here. Because of the large material of these two species, 20 and 56 specimens respectively, it is possible to indicate with certainty more specific characters than when *S. americanum* was compared to *S. vitiazi*, of which only the holotype is known. In the following comparison the characters of *S. guentheri* are in parentheses:

Dorsal fin-rays 100–108 (113–121), precaudal vertebrae 13–14 (17–18), total number of vertebrae 59–63 (67–71), pseudobranchial filaments 2 (3–6) head-length in % of SL 20.0–22.5 (16.5–19.0), upper jaw-length in % of SL 10.0–11.5 (8.1–9.7). There are also some specific internal differences: Pyloric caeca 9–13 (none), the ovaries and swimbladder short and thick (more slender, cf. figs. 6 and 7), long stomach, intestine and liver (relatively short).

Condition. — Almost all specimens are in very good condition, fixed in formalin and transferred to 30% isopropanol.

Description of the holotype. — The meristic and morphometric characters are shown in table 2. The indistinct lateral line runs close to the dorsum, but disappears at about the midpoint of the fish. The dorsal fin originates above the proximal part of the pectoral fins. The anterior anal fin-ray is placed below the 23rd dorsal fin-ray. The preanal length forms 41.5% of the SL. The ventral fins are placed well in front of the pectoral fins and they end below the anterior dorsal fin-ray. Only a few scales remain, but scale-pockets show that both the body and the head were covered with scales. The squamation does not seem to have continued on the proximal part of the vertical fins. The horizontal diameter of the oval eyes is large, of the same length as the snout. The dermal cornea is so transparent that the green lens and the blue iris are very distinct. Both the horizontal and the vertical processes of the bifurcated opercular spine are so well ossified that they show up on radiographs. The radiographs also show the large otoliths (cf. fig. 11) and the presence of a small fish in the oesophagus.

The colour of the body is light-brown with certain parts red-brown. The peritoneum and the mouth and gill cavities are blue. The rays of the posterior part of the dorsal and anal fins and in the caudal fin are dark-brown and the skin between the fin-rays is brown-mottled.

Dentition. — See the generic description on p. 18 and fig. 14.

Gill cavity. — The upper branch of the anterior gill arch has 1–2 short and 6 long rakers; one raker is in the angle between the two branches and 15–16 long + 5–6 short rakers are on the lower branch. The length of the gill laminae is $1/3$ – $1/4$ of the horizontal diameter of the dermal cornea. The two pseudobranchial filaments in each side form $1/6$ – $1/7$ of the eye-diameter. Dorsally each gill cavity contains a 4-mm long yellow “body”, most probably the thymus (NIELSEN, 11: 38). The upper pharyngeal tooth-plates are shown in fig. 10.

Axial skeleton. — The following information is based on radiographs. Fig. 11 shows that the specimen is well ossified. There are 14 precaudal and 48 caudal vertebrae, including the urostyle. The anterior neural spine is only half the length of the following ones. From the second vertebra the neural spines gradually become longer, more pointed and slender while the neural arches become smaller. From about the tenth caudal vertebra, the neural spines again decrease in length. The parapophyses are long and broad on the anterior four vertebrae, poorly developed on Nos. 5–7, but beginning

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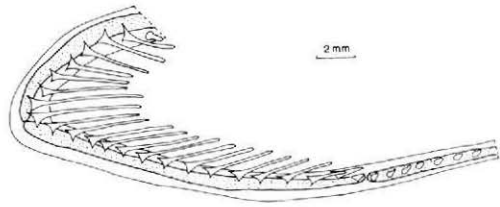


Fig. 9: Anterior, right gill arch from *S. americanum*, SL 235 mm. ISH. 1895/68. (The gill laminae are excluded).

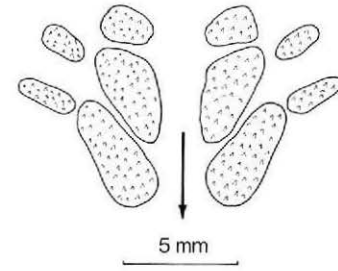


Fig. 10: Upper pharyngeal tooth-plates of *S. americanum*, SL 235 mm. ISH. 1895/68. (The arrow points anteriorly).

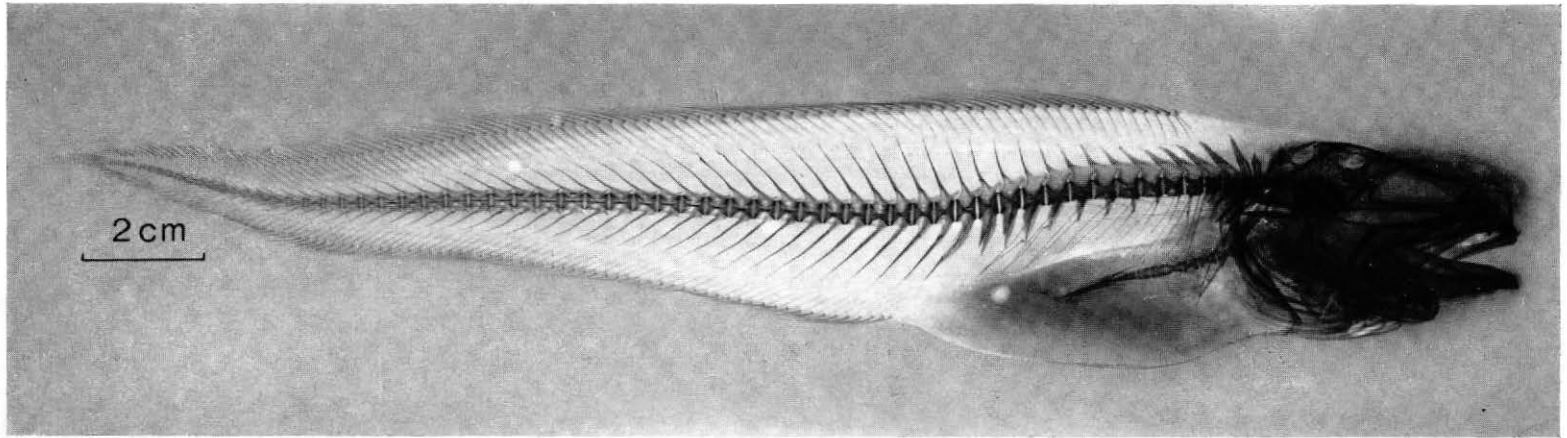


Fig. 11: Radiograph of the holotype of *S. americanum*, SL 235 mm. (Note the vertebral column of a fish in the oesophagus and stomach).

with No. 8 they become broader again. Pleural ribs are seen on vertebrae Nos. 3—12 and epipleural ribs on Nos. 4—10. No details can be observed of the caudal skeleton. Viscera. — The oesophagus and stomach are thick-walled. The posterior blind tip of the stomach ends closer to the anus than to the bases of the pectoral fins. There are ten pyloric caeca, the longest of which is 7 mm. The thin-walled intestine is very long, forming about 80% of the SL or three times the distance between the ventral and anal fins. The liver is very large, ending just in front of the anus. The thick-walled swimbladder is almost as long as the abdominal cavity. In the anterior end of the swimbladder there are two protuberances which most probably lead to the inner ear. The whitish asymmetrically formed pair of testes are 8 mm long.

Variation. — Table 2 shows that the variation of the meristic and morphometric characters is rather small. The general description of the 19 additional specimens fits well with that of the holotype. The number of rakers on the anterior, right gill arch varies from 6—9 on the upper and from 21—26 on the lower branch (cf. fig. 9). Table 1 gives the number of rakers on the other arches. All specimens were radiographed and, in addition, a 232-mm long paratype was cleared and stained with alizarin; none of the specimens differed essentially from the holotype. Some information can be added on the basis of the alizarin-stained specimen. There are four radials in the pectoral fin-base. The eight branchiostegal rays are all acinaciform (McALLISTER, 10: 4). The upper ceratohyale bears two and the lower six rays. The four dorsal ones are external and the four ventral ones are lateral, with a tendency to become internal. The subocular bones are provided with well developed fringes. Fig. 12 shows the caudal skeleton. The hypurals are grown together, forming two hypural plates. There is one epural and two pairs of uroneurals; however, the element marked un_2 is difficult to interpret.

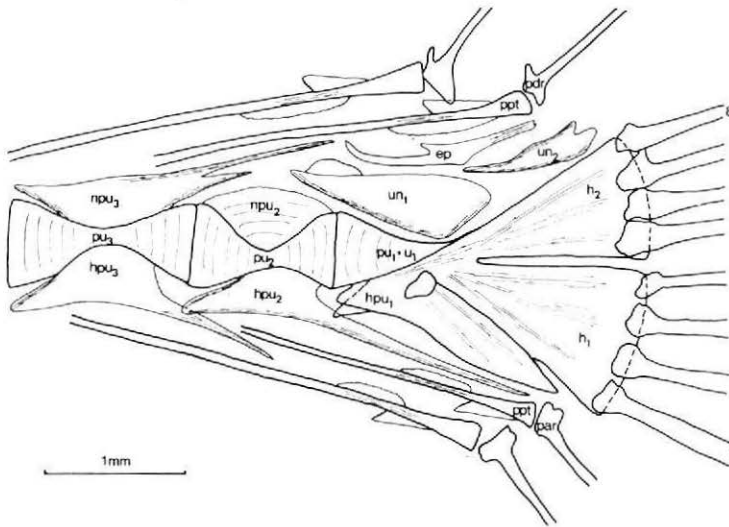


Fig. 12: Alizarin stained caudal skeleton of paratype of *S. americanum*, SL 232 mm. ep: epural, h_{1-2} : hypural plates, hpu_{1-3} : haemal arch and spine of 1st—3rd preural vertebrae, npu_{2-3} : neural arch and spine of 2nd—3rd preural vertebrae, par: posterior anal fin-ray, pdr: posterior dorsal fin-ray, ppt: posterior pterygiophore, pu_{1-3} : 1st—3rd preural vertebrae, u_1 : 1st ural vertebra, un_1 : 1st pair of uroneurals, un_2 : most probably a 2nd pair of uroneurals, 1—8: principal caudal fin-rays.

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It consists of two, almost uniform, halves which are grown together dorsally, but are separated ventrally, forming a \wedge in cross section. It is hardly an epural, but is rather a second uroneural element. The lateral view does not show that the un_2 is paired. Each pterygiophore is provided with a rather well ossified outer process, which gives support to the fin-rays. On the inner side there is another very thin, serrated process. The neural arch of the second preural vertebra (npu_2) is poorly developed. The last caudal vertebra (pu_1) is grown together with the first ural vertebra (u_1). It is not possible to see more ural vertebrae. The number of pyloric caeca varies from 9–13. In some specimens the liver ends near the posterior tip of the stomach and in other specimens it ends further back. Fig. 7 shows the rather short, thick swimbladder from a 232-mm long female. The shape of the swimbladder shows no sexual dimorphism. The testes vary in length from 7–20 mm in 10 specimens (SL 182–235 mm), apparently independent of the standard length. The testes always appear amorphous and whitish. The 7-mm long testes from a specimen 207 mm in SL were examined histologically. The 8- μ sections showed unripe testes with very young spermatogenic stages. The short, thick ovaries vary in length from 11–30 mm in 10 specimens (SL 202–250 mm), with the longest ovaries in the longest specimens. The largest eggs are 0.5 mm in dia. (Fig. 6a). In many specimens parts of the ovaries are pressed out of the genital opening. In both sexes a papilla, varying from 0.5–2.5 mm in length, was found close to this opening. The otoliths from a 235-mm long female are shown on fig. 8. Judging from the number of rings, the specimen is three years old.

Biology. — See p. 18.

Distribution. — All specimens were caught on the Continental Slope off Uruguay and southern Brazil. "Walther Herwig" did not fish north of Rio de Janeiro but, off Argentina, several stations were undertaken at the Continental Slope without catching any *Selachophidium*. This indicates that the distribution shown at fig. 1 probably will be enlarged in a northern direction by future investigations.

3. *Selachophidium vitiazi* n. sp. (Fig. 13)

Material (1 specimen):

Holotype (SL 123 mm); „Vitiaz“ cruise 31 St. 4564 (23°57'9"S, 112°14'2"E); 834 m; Galathea trawl (bottom). 1. Dec. 1959. USSR ZIAS. Cat. No. N39767.

Diagnosis and relationships. — *S. vitiazi* is, in all important characters, more closely related to *S. americanum* than to *S. guentheri*. This is evident both from tables 2–6 and from the key to the species (cf. p. 21). Some of the differences between *S. vitiazi* and *americanum* are mentioned below, with the characters of the latter species in parentheses: Dorsal fin-rays 93 (100–108), anal fin-rays 78 (82–89) and total number of vertebrae 56 (59–63). There are also differences among the morphometric characters, but since the single specimen of this new species is much smaller than any of the *S. americanum* specimens (123 mm vs. 182–250 mm in SL), these may be due to allometric growth.

Condition. — Almost all scales are lost and the pectoral fin-rays broken. There seems to be some shrinkage of the head.

Description. — Many of the meristic and morphometric characters are mentioned in table 2. The lateral line runs near the dorsum, but becomes rather indistinct at the posterior third of the body. The dorsal fin originates just posteriorly to the pectoral fins. The proximal part of the fin-rays seems to have been covered with scales. A few cycloid scales are found near the pectoral fin bases. The anal fin begins below the 16th dorsal fin-ray, much closer to the snout than to the caudal fin (the preanal length forms 40% of the SL). The ventral fins, which are placed a little anteriorly to the pectoral fins,

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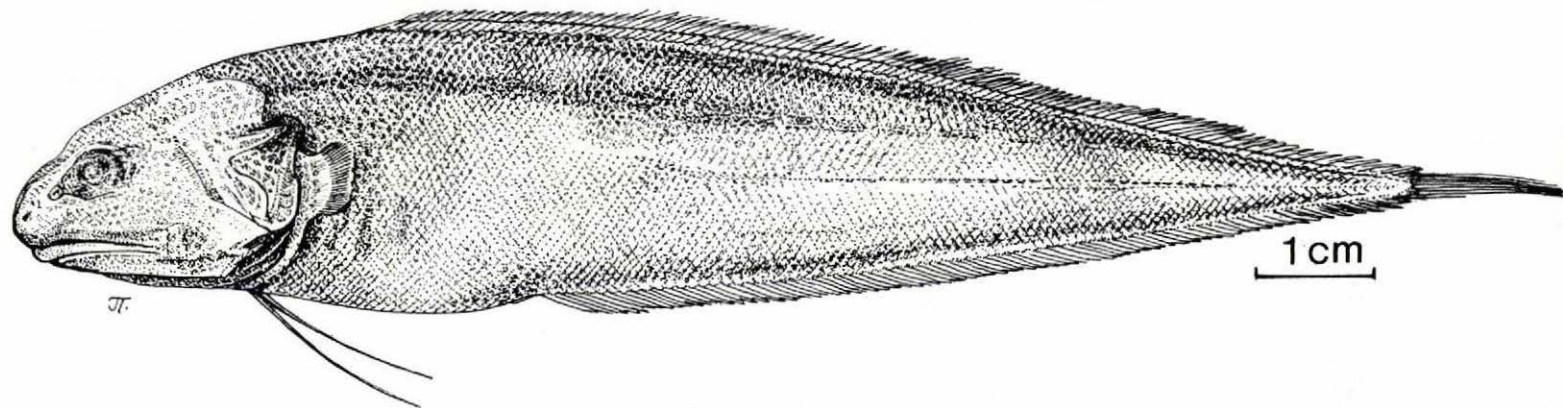


Fig. 13: Drawing of holotype of *S. vitiazi* n. sp. SL 123 mm. USSR ZIAS. N39767.

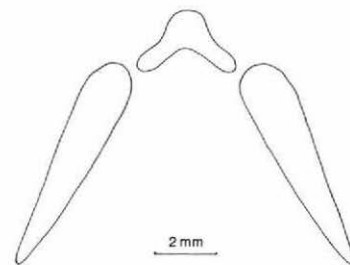


Fig. 14: Outline of the dentigerous vomer and palatines of the holotype of *S. vitiazi*, SL 123 mm.

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almost reach the anus. The scale-pockets indicate that the head was provided with scales. The diameter of the large eyes is a little shorter than the snout. The operculum bears a bifurcated spine; the ventrally directed spine is so weak that it does not show up on radiographs. The colour of the peritoneum, the eyes, the mouth and the gill cavities is bluish. Owing to the transparent skin the rest of the fish is light-brownish, coloured by the muscular tissues.

Dentition. — See the generic description on p. 18 and fig. 14.

Gill cavity. — Table 1 shows that there are fewer rakers on all five gill arches than found in any of the other two species. On the upper branch of the anterior arch there are one short and four long rakers; there is one long raker in the angle between the two branches and 12 long + 6 short rakers on the lower branch (cf. fig. 9, showing the anterior gill arch of *S. americanum*). The length of the gill laminae equals approximately one third of the diameter of the eye. There are two pseudobranchial filaments on each side, a little shorter than the longest gill laminae. Dorsally, each gill cavity contains a 3-mm long, oval "body", most probably the thymus (NIELSEN, 11:38). There is the same number and pattern of pharyngeal tooth-plates as that found in *S. americanum* (cf. fig. 10).

Axial skeleton. — The following information is based solely on radiographs. There are 13 precaudal and 43 caudal vertebrae, including the urostyle. The ossification is good. The form of the vertebrae is very similar to that of *S. americanum* (cf. fig. 11). The four anterior vertebrae are provided with long and broad parapophyses, the following two have small parapophyses, while on the posterior six vertebrae the parapophyses become gradually longer. There seem to be pleural ribs on vertebrae Nos. 3–11 and epipleural ribs on Nos. 5–9. No details of the caudal skeleton were visible.

Viscera. — The stomach is thick-walled and its posterior tip is situated midway between the anal and ventral fins. The longest of the seven pyloric caeca is 3 mm. The thin-walled intestine forms about 50% of the SL and its length is 2–3 times the distance between the ventral and the anal fins. The liver and the swimbladder are very large. The ovaries are pressed out of the genital opening. The largest eggs are 0.5 mm in diameter.

Distribution. — *S. vitiazi* is only known from the type locality off western Australia (fig. 1) at bathyal depth (834 m).

D. Summary

This paper presents a redescription of the oviparous, bathyal ophidioid genus, *Selachophidium*, Gilchrist, 1903. Variation in the type species, *S. guentheri*, hitherto known only from a few specimens, is described, based on an examination of 56 specimens. Two new species are described, *S. americanum* from the eastcoast of South America (20 specimens, all caught by the „Walther Herwig“) and *S. vitiazi* from off West Australia (1 specimen caught by the „Vitiaz“).

E. Zusammenfassung

In der vorliegenden Arbeit wird die ovipare Tiefsee-Brotulidengattung *Selachophidium* Gilchrist, 1903 redefiniert. Die Variationsbreite der bisher nur in wenigen Einzelstücken beschriebenen Typus-Art, *S. guentheri*, wird an Hand von 56 Exemplaren erörtert. Außerdem werden 2 neue Arten beschrieben, *S. americanum* von der Ostküste Südamerikas, das in 20 Exemplaren während der beiden „Walther Herwig“-Reisen nach Südamerika gesammelt wurde und *S. vitiazi* von Westaustralien, von dem nur 1 Stück von dem sowjetischen FS „Vitiaz“ erbeutet wurde.

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