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Deel XXXI, nr 64
Brussel, November 1955.

STUDIES ON THE TRICHIUROID FISHES — 2 (*)
BENTHODESMUS TENUIS (GÜNTHER)
COLLECTED BY THE
EXPÉDITION OCÉANOGRAPHIQUE BELGE
DANS LES EAUX CÔTIÈRES DE L'ATLANTIQUE SUD
(1948-1949),
WITH ADDITIONAL NOTES
ON THE GENUS BENTHODESMUS.

by Denys W. TUCKER (London).

(With Tables 1-4, Text-Figs. 1-11 and Plate 1.)

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(*) TUCKER, D. W. (1953), The Fishes of the genus *Benthodesmus* (Family Trichiuridæ). *Proc. zool. Soc. London,* 123 : 171-197, may now be regarded as No. 1 of this series.

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INTRODUCTION.

The review of the Trichiurid fishes of the genus *Benthodesmus* which I published in 1953 has attracted several loans of new study-material. Now, through the good offices of Dr. Max POLL of the Musée royal du Congo Belge, Tervuren, I am enabled to describe a series of 23 *Benthodesmus tenuis* (GÜNTHER, 1877), the first taken from the Atlantic and a valuable addition to the two specimens previously available to me.

Dr. G. Clifford CARL, Director of the Provincial Museum, Victoria, British Columbia, has contributed a critical Pacific specimen of *B. simonyi* (STEINDACHNER, 1891), the same ambiguously described by GILBERT (1917) and queried in my previous paper. Mrs. Marion GREY of the Chicago Natural History Museum and Professor Luis R. RIVAS of the University of Miami have together sent 8 *B. tenuis* from the upper Gulf of Mexico which pleasantly confirm my earlier conclusions from the work of LONGLEY & HILDEBRAND (1941). The detailed publication of this American material is under discussion with Dr. Carl L. HUBBS, Director of the Scripps Institution of Oceanography, who has further specimens at his disposal, but I have taken the present opportunity to summarise its more important features. Finally, from Mr. Günther E. MAUL, Curator do Museu Municipal do Funchal, Madeira, have come four more Madeiran *B. simonyi*.

To those whose kind co-operation is acknowledged above I offer my best thanks; also to Mr. P. E. PURVES and Mr. A. C. WHEELER of the British Museum (Natural History) who have skilfully radiographed the whole of this often damaged and difficult material.

The present paper is intended as a pendant to that of 1953 and forms one of a series of preliminary drafts for projected « Dana » Reports on the Trichiuridæ and Gempylidæ, Reports necessarily deferred by the great quantity of material to be worked through. Modifications in the generic diagnosis of

Benthodesmus are included in a paper immediately following (Studies on the Trichiuroid Fishes — 3. A Preliminary Revision of the Family Trichiuridæ. Bull. Brit. Mus. (Nat. Hist.) Zool. — in the press).

It is hoped that these « Studies » will have some interim usefulness and will attract some beneficial criticism until the time comes to « binde up all our scattered leaves ».

Benthodesmus tenuis (GÜNTHER).

Lepidopus tenuis GÜNTHER, 1877, Ann. & Mag. nat. Hist. (4) 20, 437.

Benthodesmus tenuis GOODE & BEAN, 1895, Oceanic Ichthyology, 206.

Lepidopus aomori JORDAN & SNYDER, 1901, J. Coll. Sci. Tokyo, 15, 303.

Benthodesmus benjamini FOWLER, 1938, Proc. U. S. Nat. Mus. 85, 45, fig. 16.

Benthodesmus atlanticus (nec GOODE & BEAN) LONGLEY & HILDEBRAND, 1941, Cat. Fish. Tortugas, 73.

(For complete annotated bibliography see TUCKER, 1953, Proc. zool. Soc. London 123, 186; to which add GÜNTHER (1889) and MEAD & TAYLOR (1953) from appended references on p. 25).

STUDY MATERIAL.

Collection Expédition Océanographique Belge (1948-1949) :

A. 1-2. 2 specimens, 428-430 mm. S.L. (430, 428 mm.)
St. 11 : 6°29'S, 11°35'E, 48 milles SW de Moita Seca, 7-VIII-1948; ch. (1 h); profondeur : 220-240 m; fond de vase sableuse brunâtre.

B. 3-4. 2 specimens, 297-312 mm. S.L. (312, 297 mm.)
St. 11 : F.D. (1/2 h).

C. 5-12. 8 specimens, 374-454 mm. S.L. (415, 389, 397, 454, 381, 374, 406, 384 mm.)
St. 53 : 6°08'S, 11°24'E, 52 milles W by S de Moita Seca, 26-X-1948; ch. (1 h); profondeur : 350-380 m; fond de vase brune sableuse.

D. 13-14. 2 specimens, 317-327 mm. S.L. (327, 317 mm.)
St. 66 : 5°51'S, 11°31'E, 54 milles WNW de Banana, 13-XI-1948; ch. (1 h); profondeur : 230-250 m; fond de vase brune.

TABLE 1. — *Table of Measurements and*

Specimen	H.22	G.20	F.16	G.19	F.18	B.4	B.3	D.14	D.13
Total Length MM. (Extreme tip of lower jaw to tip of caudal fin) >	*224*	*250*	*247*	*268*	*304*	*301*	*318*	*324*	*336*
Standard Length MM. (Extreme tip of snout to end of caudal peduncle)	*221*	*243*	*244*	*264*	*297*	*297*	*312*	*317*	*327*
Percentages of Standard Length :									
Ext. tip of snout to end of operculum (= Head Length)	13.4	14.0	13.5	12.8	13.5	14.2	13.0	14.2	13.6
Ext. tip of snout to Dorsal ...	11.8	11.7	11.1	11.0	11.4	11.8	10.9	11.4	11.3
Ext. tip of snout to Pectoral ...	13.6	14.0	13.5	12.9	13.6	14.1	13.1	14.0	13.3
Ext. tip of snout to Pelvic ...	13.4	13.2	12.9	12.3	13.1	13.8	—	13.3	12.5
Ext. tip of snout to Vent	42.2	43.0	42.2	43.2	42.8	42.1	42.3	43.2	42.8
Ext. tip of snout to Anal Scute	43.5	44.1	43.0	43.9	44.4	44.5	45.2	44.8	44.4
Depth at Pectoral	2.9	3.1	2.9	3.2	3.1	3.3	3.4	3.5	3.8
Depth at Vent	2.5	2.4	2.5	2.5	2.5	2.5	2.6	2.5	3.1
Head Length MM. (Extreme tip of snout to end of operculum) ...	*29.5*	*34.0*	*33.0*	*33.9*	*40.0*	*42.0*	*40.5*	*45.0*	*44.5*
Percentages of Head Length :									
Greatest breadth of head	14.3	14.1	15.2	14.8	15.3	15.7	16.1	15.6	15.7
Interorbital width (on bone) ...	6.1	6.2	6.4	6.2	7.5	7.2	7.7	8.0	8.3
Snout	40.7	39.7	41.3	41.3	42.5	41.9	42.0	40.9	42.7
Postorbital part of head	44.8	43.0	42.4	42.5	42.5	41.9	42.0	41.6	43.4
Horizontal diameter of eye ...	16.6	17.7	15.8	17.7	16.5	17.1	16.3	16.5	15.1
Vertical diameter of eye	11.5	11.8	12.1	12.4	12.5	11.9	12.3	12.2	12.8
Upper jaw (Ext. tip snout — end Mx)	34.3	35.3	34.9	37.5	36.3	36.9	36.6	37.8	39.6
Lower jaw (Ext. tip — Articular)	59.9	59.1	60.0	59.0	63.0	62.1	65.9	63.2	64.1
Height over centre of eye	19.7	20.0	19.7	21.5	22.5	21.7	23.5	23.3	23.6
Longest ray of Pectoral ... >	—	—	33.6	—	31.3	—	—	28.9	37.6

Proportions of Atlantic B. tenuis (GÜNTHER).

F.17	C.10	C.9	C.12	C.6	C.7	C.11	C.5	E.15	H.21	A.2	A.1	C.8	H.23
366	*380*	*388*	*394*	*396*	*405*	*420*	*423*	*427*	*431*	*437*	*439*	*465*	*478*
353	*374*	*381*	*384*	*389*	*397*	*406*	*415*	*420*	*423*	*428*	*430*	*454*	*467*
13.7	14.0	13.7	13.6	13.5	13.0	13.7	13.7	13.5	13.8	13.6	13.7	13.3	14.0
11.8	11.5	11.3	11.1	11.2	11.1	11.3	11.2	11.1	11.2	11.0	11.2	11.0	11.4
14.0	13.9	13.7	13.4	13.5	13.1	13.3	13.6	13.6	13.8	13.3	13.4	13.2	13.7
13.6	13.4	13.4	13.2	13.1	12.6	12.7	12.8	13.2	13.4	12.9	13.0	12.8	13.6
42.8	43.4	43.3	42.9	42.2	42.0	43.0	42.1	41.9	42.3	43.8	42.7	42.6	43.6
44.9	45.1	45.0	45.6	43.7	44.0	44.3	44.1	43.7	44.5	45.6	44.7	44.6	45.1
—	3.5	3.6	3.8	3.3	—	3.9	—	4.0	4.0	3.7	3.6	3.7	3.9
2.8	2.8	2.8	2.9	2.8	3.2	3.3	3.3	3.1	3.3	2.8	2.9	3.0	3.5
48.5	*52.1*	*52.0*	*52.0*	*52.6*	*51.5*	*55.5*	*57.0*	*56.5*	*58.5*	*58.0*	*59.0*	*60.5*	*65.5*
—	15.4	15.4	15.8	16.2	16.5	17.1	16.7	16.8	17.0	17.2	16.9	16.5	17.6
7.2	8.3	8.3	8.7	8.0	—	8.7	8.8	9.4	9.4	8.3	8.0	8.3	9.1
43.3	42.2	42.3	42.7	42.8	42.7	44.0	43.0	44.3	43.9	43.1	42.4	43.2	42.8
42.3	42.2	42.3	42.7	42.8	42.7	41.5	41.4	41.4	41.0	44.0	42.4	42.2	41.7
15.3	15.0	15.2	14.6	15.6	15.9	15.1	14.9	16.1	14.5	14.7	15.1	15.2	15.1
11.6	12.1	12.9	12.5	13.3	13.6	12.3	12.3	13.1	12.3	12.8	11.2	12.6	13.1
38.4	37.6	37.7	38.5	38.1	38.8	38.2	39.5	39.8	40.0	39.7	38.9	40.0	39.1
65.2	61.4	62.7	63.5	63.7	66.1	64.2	64.9	65.5	66.0	65.5	63.3	66.1	65.7
24.8	23.4	24.0	24.0	24.7	25.3	24.3	25.4	25.5	23.4	24.1	22.9	24.8	25.9
30.0	34.6	34.6	—	—	—	34.3	—	—	—	36.2	39.0	33.1	—

TABLE 2. — *Table of meristic counts on Atlantic B. tenuis* (GÜNTHER).

Specimen No.	Median Fins			Vertebræ
	Dorsal	Total	Anal i+I+	
A.1	XL,82	122	73	48 + 76 = 124
A.2	XL,82	122	72	49 + 76 = 125
B.3	XLI,84	125	71	50 + 75 = 125
B.4	XXXIX,84	123	75	49 + 79 = 128
C.5	XLI,84	125	73	50 + 78 = 128
C.6	XLI,84	125	75	49 + 79 = 128
C.7	XLII,83	125	72	50 + 77 = 127
C.8	XLI,83	124	72	50 + 78 = 128
C.9	XLI,82	123	72	50 + 77 = 127
C.10	XLI,83	124	74	50 + 77 = 127
C.11	XLI,83	124	75	49 + 78 = 127
C.12	XLII,81	123	73	50 + 76 = 126
D.13	XLI,83	124	75	49 + 77 = 126
D.14	XL,82	122	70	47 + 76 = 123
E.15	XL,84	124	75	47 + 79 = 126
F.16	XL,80	120	71	47 + 76 = 123
F.17	XLI,81	122	72	50 + 77 = 127
F.18	XXXIX,84	123	73	47 + 79 = 126
G.19	XLI,84	125	73	49 + 77 = 126
G.20	XLI,81	122	71	49 + 77 = 126
H.21	XLI,81	122	70	48 + 78 = 126
H.22	XLI,81	122	72	48 + 78 = 126
H.23	XXXIX,86	125	74	50 + 77 = 127

Note. — The last two dorsal rays have been counted as two rays. Any structure, however rudimentary, which by position and homology can be recognised as a ray or a basal element has been counted as a ray. Likewise in the anal counts basal elements have been counted as rays. The last trunk vertebra in the vertebral counts has been taken as that immediately before the perpendicular through the anal origin.

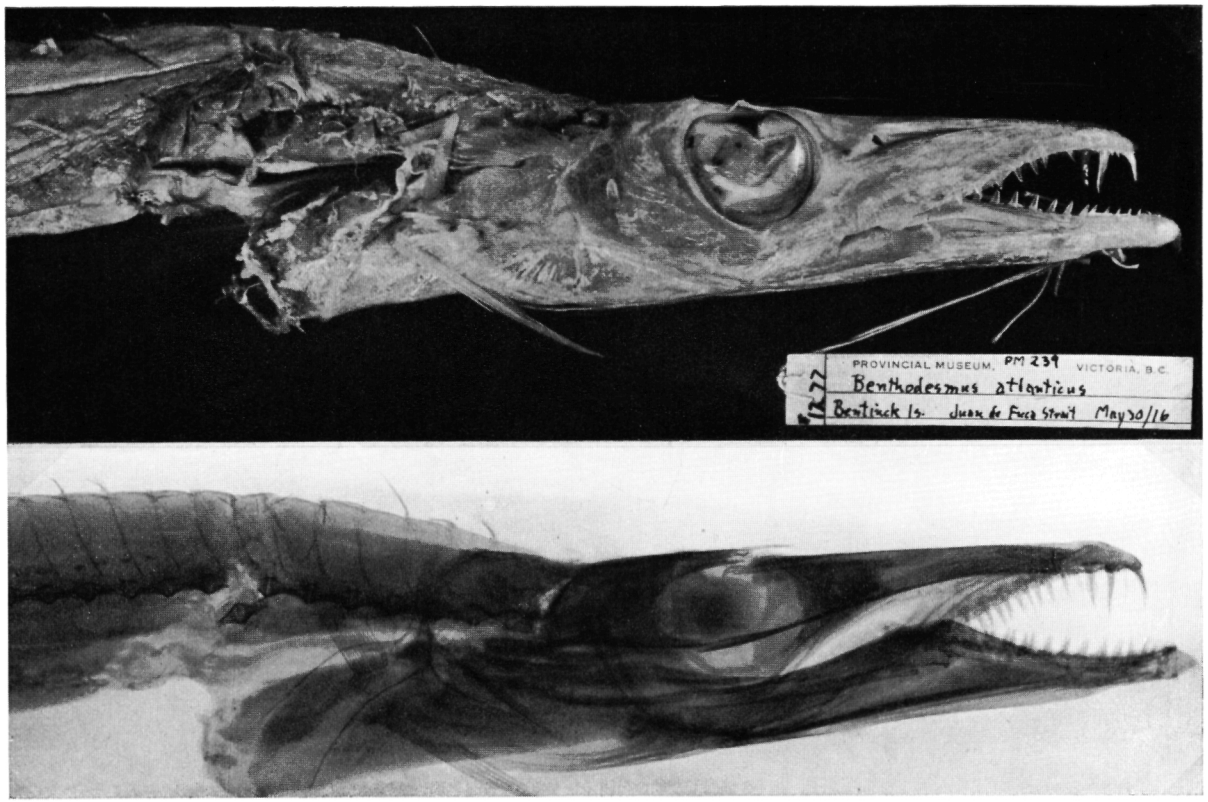

Plate 1. — *Benthodesmus simonyi* (STEINDACHNER).
Head (× 5/6) of specimen from off British Columbia described by GILBERT (1915).
The shadow of the ventral fins and pelvic girdle may be seen in the radiograph below the hind end of the right pectoral fin base. Behind this the right post-cleithrum curves down into a protuberance which GILBERT mistook for the ventral fin. (Photograph by P. H. GREEN; radiograph by A. C. WHEELER. British Museum (Natural History).

E. 15. 1 specimen, 420 mm. S.L.
St. 88 : 10°45'S, 13°07'E, 40 milles W du Cap Morro, 12-XII-1948; ch. ex. (1 h); profondeur : 400-500 m; fond de vase verte sableuse.

F. 16-18. 3 specimens, 244-353 mm. S.L. (244, 353, 297 mm.)
St. 147 : 0°00'S, 8°58'E, 45 milles N by E du Port Gentil, 11-III-1949; ch. (1 h); profondeur : 250-300 m; fond de sable vaseux vert.

G. 19-20. 2 specimens, 243-264 mm. S.L. (264, 243 mm.)
St. 172 : 5°15'S, 11°29'E, 30 milles SW de Pointe-Noire, 2-IV-1949; ch. ex. (1 h); profondeur : 225-240 m; fond de sable vaseux.

H. 21-23. 3 specimens, 221-467 mm. S.L. (423, 221, 467 mm.)
St. 203 : 6°25'S, 11°29'E, 50 milles WSW de Moita Seca, 18-V-1949; ch. ex. (1 h); profondeur : 400-430 m; fond de vase sableuse.

The entire material has been radiographed and the negatives have been deposited in the British Museum (Natural History). Register No.'s are :

No. 0102 (3 films). Specimens A. 1-C. 7 inclusive.
No. 0103 (2 films). Specimens C. 8-D. 14 inclusive.
No. 0104 (2 films). Specimens D. 14-G. 20 inclusive (NB repeat).
No. 0105 (2 films). Specimens H. 21-H. 23 inclusive.

Description

(based on above series of 23 specimens, 221-467 mm. S.L.).

Body naked, laterally much compressed, attenuate, tapering gradually from vent to base of caudal; its greatest depth (at pectorals) 4.5-3.7 in head, 34-25.9 in standard length; its greatest breadth (across sphenotics) 7-5.7 in head, 1.5 in greatest depth. Vent ca. 2/5 the standard length distant from the snout tip. Dorsal and anal fin-bases very long (see below), ca. 85 and 55 per cent of standard length respectively. Caudal peduncle very slender, dorsiventrally compressed, supporting a small but well-developed caudal fin.

Head 7.1-7.8 in standard length, its growth apparently isometric in the present sample, compressed, pointed, its upper profile nearly horizontal. Snout gibbous near its end with a

minute, cutaneous, fleshy appendage. Top of head very flat, concave between the eyes, with a very weak crest at the nape. Interorbital ridges not elevated. Eyes large, round or elongate, close to and usually breaking the upper profile. Operculum oblong, reaching about to base of pectoral fin. Nostril horizontal, reniform, close before the orbit. Maxillary not quite extending to vertical through front of orbit, sheathed by lacrimal. Lower jaw provided with a stout, pointed, symphysial cutaneous appendage or mental barbel, usually downturned in the preserved specimen. Growth of the jaws appears to be positively allometric with respect to the rest of the head (Table 1). Oral valves present : maxillary valve very large (Fig. 1) but mandibular rudimentary. The lips and palatine mucosæ in particular are covered with sensory papillæ. (See also Dentition below.)

Dorsal Fin commencing steeply above the anterior end of the operculum, falling slightly over a short distance, thereafter practically uniform in height through most of its length and extending nearly to the caudal. The fin is differentiated into spinous and soft portions, partly separated by a notch shortly before the level of the vent. Soft dorsal base twice as long as spinous. Rays very numerous; in the present sample XXXIX-XLII, 80-86, aggregate 120-125 (Table 2). The rays in general correspond with the vertebræ, but there is a general tendency toward intercalation of additional rays and interneural elements at the beginning and end of the soft dorsal (Fig. 1. See also my 1953, Pl. 2, Fig. 4). Between the end of the soft dorsal and the beginning of the caudal there is a series of 3-5 projections, flattened bony plates corresponding to the neural spines of the terminal vertebræ.

Anal Fin commencing close behind the vent, at about the level of the tenth ray of the soft dorsal and consisting of two spines (a minute spinule and a delicate keeled scute) separated by a short interval from a long fin of 70-75 soft rays which continues nearly to the caudal.

Previously examined material was sufficient to establish that the ventral caudal profile of *B. tenuis* is more deeply serrated than that of *B. simonyi*. From the new specimens it becomes apparent that the difference is more fundamental than this. In *B. tenuis* fine and quite definitely split rays are present throughout the length of the fin, although the first forty or fifty are weak and probably vestigial structures which do not support a membrane. In *B. simonyi* these anterior rays are

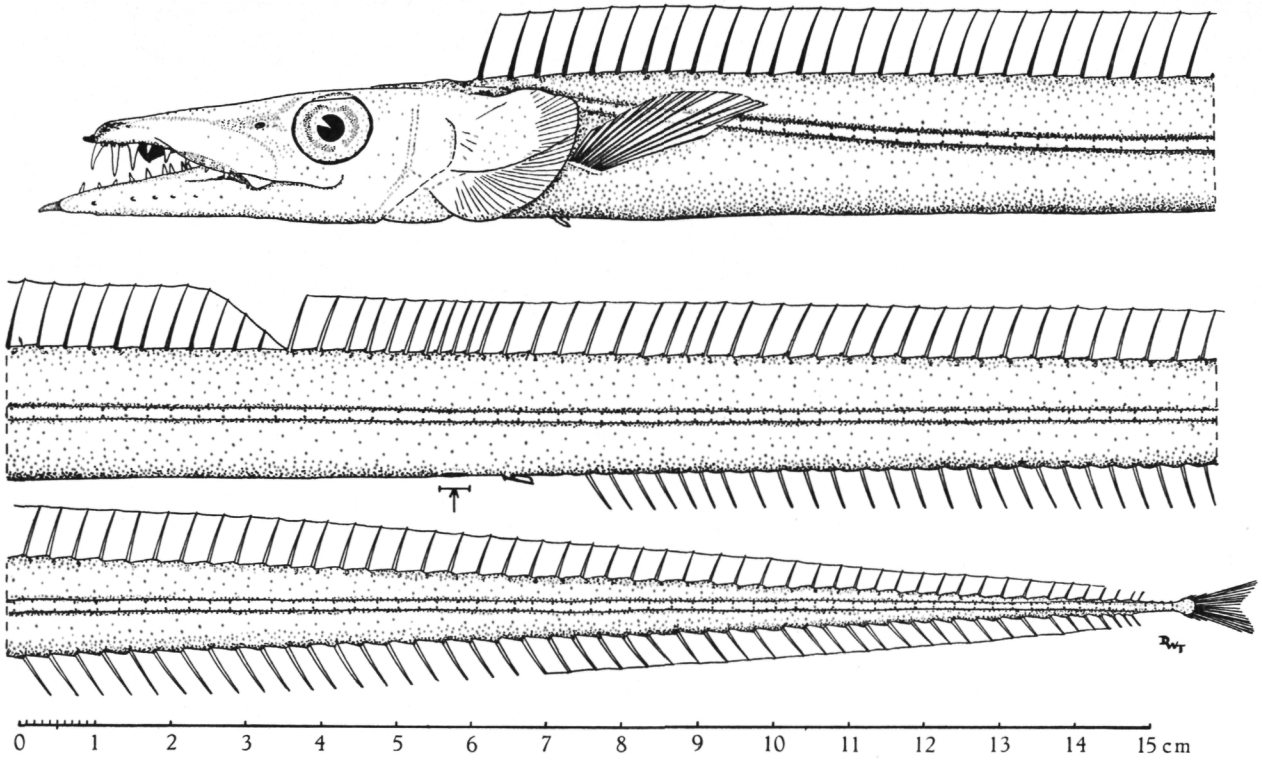

Fig. 1. — *Benthodesmus tenuis* (GÜNTHER) × 1.
(Dimensions, fin-insertions, dentition, drawn from Specimen H.23. Fins reconstructed from other specimens.)

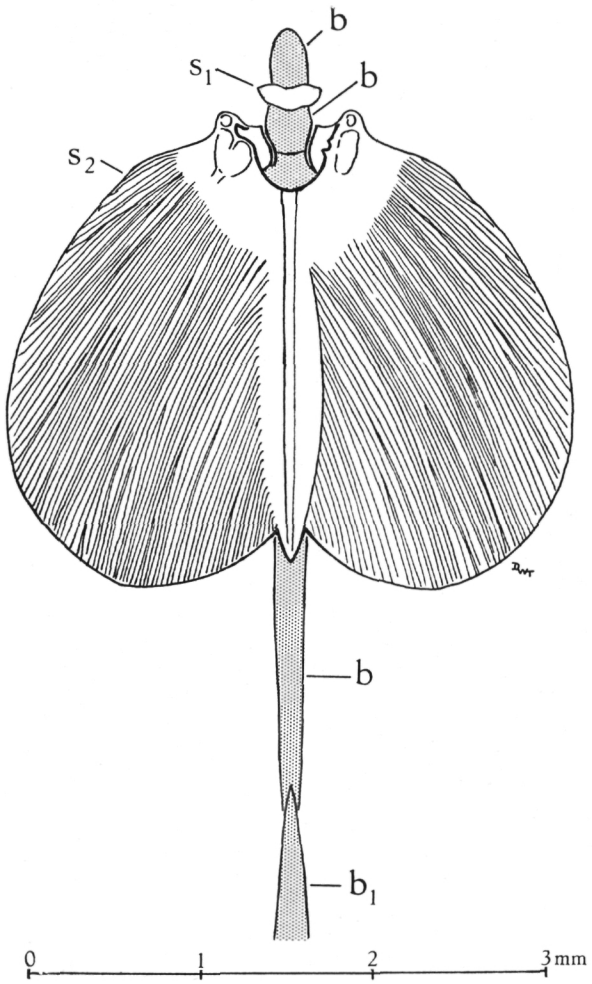

Fig. 2. — *Benthodesmus tenuis* (GÜNTHER).

Ventral view of anterior skeleton of anal fin of a specimen 327 mm S.L. (Drawn from an alizarin preparation of D.13.)

s_1, first anal spine; s_2, second anal spine (= anal scute); b, anteromost (compound) basal element; b_1, first simple basal element.

absent, and the remaining basal elements contribute to a mid-ventral keel foreshadowing the condition which is perfected in the Trichiurinæ. In both species the anal fin-membrane is supported by approximately 25 posterior rays. The present material is too badly damaged to establish with certainty whether the elongation of the penultimate anal rays found in *B. simonyi* occurs also in *B. tenuis*.

The anterior skeleton of the anal fin is shown in Figs. 2 & 3. b, the anteromost skeletal support, is a compound structure representing at least three telescoped and fused basal (= inter-hæmal) elements, probably more; dorsally it bears a thin blade

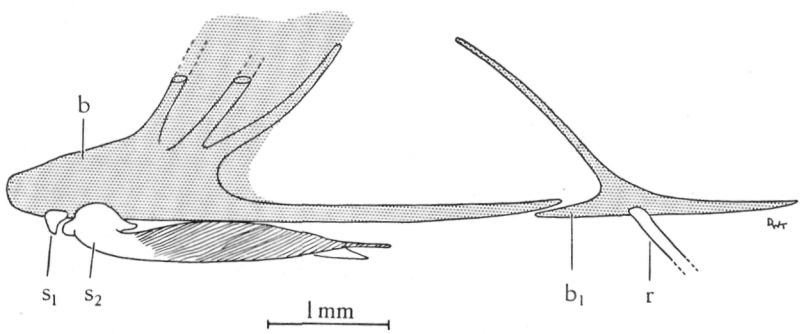

Fig. 3. — *Benthodesmus tenuis* (GÜNTHER).
Lateral view of anterior skeleton of anal fin.
r., first soft anal ray. (Remaining lettering as in Fig. 2.)

supported by three hollow spines which represent three inter-hæmal spines and are tipped with cartilage; posteriorly there is a long sliver of bone without either dorsal or ventral processes which accounts for the interval between the spinous and soft anal fin.

The anal spines (s_1, s_2) articulate with the ventral surface of b and at its anterior end. The first anal spine (newly recognised) is but a minute spinule. The second is a broad, flattened scale or scute which, in trawled material, is almost invariably destroyed so that only the two thickened, ear-like articulations with the basal remain. The body of the scale is cardiform,

extremely thin and mesially depressed into a slight keel. The lateral expansions of the scale have many fine longitudinal ridges of ossification, shown as fine lines in the figure. Though of very different form and relative development s_1, s_2, and b are readily recognised as corresponding with homologous structures in *Aphanopus* (1953, Pl. 2, Fig. 2), and at the same time it may be noted that *B. simonyi* shows a marked regression of the same region (1953, Pl. 2, Fig. 4).

b_1 and the remaining unmodified basal elements which follow it have each an antero-dorsally directed process and a ventral soft ray (r.), but no relation between these dorsally-directed interhæmal processes and the hæmal spines of the vertebræ is established until about b_{10} or later.

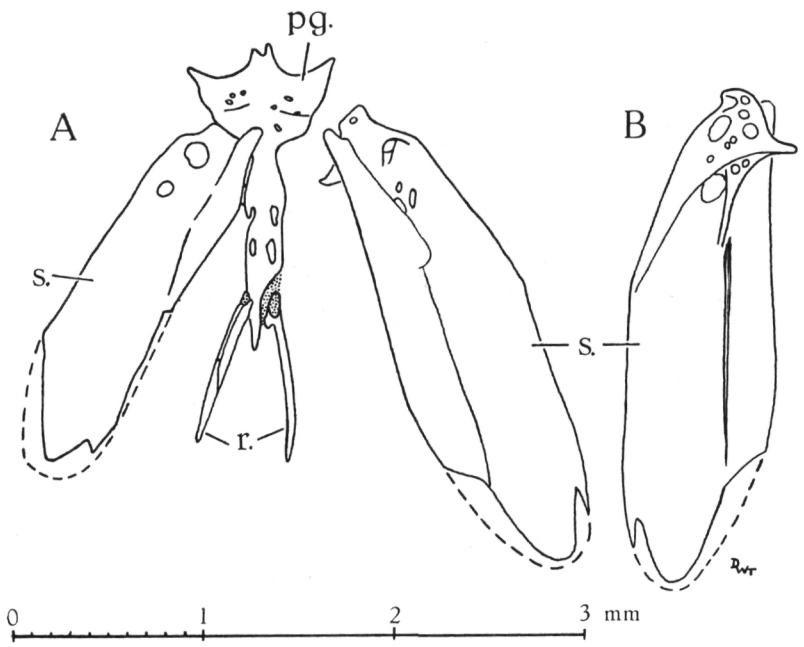

Fig. 4. — *Benthodesmus tenuis* (GÜNTHER).

Pelvic Girdle and fins of a specimen 423 mm S.L.
(Drawn from an alizarin preparation of H.21.)

A. Ventral surface of girdle and fins, the left spine disarticulated. Cartilage shown stippled. — B. Dorsal surface of left spine.
p.g., pelvic girdle; s., scale-like fin-spine; r., soft ray.

The present recognition of the forward extent of the anal fin calls for a partial apology to Mr. H. W. FOWLER for my earlier criticisms (1953 : 189).

Caudal Fin small, normal, forked, on the end of a long dorsiventrally compressed peduncle. Hypurals expanded; rays 5, 9+9, 5.

Pectoral Fins large, 12-rayed, inserted nearly horizontally and close to the edge of the operculum, the rays progressively increasing to about the 10th, which is longest.

Ventral Fins (Fig. 4) inserted close together in the midventral line, on or slightly before the vertical through the anterior end of the pectoral base and consisting each of a delicate flattened spine thickened along its mesial edge and (in the specimen stained and cleared) a rudimentary soft ray, newly recognised. The pelvic girdles are fused except for a small anterior notch and, like the proximal portions of the fin-spines, are much excavated and perforated by foramina. The soft rays are longitudinally split and have a little cartilage at the points of articulation with the girdle. For vestigial structures too minute to have any conceivable usefulness in the adult these have a surprisingly complicated structure. It is probable that here, as in other Trichiuridæ and Gempylidæ, the ventral fins are functionally significant merely as flotation devices in the juvenile stages.

Lateral Line (Fig. 5) strongly developed, its breadth ca. 13 times in the depth at the pectoral, simple, tubular, in a wide deep furrow, descending gently from the scapular region to about the middle of the body at the vent (or slightly below), thereafter running almost horizontally to the end of the caudal peduncle, of which it occupies the entire depth and a great part of the breadth. Lateral line pores on body numerous, in vertical pairs. (The lateral line canal is normally destroyed in trawled specimens and at the very least the lateral line pores generally coalesce into the « vertical slits » previously described). There are substantial lateral line canals in the bones of the skull, opening to the surface by pits which are also conspicuous, at least in preserved material.

Dentition. — The premaxillary bears three long, stout, simple, compressed, incurved fangs within its anterior end; external to these there is a row of 6-9 minute teeth and behind them a row of 5 large, laterally compressed teeth. The dentary has a single row of 7-9 moderately large teeth and the palatine

a single row of 10-15 small teeth along its anterior half. (Counts are given for the basic dentition (1953 : 177) and do not include obvious replacement teeth).

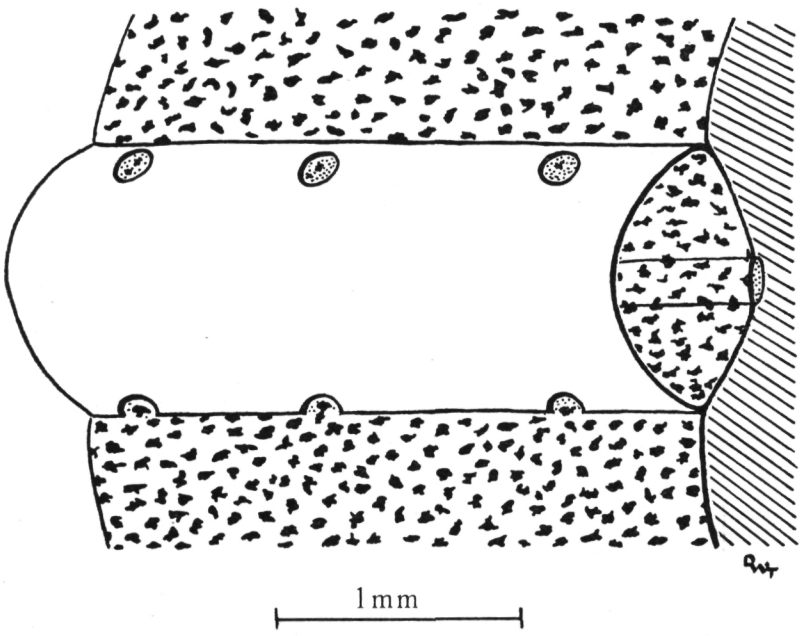

Fig. 5. — *Benthodesmus tenuis* (GÜNTHER).
Semi-diagrammatic section of lateral line, showing three pairs of pores.
(Drawn from F.17, specimen 353 mm S.L.)

The premaxillary fangs are set in a deep, broad groove, overgrown by mucosa in such a manner that the teeth and their replacements appear to emerge from pits or sockets. The first fang, curved forward and down, is in length half the horizontal diameter of the eye; it has a long though slight barb and broadens considerably at the base which is longitudinally fluted posteriorly. The second fang is the longest, about two-thirds the horizontal diameter of the eye and directed vertically downward or slightly backward. The third fang, more backwardly directed, is about equal to the first.

The small premaxillary teeth, no more than 0.5 mm long in the largest specimen to hand, are simple and conical, pointed

or rounded, sometimes barbed before and behind, and set in a groove in which they are irregularly spaced and directed. They are somewhat less numerous than in the Japanese holotype which has *12-15*.

The larger premaxillary teeth are set in a narrow groove and directed vertically downwards. They increase in size towards the middle of the ramus, where they are about one-quarter the horizontal diameter of the eye, and diminish again towards the posterior end. The microscopic serrations found on the corresponding teeth of *Aphanopus* are imperfectly developed in these if present at all. The number is again rather less than in the holotype (*5 : 8*).

The dentary teeth, though of similar form, are as a series rather smaller than those of the main premaxillary row. The first is a small recurved fang, less laterally compressed than those which follow. The remainder are set in a narrow groove, are upwardly or backwardly directed and diminish in size from the middle of the ramus.

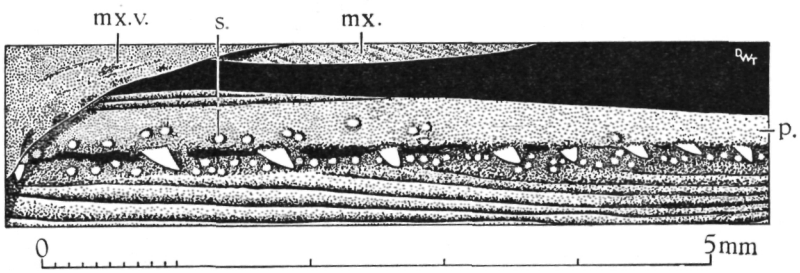

Fig. 6. — *Benthodesmus tenuis* (GÜNTHER).

Left palatine dentition of Specimen H.23 (467 mm S.L.).

mx. v., maxillary valve; s., sensory papilla; mx., inner surface of maxillary, forming cheek; p., palatine, bearing teeth set in dental groove.

The palatine teeth (Fig. 6) are borne along a groove towards the anterior end of that bone and in a somewhat irregular series. They are freely exposed at the tips, inwardly and backwardly directed, and do not exceed 1 mm length in the largest specimen to hand.

Gills 4, a slit behind the fourth; pseudobranch present. Gill arches each with a single series of patches of minute teeth,

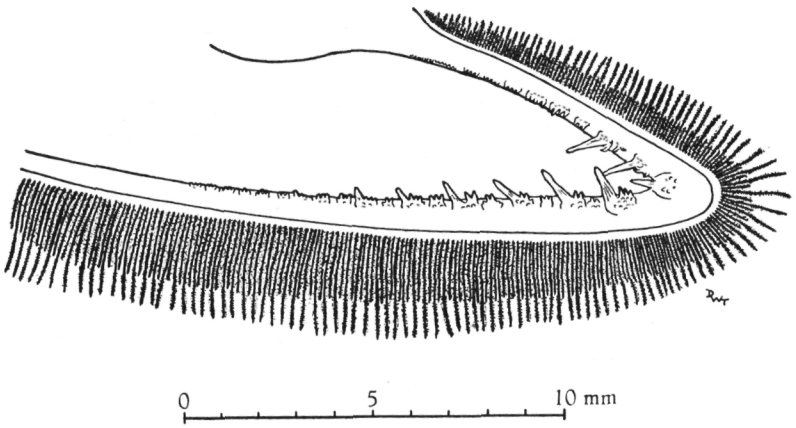

Fig. 7. — *Benthodesmus tenuis* (GÜNTHER).
First left gill-arch of a specimen 430 mm S.L. (Drawn from A.1.)

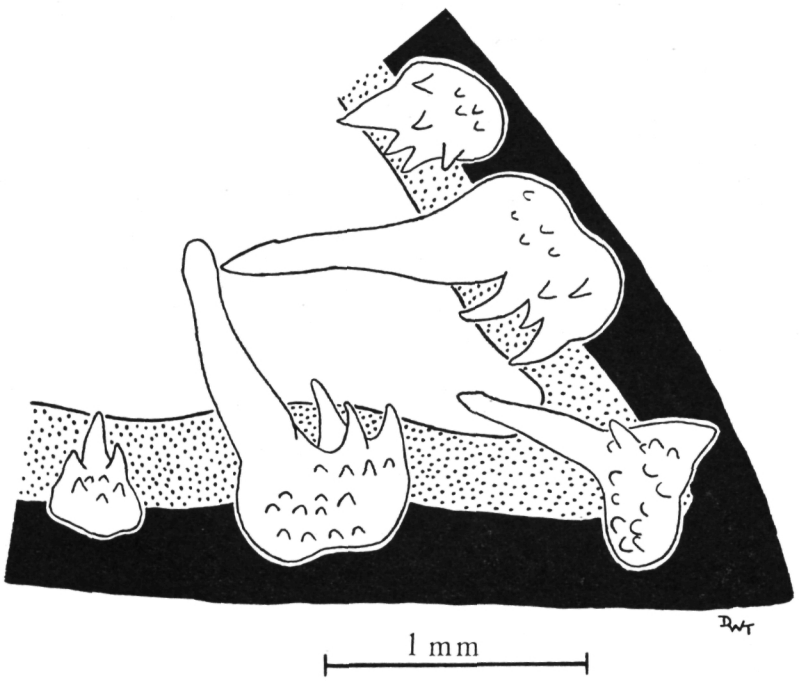

Fig. 8. — *Benthodesmus tenuis* (GÜNTHER).
Teeth at angle of first gill-arch. (Detail of Fig. 7.)

those of each patch completely or partly united by their bone of attachment save towards the proximal ends of the limbs where the teeth are minute and detached. Towards the angles of the arches some of these patches include each one large barbed tooth, and it is these principal teeth, numbering 2-3/1/5-7 on the first arch, which simulate gillrakers (Figs. 7 & 8). The condition is similar to that figured in various *Gempylidæ* by MATSUBARA & IWAI (1952). On the third and fourth arches the teeth are smaller and fewer.

Branchiostegal Rays 7.

Appendices Pyloricæ 7-9, simple (Fig. 9).

Colour. Silver, finely sprinkled with melanophores, these becoming thicker along the mid-dorsal and ventral lines and fin-bases. There is also a dense aggregation of melanophores at the base of each dorsal and anal ray. Inside of mouth, gill-chambers and body-cavity black. Iris silver.

Food. Radiographs show most of the specimens to contain fragmentary remains of small fishes, probably Myctophids and *Cyclothone* spp., but so damaged as to offer very little hope of positive identification.

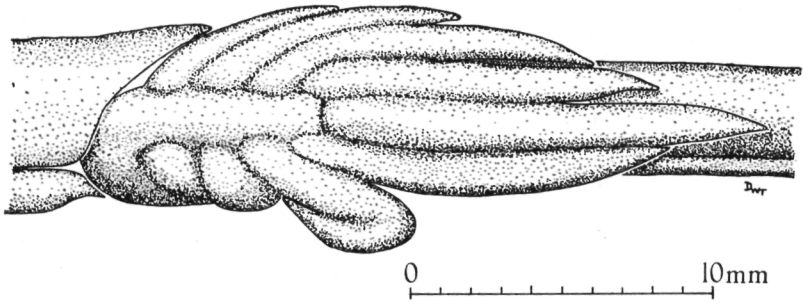

Fig. 9. — *Benthodesmus tenuis* (GÜNTHER).
Anterior abdominal viscera of a specimen 430 mm S.L., showing 9 pyloric cæca. (Drawn from A.1.)

SUPPLEMENTARY NOTES ON *Benthodesmus tenuis* (GÜNTHER).

1) Records — Pacific.

In my previous paper (1953 : 188) I commented on GÜNTHER's alleged omission of a 91 mm juvenile from « Challenger » St. 271, (0°33'0"S, 151°34'0"W, between the Sandwich Is. (= Hawaï)

and Tahiti, 2425 (—0) fms.). At that time I regarded the familiar « Challenger » Reports on « Shore Fishes » and « Deep-Sea Fishes » as being complementary and comprehensive; only recently did I happen upon GÜNTHER (1889), a small « Report on the Pelagic Fishes » and discover that, whereas the holotype of *Lepidopus tenuis* was published in 1877 and 1887, the juvenile specimen was separately published in 1889, Dr. GÜNTHER having observed that : « ...it is probable that this small and delicate fish was swimming near to the surface when it got entangled by the trawl ». The record had not previously been cited by any other author and indeed it seems apparent that GÜNTHER (1889) has been overlooked by other authors in different contexts.

GÜNTHER gives no information on the smaller specimen apart from a comment on its damaged state, a tentative identification and the statement that it was « 95 mm long ». Since I obtained a total length of 92 mm it would appear that damage to the caudal tip, aggravated since GÜNTHER's examination, must be more radical than I supposed, and, accordingly, that the body proportions which I gave in 1953 must be over-estimates. Recent

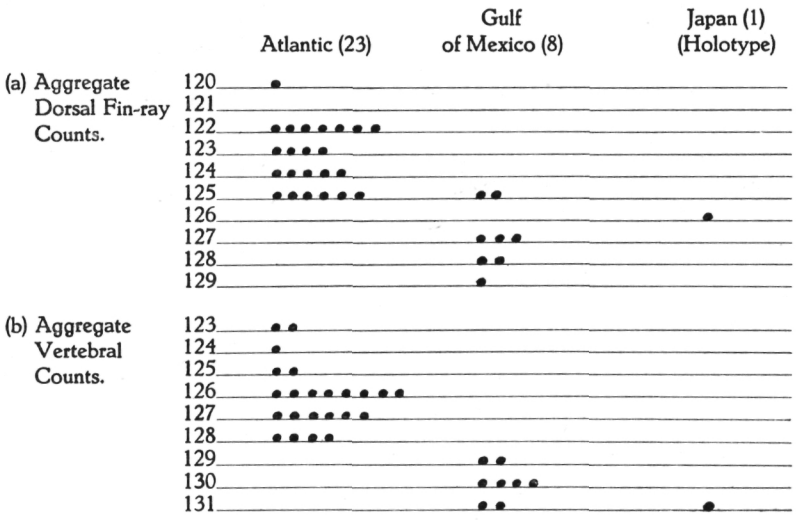

Fig. 10. — Comparison of different samples of *Benthodesmus tenuis* (GÜNTHER) in regard to meristic characters.

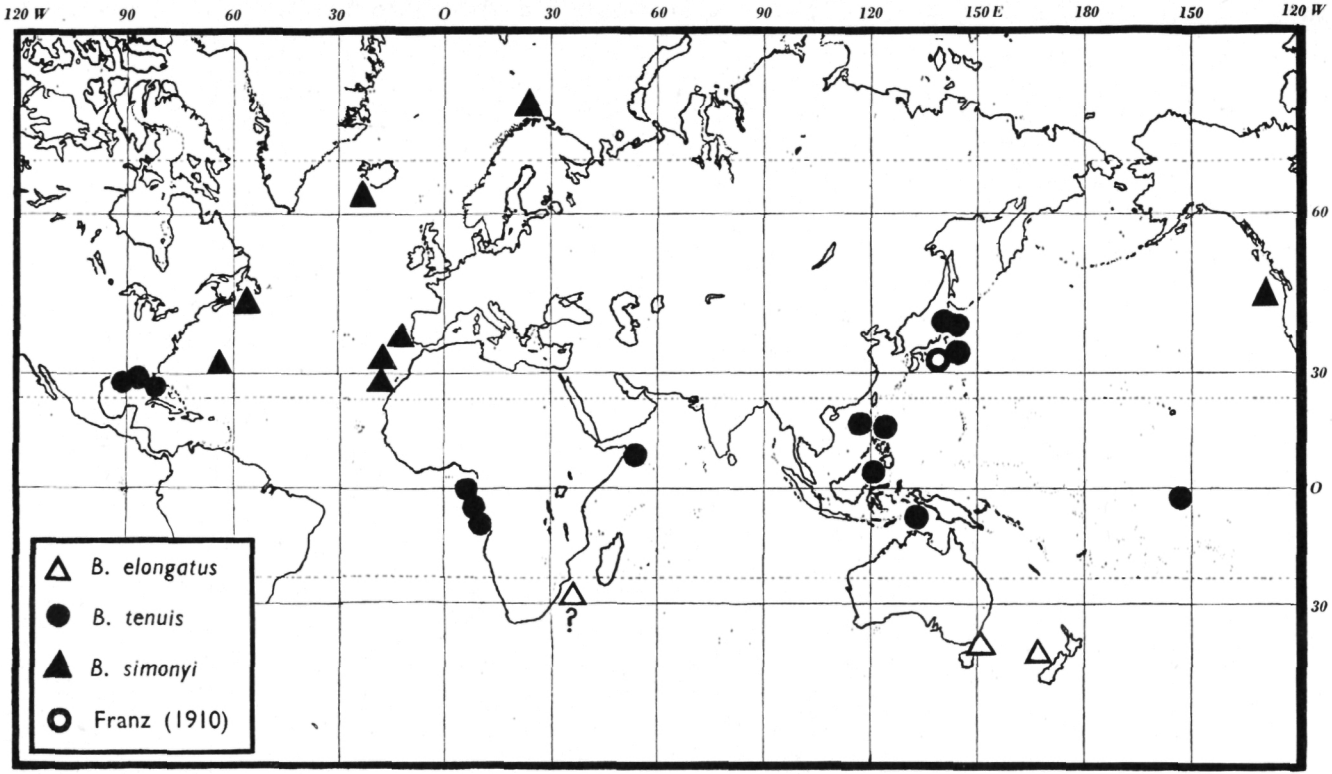

Fig. 11. — World distribution of the Genus *Benthodesmus*.

examinations of other small Trichiurids confirm the view that the caudal structure of this specimen is deficient and that it probably originally resembled that of the adult. Previous theories of relative growth must be modified accordingly.

One further Pacific record has been published. MEAD & TAYLOR (1953) report one juvenile of 146 mm from 46 miles E of Ohakozaki, Honshu, Japan, (ca. 143°E, 39°30'N) April 20th, 1952, ca. 13(—0) metres.

2) Records — Gulf of Mexico.

Commenting in 1953 (p. 190) upon the Tortugas material referred by LONGLEY & HILDEBRAND (1941) to *B. atlanticus* G. & B., I concluded that the evidence presented in their paper pointed to their having the first known material of *B. tenuis* from that region. Subsequent examination of eight specimens from the Gulf of Mexico received on loan confirms that supposition. The material will be put at the disposal of Dr. Carl L. HUBBS for detailed publication but a summary of salient characters is presented in Table 3. As is further emphasized in Fig. 10, this sample has a higher range of fin-ray counts and vertebral counts than that from the Eastern Atlantic, and demands a corresponding modification of our concept of the species. At the same time the anterior position of the ventral fins and the generally lower counts vis-à-vis *B. simonyi* are maintained.

3) Records — Indian Ocean.

In 1953 (p. 190) I questioned the identity of a supposed *B. tenuis* from « Valdivia » St. 263 in the north-western Indian Ocean, (4°41'9"N, 48°38'9"E, 823 metres), reported by BRAUER (1906) as *Lepidopus tenuis* GÜNTHER. At that time the stated counts of D. 133; A. 75 were rather higher than any known, but now that a variation of D. 120-129; A. i + 1 + 70—75 has been demonstrated there seems no longer to be any objection to accepting BRAUER's specimen as the first record from the Indian Ocean. Only slightly less certain is the similar identification of BRAUER's *Lepidopus argenteus* (non BONNATERRE) from nearby « Valdivia » St. 268, a younger specimen with lower counts (D. ca. 115; A. 67-70).

TABLE 3. — *Data relating to B. tenuis from the Gulf of Mexico.*

Specimen No.	Locality Data	Standard Length mm	Percentages of S.L.		Meristic Counts			
			Head Length	Body Depth	Dorsal Rays	Aggregate	Anal Rays i+I+	Vertebræ
I.24	« Oregon » St. 268	245	12.9	3.2	XLII,83	125	72	51 + 79 = 130
I.25	29°28'N, 87°28'W	261	13.0	3.2	XL,88	128	73	51 + 79 = 130
	110 fathoms							
	17th February, 1950							
J.26	« Oregon » St. 532	420	13.6	4.0	XLI,86	127	74	50 + 79 = 129
J.27	27°34.8'N, 93°10.2'W	445	13.7	3.4	XLII,86	128	75	52 + 79 = 131
J.28	220-300 fathoms	446	13.4	3.9	XLII,85	127	73	51 + 79 = 130
	11th April, 1952							
K.29	« Oregon » St. 795	422	13.3	3.4	XLI,84	125	74	51 + 78 = 129
K.30	29°15'N, 87°49'W	407	12.9	—	XLII,85	127	75	51 + 80 = 131
	230-300 fathoms							
	12th June, 1953							
L.31	M.V. « Antilles »	402	12.9	3.7	XLII,87	129	75	51 + 79 = 130
	29°9'N, 88°16'W							
	19th September, 1952							

SUPPLEMENTARY NOTES ON *Benthodesmus simonyi* (STEINDACHNER).

1) Nomenclature.

Dr. Carl L. HUBBS in litt. indicates that he is disposed to regard *B. simonyi* (STEINDACHNER, 1891) as a synonym of *B. elongatus* (CLARKE, 1879). Without wishing to dispute the probability of this identification I prefer to regard it as « non-proven » and retain both names for the present as a reminder that the holotype of *B. elongatus* has been lost and that no other material from New Zealand has been identified by subsequent authors.

2) Records — Atlantic.

A further record and reference may be added to the intended complete list previously given (1953 : 180-181). Carlos DE BRAGANÇA (1904) reports one head (as of *B. atlanticus* GOODE & BEAN) taken from the stomach of a *Centroscymnus cœlolepis* BOCAGE & CAPELLO caught on a long-line off Cap Espichel, Portugal.

Four further Madeiran specimens have been received as a gift from the Museu Municipal do Funchal to the British Museum (Natural History). (F.M. Reg. No's 3741, 3751, 3755, 3755; B.M. (N.H.) No's 1953.11.1. 285-288.) Information concerning these is tabulated in Table 4.

These specimens are darker than others previously seen, colour evidently being widely variable according to the relative expansion of the melanophores. No. 286 is being used for osteological and other studies; its stomach contained an agglomeration of well-digested fish-remains, including otoliths which may eventually be identified, lenses and beak fragments of a very small cephalopod, and the inevitable larval nematodes, probably the ubiquitous *Ascaris capsularia* RUUD.

TABLE 4. — *Madeiran B. simonyi* (STEINDACHNER).

Reg. No. 1953.11.1	Standard Length mm	% of S.L.		Counts		
		Head	Depth	Dorsal	Total	Anal i+I+
285	1015	13.89	4.23	XLVI,106	152	97
286	1225	14.61	4.56	XLV,105	150	96
287	1015	14.48	4.13	XLIV,104	148	93
288	1170	14.44	4.44	XLV,105	150	98

3) Records — Pacific.

Study Material. — Provincial Museum, Victoria, British Columbia : No. P.M. 239/1277. One specimen, 1005 mm S.L. Loc. Bentinck Island, near Race Rocks, Juan de Fuca Strait, (about 10 miles by sea from Victoria, B.C.). May 30th, 1916. British Museum (Natural History) Radiograph No. 805. (Four sections on two negatives.)

GILBERT (1917) published an account of a supposed *Benthodesmus atlanticus* GOODE & BEAN from off Victoria, British Columbia, of which he remarked : « Ventrals mutilated, their base posterior to that of the pectoral by 2/5 diameter of orbit ».

In the light of what I knew of ventral fin-insertions in the Trichiuridæ I described this statement as « ambiguous and puzzling » and now, having examined the specimen, I am able to understand and explain the mistake which GILBERT must have made.

Plate 1 shows a photograph and a radiograph of the head. The body immediately behind the head is badly torn so that the mid-ventral body-wall, carrying with it the ventral fins closely applied to its surface, is deflected upwards and to the left side of the fish. The small protuberance in the mid-ventral line which GILBERT evidently regarded as the « base » of the ventral fins is actually the exposed tip of the right post-cleithrum. The ventral fins themselves are inserted just behind the vertical through the posterior end of the pectoral base, in the position characteristic of *B. simonyi,* to which species I now refer the specimen.

GILBERT also made mistakes in describing the dentition; he misinterpreted the premaxillary fangs as two pairs instead of three; he misattributed the premaxillary dentition to the maxillary, which is in fact toothless, and he also failed to observe the palatine teeth, which were concealed.

Apart from slightly lower vertebral and fin-ray counts, less significant now that we know the variation in *B. tenuis,* this specimen corresponds very well with the previously described (1953 : 185) Paris Museum No. 05.578 specimen of *B. simonyi* from Portugal, so that a list of counts and proportions will be adequate to describe it.

Radial Formula : D.XLV,102; P.12; V.1; A.i+I+91; C.4,8+8,5.

(The Anal count is that of the interhæmal processes of the basal elements : along the anterior part of the fin there are only the minutest vestiges of rays and at most 26 posterior rays are stout enough to have supported a fin-membrane.)

Vertebral Count : 52+101=153.

Branchiostegal Rays : 7.

Principal Teeth on first Gill-Arch : 4/1/6.

Basic Dentition : Premaxillary : 3 enlarged fangs, 6-7 minute teeth, 9 in main series.
Dentary : 16.
Palatine : ca.7 (previously concealed). (Left Palatine only examined).

The situation with regard to the premaxillary fangs may be expressed thus :

Side	1	2	3
Left	Tooth	Broken stump, having a replacement tooth behind lying back in the mucosa	Tooth
Right	Tooth	Tooth	Pit with replacement tooth lying back in mucosa

Appendices Pyloricæ : Destroyed.

Total Length (tip of mental barbel to tip of unfolded caudal fin) : 1033 mm.

Standard Length (soft tip of snout to end of caudal peduncle) : 1005 mm.

Percentages of Standard Length : Head Length 12.53; Tip of Snout to Dorsal 10.64; to Pectoral 12.43; to Ventral 13.03; to Vent 39.60; to Anal Scute 41.49. Depth at Vent 3.88; Spinous Dorsal Base 28.45; Soft Dorsal Base 58.20; Combined Dorsal Base 87.16; Anal Base 56.31.

Head Length (soft tip of snout to extreme edge of operculum) : 126 mm.

Percentages of Head Length : Greatest Breadth 18.25; Interorbital 6.74; Interocular 13.88; Snout (from soft tip) 45.23; Postorbital Head 37.30; Horizontal diameter of Eye 20.63; Vertical do. 16.66; Upper Jaw 38.88; Lower Jaw (tip of mental barbel to end of Articular) 65.07; Tip of Snout to Anterior Nares 8.73; Posterior Nares to Eye 7.14; Height over centre of Eye 24.20.

Colour : Silvery, scraped white.

4) Negatived Records — Caribbean.

GOODE & BEAN (1895) mention two small specimens from the Yucatan Strait and the neighbourhood of St. Kitts, B. W. I. which they assign to *Benthodesmus atlanticus* G. & B. Information supplied to me in litt. by Dr. Ernest A. LACHNER of the United States National Museum enabled me to question these identifications (1953 : 183) and now Dr. Carl L. HUBBS has established that these two specimens are not, in fact, *Benthodesmus* at all but *Diplospinus*.

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ADDENDA.

(1) Since the present paper went to press, one further record of *Benthodesmus simonyi* STEINDACHNER (from off Bermuda) has been published :

GREY, M. (1955), *Notes on a Collection of Bermuda Deep-Sea Fishes.* (Fieldiana : Zoology. Chicago, 37, 265.)

(2) *Scarcina argyrea* RAFINESQUE, based apparently on a Mediterranean specimen from Sicily, has been generally assumed to be a junior synonym of *Lepidopus caudatus* (Euphrasen). Fram RAFINESQUE's description and figure, however, it would appear much more likely that his material was conspecific with *Benthodesmus tenuis* (GÜNTHER), save that the latter has not yet been reported from the Mediterranean. In such a case, not only would RAFINESQUE's name have priority over GÜNTHER's but *Scarcina* would have priority over *Benthodesmus* GOODE & BEAN. In the circumstances it seems best to leave *S. argyrea* in the synonymy of *Lepidopus caudatus* for the present, where it can do no harm; if Mediterranean material of *Benthodesmus tenuis* should ever appear, then, in the interests of nomenclatorial stability, it might be considered desirable to make application to the International Commission on Zoological Nomenclature to use its plenary powers to suppress the names *Scarcina* and *Scarcina argyrea* RAFINESQUE.

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BRITISH MUSEUM (NATURAL HISTORY).

AD. GOEMAERE, Imprimeur du Roi, 21, rue de la Limite, Bruxelles