

REVISION OF THE COSMOPOLITAN DEEP-SEA GENUS *BASSOZETUS* (PISCES: OPHIDIIDAE) WITH TWO NEW SPECIES

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ABSTRACT

Most known specimens (395) of the mainly benthopelagic deep-sea genus *Bassozetus* were examined in a global revision. The fact that several of the species known hitherto were based upon single specimens, often in poor condition as was much of the material examined, together with a dearth of obvious interspecific diagnostic characters and allometric growth patterns hampered the study. Nevertheless, aided by sagittal otolith size and morphology and other characters, 13 species are recognized, of which two are described herein and lectotypes selected for three (*B. compressus*, *glutinosus* and *nasus*). A diagnostic key and field guide to species is provided, together with a generic diagnosis, specific descriptions and distributional

charts. A cladistic analysis left the question of relationships among the 13 species unresolved. Little evidence could be provided on species biology, but ripening gonads in several species indicated size at maturity. Hence four species were confirmed to mature at small adult size (<300 mm standard length (SL)) and 7 at large size (>450-800 mm SL). Species were found below temperate and tropical surface waters (1500-5000 m) (only *B. zenkevitchi* was found to have a pelagic lifestyle), six in the Atlantic (two reported for the first time), nine in the Indo-West Pacific (five seemingly indigenous) and only two species in the eastern Pacific region (one indigenous).

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INTRODUCTION

Representatives of the mainly benthopelagic genus *Bassozetus* are commonly caught at depths between 1500 and 5000 meters. Specimens are found in many collections but quite often catalogued as *Bassozetus* sp. or with an incorrect specific name. The reason is that many of the specimens, being trawled at great depths, are in a poor condition as the bones of the head are rather fragile and the scales easily shed. Also the descriptions of many *Bassozetus* spp. were based on single or a few specimens so that interspecific variation was poorly known. By borrowing most type specimens and a large number of others for direct comparison we achieved a better understanding of the species and their diagnostic features (detailed on p. 12).

A cladistic analysis (PAUP 3.1.1) was based on

14 characters with *Neobythites gilli* Goode & Bean, 1885 chosen as the outgroup. A heuristic search carried out with 100 random input orders of the taxa resulted in 1586 trees with a length of 24 steps and a consistency index of 0.667. The results indicate that the characters used in this analysis were not adequate to resolve the phylogeny of this genus.

The result of this revision is that we recognize 13 species, of which two are here described (*B. galathea* and *B. werner*) and lectotypes are selected for *B. compressus*, *B. glutinosus* and *B. nasus*. The outcome is that we have satisfied Cohen & Nielsen's (1978) call that "The genus requires revision" as far as is currently possible.

MATERIAL AND METHODS

All material available has been examined, which amounts to 395 specimens. Tables presenting meristic and morphometric characters do not always include data from all specimens listed in the "Material examined" as some specimens are in such poor condition that only a few diagnostic characters were available.

In the "Appendix" p. 54 are listed specimens which could not be assigned a specific name due to poor condition. Almost all specimens caught by the

Galathea have no otoliths remaining as they were kept in unneutralized formalin for about 50 years.

In some species accounts (*B. galathea*, *robustus*, *taenia*) 1-2 specimens are treated as "tentatively referred specimens" as they differ from the typical species but, considering the limited material available, not enough to warrant establishment of new species.

Species descriptions are brief, as much informa-

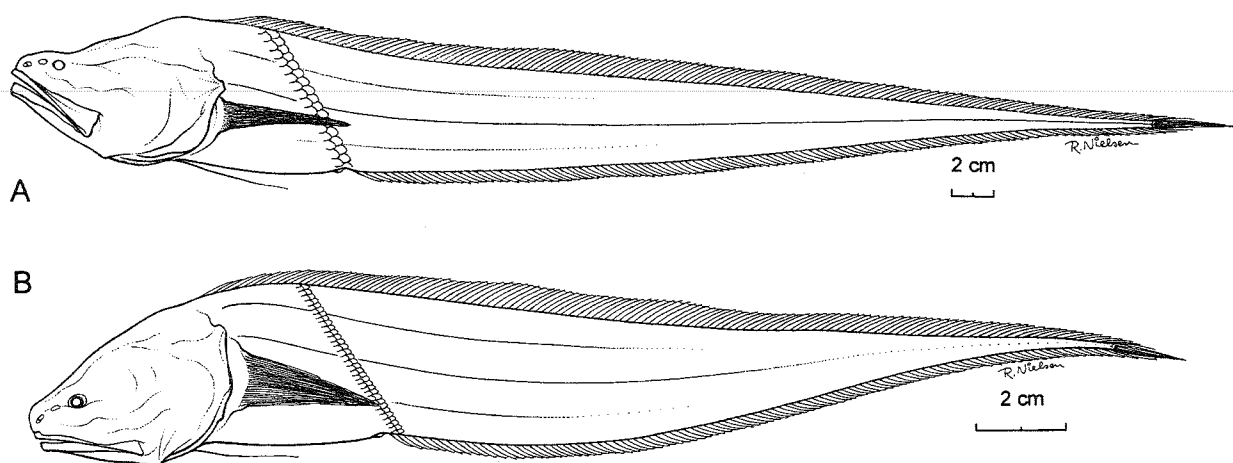


Fig. 1. A, large scales in *Bassozetus elongatus* (SL 475); B, small scales in *B. glutinosus* (SL 225).

tion is given in the frequency distribution table, the tabulated data for each species showing the principal meristic and morphometric characters and the figures.

Counts and measurements follow Cohen & Nielsen (1978).

Additional characters are "Oblique scale rows" which is the number of scale-rows in a dorso-ventrally oblique series anteriorly from the anus (Fig.

1) and "Depth of body at 1st. anal ray" which is a more precise measurement than the often used "Maximum depth of body" which varies according to the condition of the abdomen.

Whenever possible we have examined the left sagittal otolith which was removed by making an incision on the left side above the anterior gill arch into the inner labyrinth.

ABBREVIATIONS AND DEFINITIONS

Material has been borrowed from several institutional collections, abbreviations for which follow Leviton et al. (1985). They did not include The Natural History Museum, London (NHM) and the Zoological Museum, Moscow State University (ZM MGU). The abbreviation for Institute of Oceanology, Moscow has been changed from IOAN to IORAN.

SL - standard length in mm

IKMT - Isaacs Kids Midwater Trawl

Benthopelagic - living close to the bottom but not habitually in contact with it

Cephalic or radiating discs - appear as whitish, round thickenings on the head of several species of deep sea fishes. Garman (1899: 355, 357, plates LXXVII-LXXVIII) suggested that the cephalic discs might have luminous, electric and/or tactile functions. Lendenfeld (1905: 197) gave a very detailed description of the discs, using the term "radiating discs", showing that they were well provided with blood vessels and with a stout nerve. Their function is unknown.

Diameter of eye - diameter of eye window

Depth zones from Merrett & Haedrich (1997):

Continental slope - from 200 to 2000 m

Continental rise - from 2000 to 4000 m

Abyssal - from 4000 m down

Sounding - equivalent to depth of capture in benthopelagic species referred here to merely as depth.

Genus *Bassozetus* Gill, 1884

Bassozetus Gill, 1884: 259 (type species by monotypy *Bassozetus normalis* Gill, 1884).

Pterodicromitra Fowler, 1925 (type species *Sirembo oncercephalus* Vaillant, 1888 by original designation.

Diagnosis

Ophidiid genus with elongate body tapering caudally, head and body with deciduous scales, lateral line indistinct, head about half of preanal length, mouth terminal, snout inflated (judging from photos of live specimens), most often flattened in preserved specimens, eye diameter much smaller than snout, upper jaw ending well beyond eye and sheathed posteriorly, opercular spine weak or absent, preopercle unarmed and posteriorly enlarged almost reaching posterior margin of opercle, 0-1 elongate median basibranchial tooth patch (none in *B. levistomatus*, *weneri* and *zenkevitchi*), small and close-set teeth on premaxillary, dentary, vomer (lacking or few in *B. levistomatus* and *weneri*) and palatines, 9-22 long rakers on anterior gill arch, two pseudobranchial filaments, pectoral fin with 21-29 rays not reaching anus, ventral fin with one ray in each, precaudal vertebrae 11-17, short genital papilla, ripe males with a pair of thick drumming muscles attached to swimbladder anteriorly.

Similarity

The most similar genus is *Eretmichthys* Garman, 1899. Shcherbachev (1980, fig. 13) showed that the fourth (lower) radial in the pectoral girdle is provided with a ventrally protruding process which is not found in *Bassozetus*. Furthermore, the rays of the lower part of the pectoral fin are much prolonged (reaching well beyond the anus) in ripe males of *Eretmichthys* while the pectoral fin in *Bassozetus* is unmodified; it seems as if the pectoral fins of females and unripe males of *Eretmichthys* tend to split but remain unsplit in *Bassozetus*.

Table 1. Depth distribution by capture locality and field guide to the species of *Bassozetus* by oceanic region of occurrence. (Species listed in bold are known from one oceanic region only).

Ocean	Species	Tot Loc	Size mm SL	Depth range X 100m																									Characters	Species	
				12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58				
ATLANTIC	<i>levistomatus</i>	5	185-805														2	-	-	1	-	1	1				Sagitta L	Deep	<i>levistomatus</i>		
	<i>robustus</i>	17	115-485	5	2	2	7	1																				Sagitta L	Shallow	<i>robustus</i>	
	tent. ref.	2	360-435		1			1																							tent. ref.
	<i>compressus</i>	25	103-620										1	-	2	-	2	2	2	5	-	4	4	2	1				Sagitta S	Scales L	<i>compressus</i>
	<i>taenia</i>	15	85-242				1	-	1	-	-	-	-	-	-	-	-	-	-	3	-	5	3	-	1	1				L gr 11-14 L gr 15-20 V to A <20% SL	<i>taenia</i>
	tent. ref.	1	89-162																					1							tent. ref.
	<i>oncrocephalus normalis</i>	22	60-276				2	1	2	1	1	4	1	1	3	2	2	1	-	-	-	-	-	1						V to A 23.5% SL	<i>oncrocephalus normalis</i>
INDO-WEST PACIFIC	<i>zenkevitchi</i>	13	57-275	(Pelagic capture - non-closing nets)																											<i>zenkevitchi</i>
	<i>levistomatus</i>	3	233-498															1	-	-	-	1	-	-	-	1			BBTP - 0	L gr 15-18 L gr 9-11	<i>levistomatus</i>
	<i>weneri</i>	1	375					1																						Deep # Shallow #	<i>weneri</i>
	<i>multispinnis</i>	4	215-452				2	1	1																						<i>multispinnis</i>
	<i>galathea</i>	13	109-573	1	3	3	4	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	BBTP - 1	V short V long	<i>galathea</i>
	tent. ref.	1	232																												tent. ref.
	<i>robustus</i>	21	138-640	5	5	5	1	1	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1			<i>robustus</i>
	<i>elongatus</i>	7	172-480					1	2	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2			<i>elongatus</i>
	<i>glutinosus</i>	19	68-292		1	3	-	4	5	1	2	-	1	-	1	1															<i>glutinosus</i>
	<i>compressus</i>	2	405-432			1	-	-	-	-	1																				<i>compressus</i>
EAST PACIFIC	<i>levistomatus</i>	1	340							1	-	-	-	-	1	1	4											Sagitta L		<i>levistomatus</i>	
	<i>nasus</i>	7	80-465																									Sagitta S		<i>nasus</i>	

Abbreviations:

A = anal fin; BBTP = basibranchial tooth patch; D = dorsal fin; L = large; L gr = long gill rakers; Tot Loc = total number of capture localities; tent. ref. = tentatively referred specimens; S = small; V = ventral fin. # - 'deep' & 'shallow' refer to living depth and are placed under 'Characters' for convenience.

Biology

Apart from the benthopelagic lifestyle of all but *B. zenkevitchi*, little can be inferred of the biology of these species. The smallest known specimen (SL 68 mm) of *B. glutinosus* was caught in an IKMT between the surface and 2250 m indicating that juveniles can occur pelagically. No larvae are recorded but almost all known ophidiid larvae have been caught pelagically in the lower part of the epipelagic zone (personal observation - JGN). The well developed drumming muscles on the swim-bladder in ripe males indicate that they may attract females during the breeding season. In common with many deep-sea bottom-living fishes, specimens were found to contain very few stomach contents. Most information could be obtained from *B. galathea*, where six out of 22 specimens contained fish, crustacean and polychaete remains. The only other dietary evidence came from *B. levistomatus* (polychaete setae) and *B. werneri* (amphipod and isopod remains).

Ripening gonads were found in several species, giving a useful indication of size at maturity. The largest ova occurred in a specimen of *B. robustus* (1 mm diameter, SL 480), but 0.5 mm ova also occurred in *B. compressus* (5 specimens, SL 432-560), *B. galathea* (SL 232), *B. multispinis* (SL 425), *B. nasus* (2 specimens, SL 278 and 465), *B. robustus* (2 specimens, SL 413 and 561) and 2 *B. zenkevitchi* (SL 240 and 245). One *B. taenia* (SL 232) contained eggs of 0.6 mm diameter and a female *B. levistomatus* (SL 805) was spent. Among males, ripe or spent fish were found in *B. galathea* (SL 555), *B. levistomatus* (SL 735) and 2 *B. nasus* (SL 197 and 243). Taken with the species' size distribution, this gonad maturity evidence indicates that *B. glutinosus* (to 292 SL), *B. normalis* (to 276 SL), *B. taenia* (to 242 SL) and *B. zenkevitchi* (to 275 SL) are likely to attain the smallest adult size. The remaining sufficiently abundant species suggest maximum adult sizes of between >450 to >800 SL (*B. compressus*, *B. elongatus*, *B. galathea*, *B. levistomatus*, *B. multispinis*, *B. nasus*, *B. robustus*).

Distribution

Bassozetus species have been caught in all tropical and temperate oceans. Their representation by oceanic region and by 200 m depth strata is given in the "field guide" (Table 1), whereas geographi-

cal and bathymetric details are given in the individual species' accounts. All species, apart from *B. zenkevitchi*, are deep benthopelagic in habit and collectively span mid-slope to abyssal depths, occupying all strata from 1001-1200 down to 5601-5800 m, except 4601-4800 m. *B. zenkevitchi* has been caught largely in non-opening/closing nets fished pelagically, often at great depth to give no indication of their living depth (see p. 53). Commonly species occupy broad bathymetric ranges and some ranges are further extended by outlying captures at considerably shallower or greater depth (e.g. *B. taenia*, Table 1) which, until more material is collected, can only be noted as unusual.

We record six species from the Atlantic Ocean. Three occur only there (in bold type in Table 1) and two, *B. levistomatus* and *B. robustus*, are reported from there for the first time. *B. levistomatus* is the only species known to be restricted to abyssal depths globally, whilst *B. robustus* is entirely a slope dweller in the Atlantic and mainly so in the Indo-West Pacific. *B. taenia* would be considered deep abyssal in distribution were it not for two captures at lower slope depths. The shallow locality of capture in Exuma Sound in the Bahamas, however, may represent an atypical extension of the deep ocean into a shallower area (see species account). *B. normalis* seems to be an almost exclusive inhabitant of the continental rise, whilst *B. compressus* extends from the rise down into the abyss.

Nine species have been caught in the Indo-West Pacific, of which six appear to be indigenous to this region. Inspection of Table 1 suggests that this assemblage generally, apart from *B. zenkevitchi* and *B. levistomatus*, frequent shallower depths than their congeners in the Atlantic. Nevertheless, this may be just a sampling artefact since abyssal trawling in this area has been far less widespread than in the Atlantic. Such rather restricted coverage may also affect apparent geographical distributions. Currently, the seemingly pelagic *B. zenkevitchi* is distributed only in the North Pacific and mainly around Japan. Yet, apart from the rarely caught *B. werneri* (holotype only) and *B. compressus* (2 specimens) the only other species with a restricted distribution is *B. multispinis*. This last species is a slope dweller and currently is restricted to the Ninety Degrees East Ridge in the Indian Ocean.

Only two *Bassozetus* species have been caught in the eastern Pacific region. *B. levistomatus* has been taken at a single locality, whilst *B. nasus* has

been caught at seven (Table 1). *B. nasus*, which we consider is closely related to *B. normalis* from the Atlantic and *B. glutinosus* from the Indo-West Pacific (see p. 14), is restricted to the continental rise in this area from the Gulf of Panama northward to include Baja California; see also note on specimen photographed south of the Galapagos Islands.

Species

Initially we intended to revise only the Atlantic species of *Bassozetus*. The small size (lacking any indication of sexual maturity), poor condition and similarity in published characters among most of the type material of this group (*B. compressus*, *B. normalis*, *B. oncerocephalus*, *B. taenia*) resulted in great difficulty in recognizing valid, consistent diagnostic features. While this led to problems in assigning the range of non-type material to species, new characters were found (e.g. sagittal otolith size, transverse scale-row count and supported in some species by depth of occurrence) by which this material could be sorted into entities. (Specimen condition, nevertheless, remains a considerable problem necessitating further confirmatory study as better material and methodology becomes available).

Atlantic *Bassozetus* were found to be divisible into two groups dependent upon the size of the sagittal otolith. The readily recognizable *B. levistomatus*, together with *B. robustus* (both hitherto unreported from the Atlantic), have considerably larger otoliths than the *B. compressus/normalis/oncer-*

cephalus/taenia group. (At standard lengths of more than some 150 mm the increase in relative length of sagittae follows the pattern, *B. robustus* > *B. levistomatus* > *B. compressus/normalis/oncerocephalus/taenia* group - Table 2 and Fig. 7).

The small otolith group, once distinguished, was further divisible into two on the basis of squamation (Fig. 1). One group consists of those fish with large scales (< 25 transverse rows from anus to dorsal origin, usually 15-20), while the other has small scales (>25 rows, usually 30-35). Those with small scales we referred to *B. normalis* Gill, 1884. This is a species mainly found on the continental rise (Table 1) which attains relatively small adult size (to 276 mm SL). Morphometric and meristic features, of diagnostic value in other species, were not found to distinguish *B. normalis*.

The group of three species with large scales were divided further primarily by the total number of long rakers on the first gill arch, separating *B. compressus* (11-14) from *B. taenia* and *B. oncerocephalus* (15-20) (Fig. 2). While recognizing the possibility of allometric variation operating here as in some growth patterns (e.g. Fig. 6), we discounted it on the basis of the unlikelihood of a negative relationship in long rakers when the short rakers remain constant over size (Fig. 2). The interspace between the ventral and anal fin insertions was found also to separate *B. taenia* (<20% SL) from *B. oncerocephalus* (23.5% SL).

The overall length/frequency distribution of this large scaled group provided extra grounds for separating two species, at least, the unique *B. oncer-*

Table 2. SL/sagitta length relationships (SL = X coefficient x sagitta I. x constant) for *Bassozetus* species.

Species	SL (mm)		Sagitta I. (mm)		X Coeff.	Constant	R squared	No obs.
	min.	max.	min.	max.				
<i>compressus</i>	350	620	3.4	6.8	30.8628	327.8171	0.229	13
<i>elongatus</i>	203	480	3.8	7.2	82.9218	-81.6973	0.816	5
<i>galathea</i>	225	555	5.0	9.4	65.7169	-106.7456	0.870	12
<i>glutinosus</i>	68	292	1.9	4.3	80.3760	-69.7289	0.517	14
<i>levistomatus</i>	185	805	5.6	7.8	257.3284	-1243.2096	0.735	6
<i>multispinis</i>	215	425	8.7	10.0	18.1487	493.3072	0.013	6
<i>nasus</i>	169	282	2.4	3.0	57.3404	73.6915	0.125	6
<i>normalis</i>	105	276	2.0	3.6	90.6476	-67.0974	0.733	16
<i>oncerocephalus</i>	225	-	3.5	-	-	-	-	1
<i>robustus</i>	78	640	2.8	19.6	35.6272	-3.7542	0.952	71
<i>taenia</i>	85	242	2.0	2.7	140.2480	-153.7984	0.419	17
<i>wernerii</i>	375	-	9.0	-	-	-	-	1
<i>zenkevitchi</i>	57	263	2.2	3.8	54.1624	30.7462	0.214	10

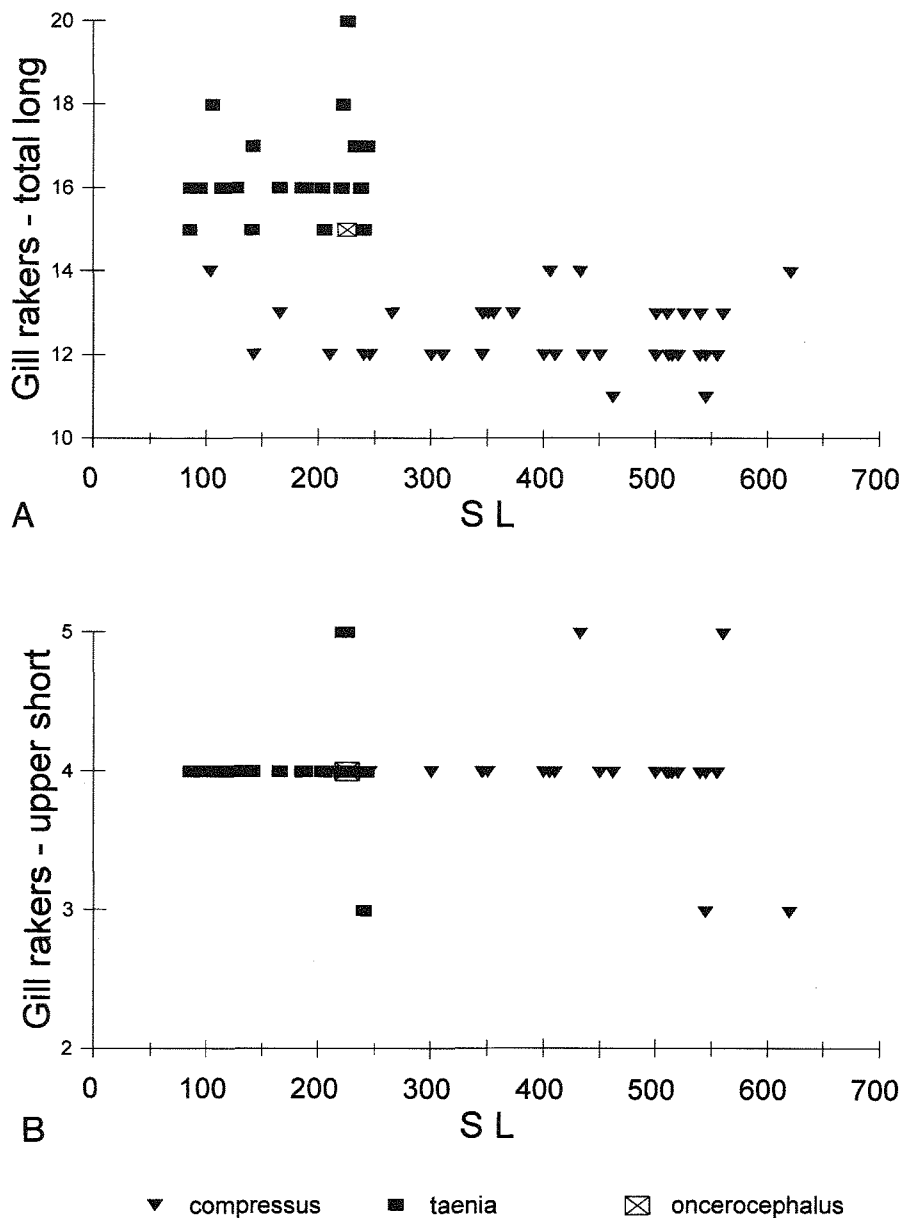


Fig. 2. A, total number of long gill rakers on anterior arch/SL; B, number of short rakers on upper branch of anterior gill arch/SL.

cephalus excepted (Fig. 3). Widely separate modes at 300 and 600 mm SL seem unlikely to represent two sequential, but very broadly separated, age classes of a single species. Rather, they suggest largely unimodal length distributions of two different species (typical of many deep demersal fishes). This is supported by the fact that the only ripe female found in the group measured 232 mm SL; none of the larger specimens showed any ovarian ripening by comparison. The outcome implies that *B. compressus* is a species of large adult size (specimens here 103-620 mm SL, with no females found

in ripe condition) and distributed in the Atlantic on the lower rise and abyssal plain (Table 1). *B. taenia*, on the other hand, attains smaller overall size (85-242 mm SL, with females ripening at least by 232 mm SL) and has a disjunct lower slope (see comments p. 50) but mainly abyssal distribution (Table 1). The only known *B. oncrocephalus* is the type, which is small (225 mm SL) and comes from the 3200 m depth stratum (Table 1).

While establishing the status of *B. compressus* in the Atlantic, examination of the syntypical series of this species showed it to be comprised of a single

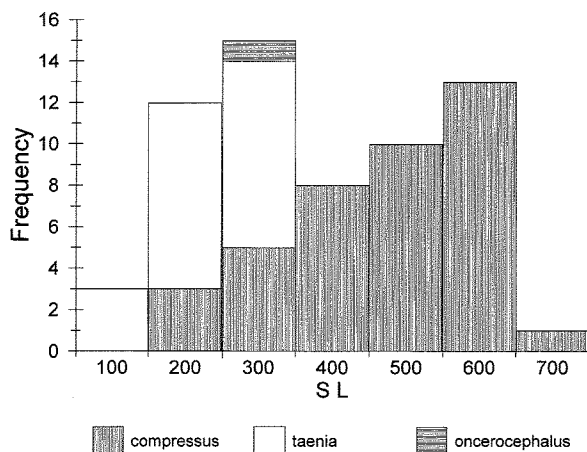


Fig. 3. Length/frequency plot of Atlantic large-scaled *Bassozetus* species (n = 62).

B. compressus only (selected here as the lectotype), from New Guinea in the Pacific. The other specimen from this station and that from the Philippines were found to be *B. glutinosus*, while the single specimen from the Atlantic is in too poor a condition for confirmation of its identity. This discovery, coupled with that of presence of *B. robustus* in the

Atlantic in substantial numbers and also of *B. levis-tomatus*, dictated that the revision should be extended globally. Furthermore, the small-scaled Indo-West Pacific *B. glutinosus* was found to have characters whose ranges overlapped considerably with those of *B. normalis* from the Atlantic. In addition, the geographically restricted *B. nasus*, from the equatorial East Pacific, conforms closely with these species also.

Thus, while the overall ranges in the variation of characters among the *B. glutinosus/normalis/nasus* group are often broad, considerable overlap occurs in both the range and frequency of the total long gill raker count (Table 3a), and the preanal length among individual species (Fig. 4). In the gill raker counts, however, some separation is indicated (*B. glutinosus* - 15-21; *B. normalis* - 13-17; *B. nasus* - 13-17, Table 3a) and this higher count range is also evident in the pectoral fin ray counts (*B. glutinosus* - 24-29; *B. normalis* - 22-27; *B. nasus* - 22-26, Table 3b). In the anal fin ray counts the range of *B. glutinosus* is somewhat more similar to the other two species (*B. glutinosus* - A 98-108; *B. normalis* - A 99-108; *B. nasus* - A 102-110 - Table 3c).

Table 3. Frequency distributions of (a) gill rakers, (b) pectoral and (c) anal rays in *B. normalis*, *glutinosus* and *nasus*.

(a)	Gill rakers, left: total long			(c)	Anal rays		
	<i>normalis</i>	<i>glutinosus</i>	<i>nasus</i>		<i>normalis</i>	<i>glutinosus</i>	<i>nasus</i>
Freq.				Freq.			
13	1		2	98			
14	4		13	99	1	2	
15	12	2	25	100	3	2	
16	10	5	6	101		4	
17	3	9	1	102	5	5	2
18		10		103	2	4	3
19		2		104	6	3	3
20		2		105	2		3
21		1		106	3		8
				107	1	1	4
(b)	Pectoral rays			108	1	1	5
	<i>normalis</i>	<i>glutinosus</i>	<i>nasus</i>	109			3
Freq.				110			4
22	1		8				
23			18				
24	4	1	4				
25	7	1	3				
26	4	10	1				
27	1	7					
28		8					
29		2					

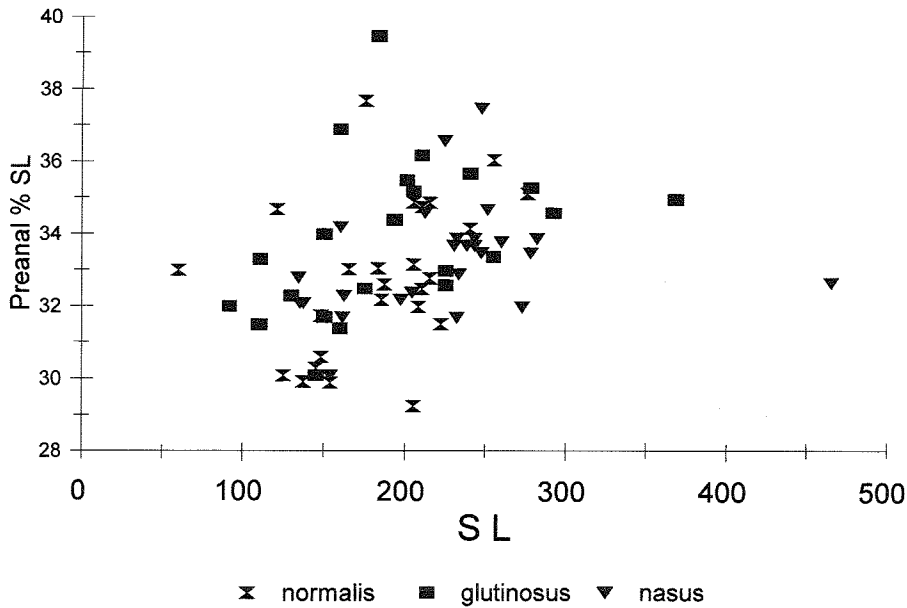


Fig. 4. Prenal length in % of SL/SL.

Without a unique suite of characters to maintain consistent differences among the *B. glutinosus/normalis/nasus* group, multivariate analysis on the total suite of data collected was found to distinguish the majority of specimens. Stepwise removal of variables (SYSTAT 8.0) revealed that counts of anal fin rays, pectoral fin rays and total long gill rakers contributed most to this separation (Table 3). Indeed, the almost exclusive count of 23 pectoral fin rays in *B. nasus* is, for most practical purposes, sufficient to diagnose this species.

A plot of just three external characters separates 75% of *B. nasus* specimens unequivocally along the canonical scores Factor 1 axis (Fig. 5). The Factor 2 axis, however, provides little input. Whilst there is a degree of overlap evident between *B. glutinosus* and *B. normalis*, location of the co-ordinates of individual fish on the two axes can be obtained using the expressions (A - anal, P - pectoral, Grltot - total long gill rakers on anterior arch):

$$F1 = 1.801 + (A \text{ ray } (0.529)) + (P \text{ ray } (-0.807)) + (\text{Grltot } (-0.490))$$

$$F2 = -38.120 + (A \text{ ray } (0.654)) + (P \text{ ray } (-0.117)) + (\text{Grltot } (0.736))$$

These factors are derived from the canonical discriminate functions standardized from within group variances. The resulting placement is the most reliable means at present of morphologically distinguishing the majority of specimens.

Specific characters

Allometric growth - many species show positive or negative allometric growth in morphometric characters such as depth at 1st anal ray, preanal and

External Characters Canonical Scores Plot

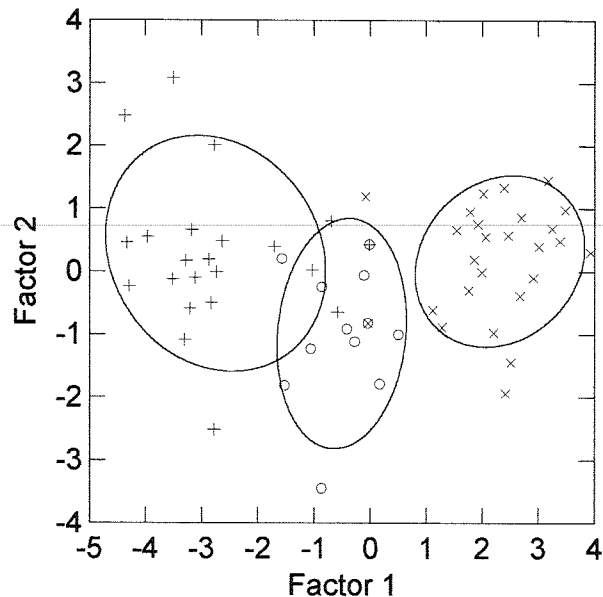


Fig. 5. External characters canonical scores plot. (○ *B. normalis*, ⊗ *B. nasus*, + *B. glutinosus*).

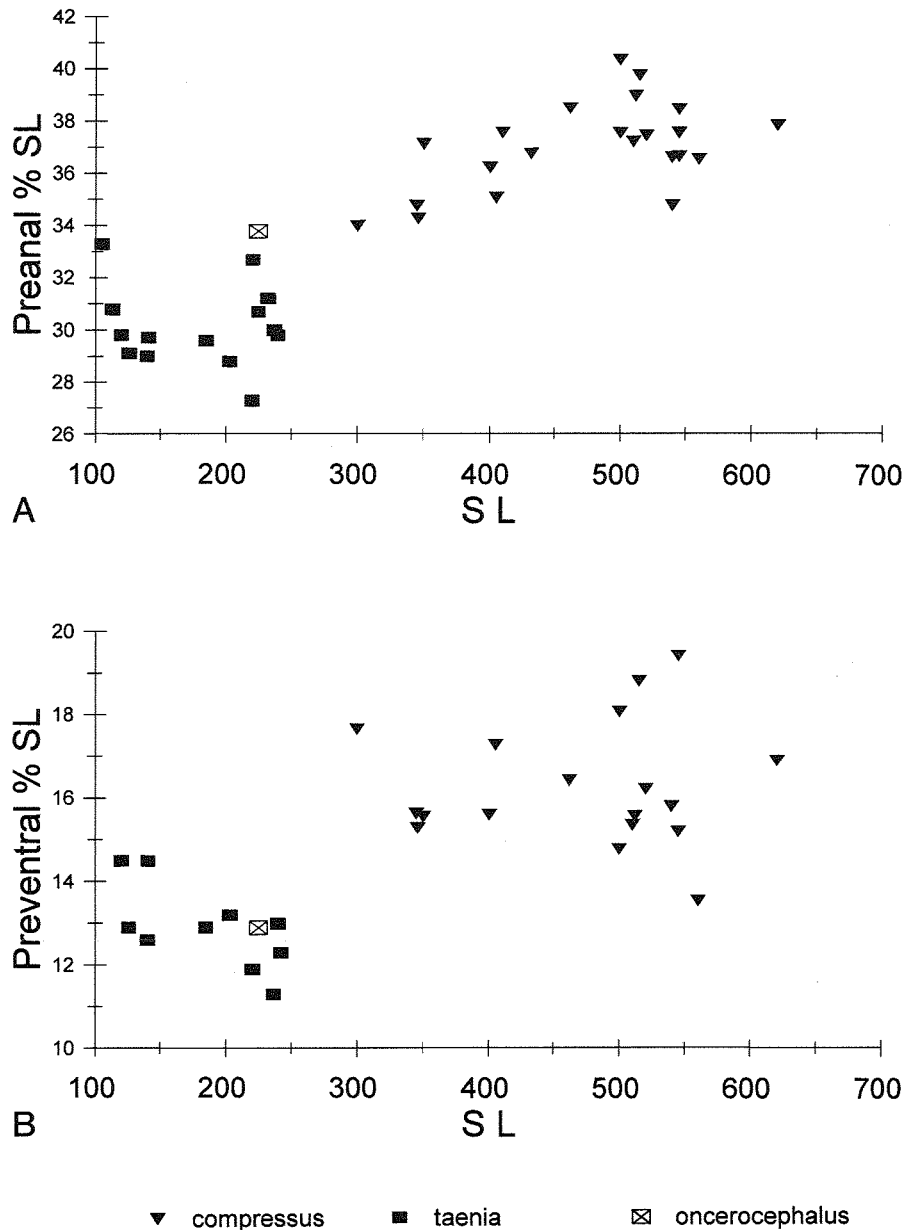


Fig. 6. Allometric growth. A, preanal length; B, preventral length.

preventral length (Fig. 6) and distance from basis of ventral fins to anal fin.

Ventral fin length - the distal part of the ventral fins are often very thin which makes it difficult to be sure it is unbroken.

Sagitta - the sagittal otolith is illustrated for all species. The sagittas of the most shallow living species are generally larger than those from deeper occurring forms, which corresponds to the findings on species of macrourids by Wilson (1985). Also the

sagitta becomes relatively shorter and thicker with growth, e. g. *B. levistomatus* (Fig. 20).

Table 2 indicates for each species the length of the smallest and the largest sagitta and the corresponding standard length, the X Coefficient, the Constant, the R squared value and the number of sagittas measured. By using the equation "SL = X Coefficient x sagitta length + Constant" it is possible to compare the species. Fig. 7 shows the sagitta length/SL for four species of *Bassozetus*.

The following *Bassozetus* spp. have been described:

- B. compressus* (Günther, 1878)
- B. elongatus* Smith & Radcliffe in Radcliffe, 1913
- B. galathea* here described
- B. glutinosus* (Alcock, 1890)
- B. levistomatus* Machida, 1989
- B. multispinis* Shcherbachev, 1980
- B. nasus* Garman, 1899
- B. normalis* Gill, 1884
- B. oncercephalus* (Vaillant, 1888)

- B. otteri* Schwarzahns, 1981 - sagittal otolith, Lower Pliocene, Italy
- B. robustus* Smith & Radcliffe in Radcliffe, 1913
- B. taenia* (Günther, 1887)
- B. weneri* here described
- B. zenkevitchi* Rass, 1955.

During the VIMS "Tongue of the Ocean" (TOTO) cruises to the Bahamas *Bassozetus* material was often registered and published upon as sp. A and B (see the taxonomical section).

Table 4. Frequency distribution of meristic and morphometric characters of *Bassozetus* spp.

	Number of dorsal finrays																																
	2	3	4	115	6	7	8	9	120	1	2	3	4	125	6	7	8	9	130	1	2	3	4	135	6	7	8	9	140	1	2		
<i>compressus</i>												1	2	1	4	6	5	2															
<i>elongatus</i>									1	1	2	2		1	1	1	1																
<i>galathea</i> *																					1	3	1	<u>5</u>	6	4	1	1					
<i>glutinosus</i>									4	6	1	1	3	4	2	2	1	1															
<i>levistomatus</i>						1	2		1	2			1																				
<i>multispinis</i>												1	1	2					2	1													
<i>nasus</i>												5	5	2	6	3	5		4	1	1	2											
<i>normalis</i>									3	1	1	2	2	6	1	4	2		1	1													
<i>oncercephalus</i>																			1														
<i>robustus</i> *																																	
Atlantic			<u>1</u>	<u>1</u>	1	3	3	6	4	2	4	6	1	1	1				1														
Indo-Pac	1	2	1	3	2	4	2	2	5	5	3	2	1																				
<i>taenia</i> *											1	<u>2</u>	1	1	3	2	3																
<i>weneri</i>																					1												
<i>zenkevitchi</i>		1			6	4	2	2																									

*tentatively referred specimens underlined.

	Number of anal finrays																																
	90	1	2	3	4	95	6	7	8	9	100	1	2	3	4	105	6	7	8	9	110	1	2	3	4	115							
<i>compressus</i>														2	1	1	4	7	3	2	2												
<i>elongatus</i>													1	1	1	4		1	2														
<i>galathea</i> *																				1	3	2	6	5	3	1	<u>1</u>						
<i>glutinosus</i>									1	3	2	4	5	4	4		1	1															
<i>levistomatus</i>				1	4	1				1																							
<i>multispinis</i>													1	1		1	3				1												
<i>nasus</i>													2	3	2	3	8	4	5	3	4												
<i>normalis</i>									1	3	5	2	5	4	1	2	2																
<i>oncercephalus</i>																																	
<i>robustus</i> *																																	
Atlantic				<u>1</u>	<u>2</u>		1	4	3	6	8	6		2																			
Indo-Pac			1		2	4	4	3	4	5	5	3	1	1																			
<i>taenia</i> *											1			1	1	1	3	3			2	<u>1</u>											
<i>weneri</i>																																	
<i>zenkevitchi</i>		2	1	3	2	1	4	1	1		1																						

*tentatively referred specimen underlined.

	Number of pectoral finrays										Number of long gill rakers on anterior arch															
	20	21	22	23	24	25	26	27	28	29	30	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
<i>compressus</i>					1	14	3	2						3	23	15	4									
<i>elongatus</i>		1	2	1	2	3	1							1	2	1	4	1	1							
<i>galathea</i> *							6	7	3	<u>5</u>							5	5	10	1	<u>1</u>					
<i>glutinosus</i>					1	2	11	7	8	2								2	5	11	10	2	2	1		
<i>levistomatus</i>								4	1	3	2	2	6													
<i>multispinis</i>				5	3															1	5	5	3	2	1	
<i>nasus</i>			8	18	3	3	1								3	13	22	7	1							
<i>normalis</i>			1		4	7	4	1	1						1	4	10	12	3			1	1			
<i>oncerocephalus</i>								1										1								
<i>robustus</i> *																										
Atlantic						<u>3</u>	<u>9</u>	10	3					1	11	<u>14</u>	9	4								
Indo-Pacific						6	8	12	4	1				1	11	15	5	1								
<i>taenia</i> *						<u>5</u>	9	1						<u>1</u>	<u>1</u>		8	11	3	2			1			
<i>weneri</i>									1			1														
<i>zenkevitchi</i>				5	10	2											6	8	2	2						

*tentatively referred specimens underlined.

	Number of precaudal vertebrae							Number of total vertebrae																	
	11	12	13	14	15	16	17	63	64	65	66	67	68	69	70	71	72	73	74	75	76				
<i>compressus</i>	1		16	7	1							1	2	8	7	3	1								
<i>elongatus</i>	3	4	3								2	1	1	5	1										
<i>galathea</i> *			<u>1</u>	1	2	13	5									1			3	<u>10</u>	7	1			
<i>glutinosus</i>			12	12	4						3	7	6	4	2	3									
<i>levistomatus</i>				3	4	2		2	1	3		1													
<i>multispinis</i>			1	6								1		5		1									
<i>nasus</i>			1	19	26								2	18	15	6	4								
<i>normalis</i>			1	12	16							4	8	5	9	2									
<i>oncerocephalus</i>						1									1										
<i>robustus</i> *																									
Atlantic			1	<u>30</u>	7			<u>1</u>	<u>1</u>	2	13	16	1												
Indo-Pacific			2	9	6	1		1	2	1	5	6	2	1											
<i>taenia</i> *		2	<u>10</u>	<u>11</u>								<u>5</u>	<u>3</u>	6	4	2			1						
<i>weneri</i>			1													1									
<i>zenkevitchi</i>			14	3						1	6	4	5												

*tentatively referred specimens underlined.

	Depth at 1st anal ray in % of SL														
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
<i>compressus</i>			1		2	7	11	5	4						
<i>elongatus</i>			1	4	3	2									
<i>galathea</i> *		1	1	<u>1</u>	6	8	5								
<i>glutinosus</i>			1	7	7	9	4	1							
<i>levistomatus</i>						1	1	2	2		1			1	
<i>multispinis</i>						5	5	2	3						
<i>nasus</i>		1	6	9	16	5	2								
<i>normalis</i>			2	7	10	6	1								
<i>oncerocephalus</i>				1											
<i>robustus</i> *															
Atlantic					2	10	<u>8</u>	<u>10</u>	6	2			1		
**Indo-Pacific					1	2	1	3	6	11	4	2		1	
<i>taenia</i> *		<u>6</u>	8	<u>8</u>	1										
<i>weneri</i>											1				
<i>zenkevitchi</i>			1	2	6	5									

*tentatively referred specimens underlined.

** most of the high values derive from fresh material.

	Preanal length in % of SL																			
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
<i>compressus</i>								2	2	2	7	4	2	2						
<i>elongatus</i>			1	1	2	2	2		2											
<i>galathea</i> *	1			1	<u>1</u>			2		2	6	6	2	1						
<i>glutinosus</i>				1	2	3	5	4	4	2	1		1							
<i>levistomatus</i>										2	1						1	1	1	
<i>multispinis</i>								1	6		5	3								
<i>nasus</i>				1	1	7	6	8	1	1	1									
<i>normalis</i>				5	1	5	5	3	4	1	1									
<i>oncocephalus</i>									1											
<i>robustus</i> *																				
Atlantic					3	5	2	2	9	6	<u>5</u>	2	<u>3</u>		1					
Indo-Pacific										5	3	2	2	1		1				
<i>taenia</i> *		1	<u>6</u>	5	3	1	<u>4</u>													
<i>weneri</i>										1										
<i>zenkevitchi</i>				2		2	5	2		1										

*tentatively referred specimens underlined.

	Ventral fin length in % of SL																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
<i>compressus</i>												1	1		2	3	4	1							
<i>elongatus</i>																		1			1	1			1
<i>galathea</i> *											1	1	2	4	<u>4</u>	3	4								
<i>glutinosus</i>															2	3	6				1				
<i>levistomatus</i>								1	1	1		1													
<i>multispinis</i>	13	1	1																						
<i>nasus</i>													2	3	6	1									
<i>normalis</i>														6	3	4	4	2							
<i>oncocephalus</i> (broken)																									
<i>robustus</i>																									
Atlantic																1	3	4	4	3	1				
Indo-Pacific																	1	4	1	3					
<i>taenia</i> *												2		6	<u>7</u>	1		1							
<i>weneri</i>																		1							
<i>zenkevitchi</i>					4	3	1	1																	

*tentatively referred specimens underlined.

	Distance between base of ventral fins and anal fin in % SL																			
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
<i>compressus</i>							2	2	5	3	6	3	2							
<i>elongatus</i>				2	3	2	2	1												
<i>galathea</i> *					2			1	<u>2</u>	3	6	5	2	1						
<i>glutinosus</i>				1	1	1	6	4	6	4	1	1								
<i>levistomatus</i>							1	1	1	1							1	1	1	
<i>multispinis</i>							2	3		1	1									
<i>nasus</i>						2	5	10	14	4	2									
<i>normalis</i>				1	2	5	8	6	2	6										
<i>oncocephalus</i>												1								
<i>robustus</i> *																				
Atlantic					1	5	5	3	<u>6</u>	6	5	1	<u>1</u>							
Indo-Pac.								3	2	4	1	1	1		1					
<i>taenia</i> *			<u>3</u>	3	7	<u>10</u>	2													
<i>weneri</i>										1										
<i>zenkevitchi</i>				1	2	5	3	2												

*tentatively referred specimens underlined.

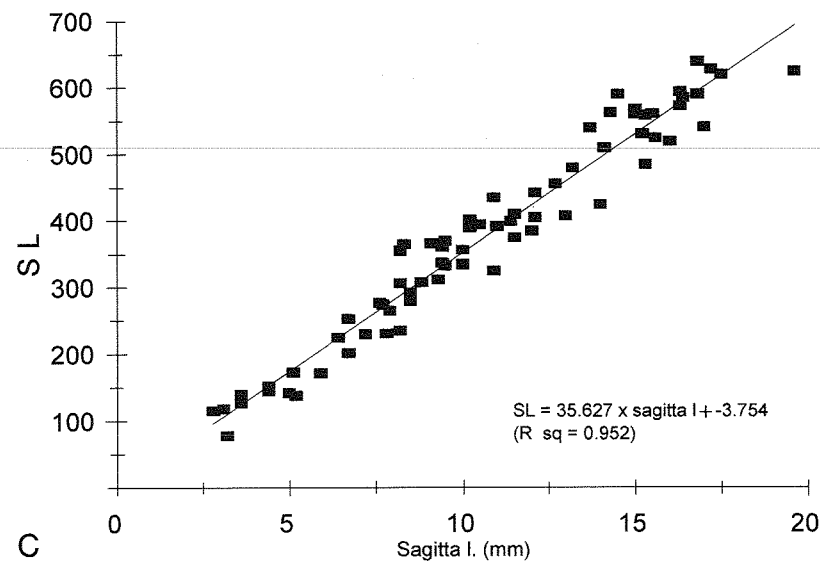
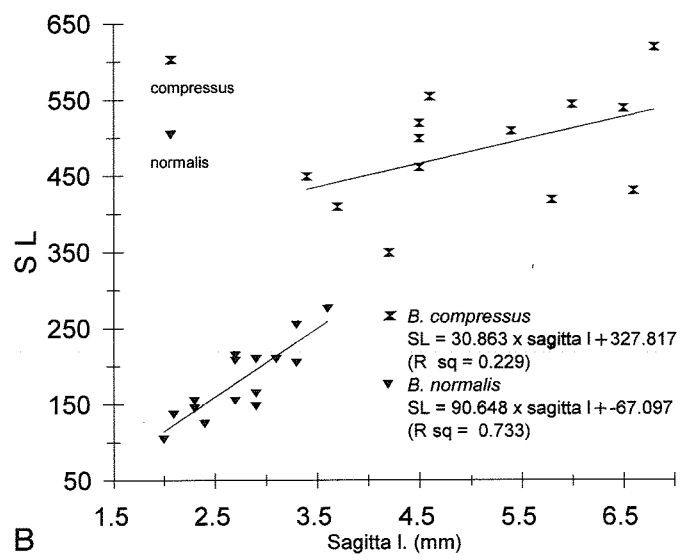
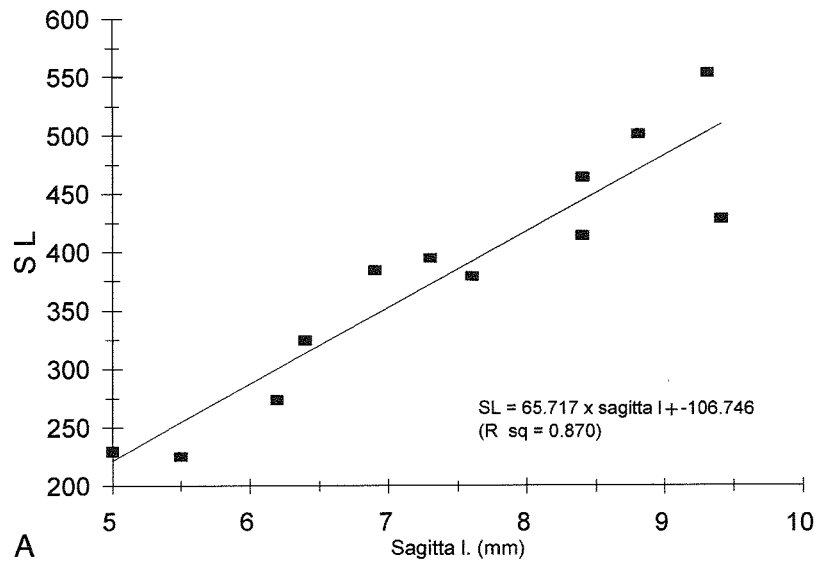


Fig. 7. Length of sagitta/SL. A, *B. galathea*; B, *B. compressus* and *normalis*; C, *B. robustus*.

Key to *Bassozetus* species

- | | | | | | |
|----|---|---------------------|--|--|---------------------|
| 1a | Basibranchial tooth patches 0 | 2 | 8b | Scales large (less than 25 in oblique row),
Fig. 1a..... | 11 |
| 1b | One well developed basibranchial tooth
patch..... | 4 | 9a | Long gill rakers 15-21* | <i>glutinosus</i> |
| 2a | Long gill rakers 15-18, vomer with v-
shaped dentigerous tooth patch..... | <i>zenkevitchi</i> | 9b | Long gill rakers 13-20* | 10 |
| 2b | Long gill rakers 9-11, vomer edentate or
with small circular tooth patch | 3 | 10a | Anal fin rays 99-108*, pectoral fin rays 22-
28* | <i>normalis</i> |
| 3a | Ventral fin 8-12% SL, vomer usually eden-
tate (a 735 mm specimen with a propor-
tionally small, 5 mm tooth plate), sagitta
(Fig. 20) | <i>levistomatus</i> | 10b | Anal fin rays 102-110*, pectoral fin rays
22-26* | <i>nasus</i> |
| 3b | Ventral fin 17.5% SL, vomer with a 3 mm
tooth plate in the 375 mm known speci-
men, sagitta (Fig. 37B)..... | <i>wernerii</i> | 11a | Long rakers on anterior gill arch 11-14,
depth at anus 8-14% SL, preanal 34-40%
SL..... | <i>compressus</i> |
| 4a | Ventral fin rays less than about 3% SL,
long gill rakers 17-22 | <i>multispinis</i> | 11b | Long rakers on anterior gill arch 15-20,
depth at anus 7-10% SL, preanal 28-34%
SL | 12 |
| 4b | Ventral fin rays more than 5% SL, long gill
rakers 11-21 | 5 | 12a | Distance between bases of ventral fins and
anal fin 15.0-19.0% SL, 12-14 precaudal
vertebrae | <i>taenia</i> |
| 5a | Dorsal fin rays 132-142 and anal 108-115,
long gill rakers 14-18, precaudal vertebrae
13-17 | <i>galathea</i> | 12b | Distance between bases of ventral fins and
anal fin 23.5% SL, 16 precaudal vertebrae
..... | <i>oncocephalus</i> |
| 5a | Dorsal fin rays 98-133 and anal 90-111,
long gill rakers 9-22, precaudal vertebrae
11-16..... | 6 | * See p. 15 for discussion of the separation of <i>B. glutinosus</i> , <i>B. normalis</i> , and <i>B. nasus</i> . | | |
| 6a | Length of ventral fins 18-25% SL reaching
beyond anus, depth at 1st anal ray 8.2-
11.0% SL, precaudal vertebrae 11-13,
scale-rows between anus and dorsal 15-20
(Fig. 1)..... | <i>elongatus</i> | <i>Bassozetus compressus</i> (Günther, 1878) | | |
| 6b | Length of ventral fins seldom more than
19% SL rarely reaching beyond anus,
depth at 1st anal ray 6.4-19% SL, precaudal
vertebrae 11-17, scale-rows between
anus and dorsal 15-35 | 7 | Figs. 8-10 | | |
| 7a | Sagittal otolith large (Fig. 7), long gill rak-
ers 12-16, scale-rows between anus and
dorsal fin 25-35, depth at 1st anal ray 10-
19% SL | <i>robustus</i> | <i>Bathynectes compressus</i> Günther, 1878: 20 (local-
ity for syntypes south-east of New Guinea (2
specimens), Philippines (1 specimen) and Mid-
Atlantic (1 specimen)). | | |
| 7b | Sagittal otolith small (Fig. 7), long gill rak-
ers 11-21, scale-rows between anus and
dorsal fin 15-35, depth at 1st anal ray 7-
14% SL | 8 | <i>Bassozetus compressus</i> : Goode & Bean 1896: 322;
Jordan & Evermann 1898: 2508; Smith & Rad-
cliffe in Radcliffe 1913: 157; Fowler 1936:
1062; de Beaufort & Chapman 1951: 431; Grey
1956: 209. | | |
| 8a | Scales small (more than 25 in oblique
row), Fig. 1b..... | 9 | <i>Bathyonus compressus</i> : Günther 1887: 109, pl.
XXII, fig. A.
<i>Bassozetus</i> sp.: Séret & Andreato 1992: 91.
<i>Bassozetus</i> sp. B: Anderson et al. 1985 (in part.). | | |

Material examined (47 specimens, SL 103-620):
Lectotype (here selected): SL 405+, south of New
Guinea, Raine Id., 12°8'S, 145°10'E, R/V CHAL-
LENGER st. 184, bottom trawl, 2562 m, 29 Aug.
1874, BMHN 1887, 12.7.47.

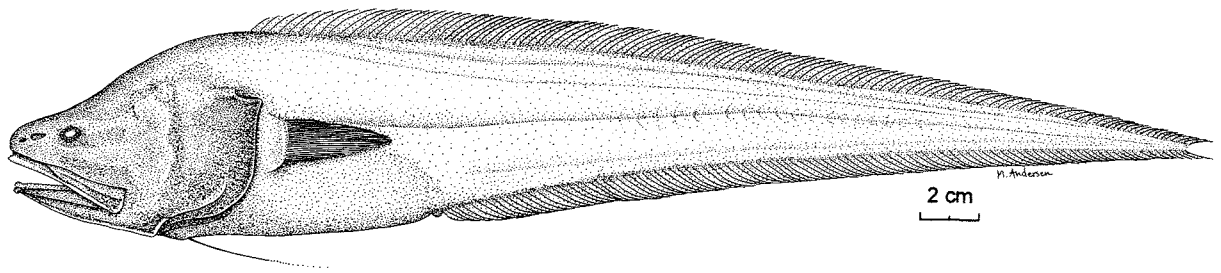


Fig. 8. *Bassozetus compressus*. Lectotype, BMNH 1887.12.7.47, SL 405+.

Non-types: ♀, SL 540, Gulf of Mexico, 25°41'N, 91°2'W, R/V OREGON st. 2567, bottom trawl, 3180 m, 25 July 1959, USNM 206928. - ♀, SL 432+, Mozambique Channel, 21°18'S, 36°18'E, R/V ANTON BRUUN cr. 8 st. 399C, bottom trawl, 1555 m, 2 Oct. 1964, USNM 206917. - 1♀ and 1♂, SL 346-512, Caribbean Sea, 14°29.5'N, 74°28.8'W, R/V ALAMINOS st. 70-A-10-48, bottom trawl, 4154 m, 24 July 1970, TCWC 3355.11. - ♂, SL 295, Northwest Atlantic, 24°36.8'N, 65°16'W, R/V PILLSBURY st. 1370, bottom trawl, 5456 m, 30 June 1971, UMML 30524. - ♀, SL 520, Bahamas, 28°27.3'N, 76°30.6'W, R/V COLUMBUS ISELIN CI-7802 st. 3, bottom trawl, 5136 m, 12 Feb. 1978, VIMS 5300. - ♂, SL 300, Bahamas, 23°50'N, 73°13'W, R/V COLUMBUS ISELIN cr. CI-8007 st. C015, bottom trawl, 5263 m, 6 Sep. 1980, VIMS 7054. - 7?, SL 112-550+, Bahamas, 26°9.3'N, 76°25.5'W, R/V COLUMBUS ISELIN cr. CI-8007 st. C034, bottom trawl, 4538 m, 11 Sep. 1980, VIMS 7055. - SL 142, Bahamas, 29°35.5'N, 74°32.4'W, R/V COLUMBUS ISELIN cr. CI-8007 st. C060, bottom trawl, 4553 m, 19 Sep. 1980, VIMS 7052. - ♀, SL 560, south of Ireland, 49°33'N, 14°5.9'W, R/V DISCOVERY st. 51013, bottom trawl, 4242 m, 5 May 1981, BMNH 1991.7.9.41. - SL 345, Caribbean Sea, 15°8.8'N, 69°13.2'W, R/V BARTLETT cr. 1301-82 st. E038, bottom trawl, 3959 m, 27 Oct. 1981, VIMS 6889. - 2♀, 4♂ and 1?, SL 250-525, Caribbean Sea, 15°8.9'N, 69°13.3'W, R/V BARTLETT cr. 1301-82 st. E039, bottom trawl, 4012 m, 27 Oct. 1981, VIMS 6886. - SL 103, Caribbean Sea, 13°26.9'N, 64°42.7'W, R/V BARTLETT 1301-82 st. E090, bottom trawl, 3437 m, 26 Nov. 1981, VIMS 6893. - 1♀ and 1?, SL 310-372, Caribbean Sea, 13°26.3'N, 64°47.3'W, R/V BARTLETT cr. 1301-82 st. E091, bottom trawl,

3576 m, 27 Nov. 1981, VIMS 6887. - SL 265, Caribbean Sea, 14°16.6'N, 67°6.2'W, R/V BARTLETT, cr. 1301-82 st. E096, bottom trawl, 5011 m, 30 Nov. 1981, VIMS 6883. - 3?, SL 165-245, Caribbean Sea, 14°34.1'N, 67°26.3'W, R/V BARTLETT cr. 1301-82 st. E097, bottom trawl, 5011 m, 1 Dec. 1981, VIMS 6884. - 1♀ and 2♂, SL 515-545, off Portugal, 37°9'N, 11°17'W, R/V DISCOVERY st. 10652#1, bottom trawl, 5112 m, 24 Feb. 1983, BMNH 1990.8.21.141(♂♂) and 1991.7.9.734(♀). - ♀, SL 545, off Madeira, 34°45.7'N, 18°30'W, R/V DISCOVERY st. 11134#1, bottom trawl, 4835 m, 10 June 1984, BMNH 1994.5.6.3. - ♀, SL 410, west of Madeira, 31°38.5'N, 24°55.9'W, R/V WALTHER HERWIG st. 33, bottom trawl, 5360 m, 16 June 1985, ISH 13/1986. - SL 462, west of Madeira, 31°12.6'N, 25°12.5'W, R/V DISCOVERY st. 12261#52, bottom trawl, 5440 m, 3 July 1985, BMNH 1994.5.6.8. - ♀, SL 500, off Brazil, 21°20.9'S, 34°53'W, R/V MARION DUFRESNE cr. MD-55 st. 22CP36, bottom trawl, 4425 m, 16 May 1987, MNHN 1989-396. - ♀, SL 400, off Brazil, 20°33.9'S, 28°19.8'W, R/V MARION DUFRESNE cr. MD-55 st. 34CP56, bottom trawl, 4941 m, 21 May 1987, USU 01498. - ?, SL 450+?, west of Cape Verde Is., 35°23.5'N, 14°29.8'W, R/V DISCOVERY st. 11910#1, bottom trawl, 4370 m, 24 Sep. 1989, BMNH 1994.9.6.9. - ♀, SL 555, south of Madeira, 31°4.3'N, 21°19.1'W, R/V DISCOVERY st. 12174#19, bottom trawl, 4950 m, 18 Aug. 1990, BMNH 1994.5.9.13. - 2♀, 520-620, northwest of Cape Verde Is., 20°53.1'N, 31°13.8'W, R/V DISCOVERY st. 12600#23, bottom trawl, 4523 m, 4 Oct. 1993, BMNH 1994.5.6.4-5. - 1♀ and 1♂, SL 500-510, northwest of Cape Verde Is., 20°56'N, 31°11.5'W, R/V DISCOVERY st. 12600#66, bottom trawl, 4555 m, 16 Oct. 1993,

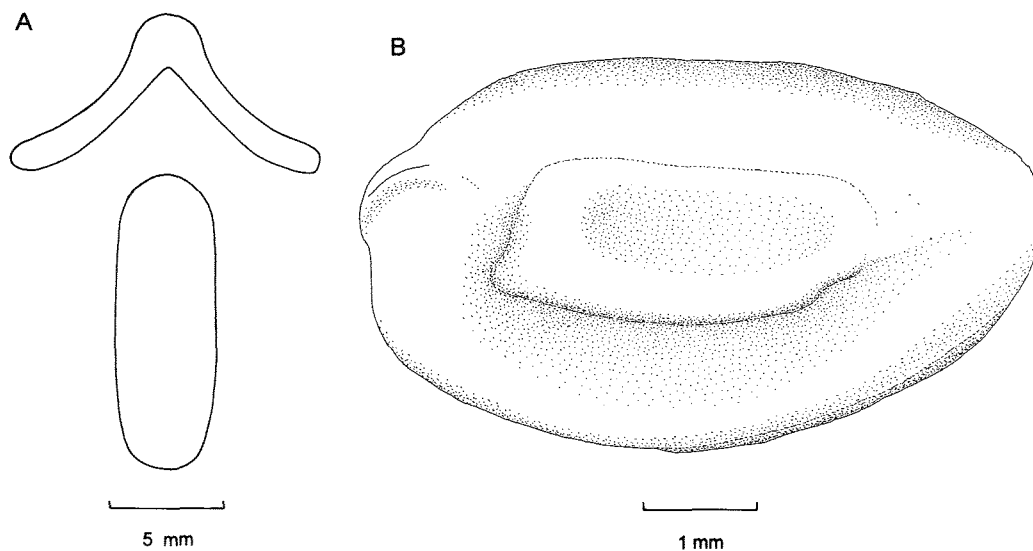


Fig. 9. *Bassozetus compressus*. Lectotype. A, vomer and basibranchial tooth patch; B, median view of left sagitta.

BMNH 1994.5.6.6-7. - ♀, SL 545, northeast of Madeira, 35°36.6'N, 13°51.5'W, R/V CHALLENGER st. 53603#1, bottom trawl, 4835 m, 27 Nov. 1995, BMNH 1999.4.23.1.

Condition of the material: Most specimens are rather soft and with very few remaining scales. The caudal tip of the holotype is missing; judging from the meristic characters the lost part amounts to 5-10 vertebrae.

Notes on the type series: The original description (Günther 1878) states "South-east of New Guinea; mid-Atlantic, 1075-2500 fathoms" and does not indicate the number of specimens in the type series. In 1887 Günther mentions four specimens all from the Challenger viz. one from st. 107 (mid-Atlantic), two from st. 184 (south-east of New Guinea) and one from st. 205 (Philippine Islands) and all four are labelled syntypes in the BMNH collection. However, we consider the large specimen only from st. 184 to be a *B. compressus* and it is here selected a lectotype. The remaining two syntypes from the West Pacific are referred to *B. glutinosus* and the Atlantic syntype is in such a condition that we refrain from giving it a specific name. Günther (1878) gives the depths of the type localities as 1075-2500 fathoms while in 1887 he states 1050-1500 fathoms in the "List of stations". We consider the 1887-depths the correct ones.

Diagnosis: Head short and high, body com-

Table 5. Meristic and morphometric characters of *B. compressus*.

	Lectotype BMNH 1887.12.7.47	Lectotype and 46 specimens		
Standard length	405+	103-620		
MERISTIC CHARACTERS				
Dorsal finrays	117+	123	127.1	129 21
Caudal finrays	-	8	8.0	8 22
Anal finrays	100+	102	106.2	109 22
Pectoral finrays	25	24	25.3	27 20
Precaudal vertebrae	11	11	13.3	15 25
Total vertebrae	62+	67	69.5	72 22
Developed rakers on				
ant. gill arch	14	11	12.4	14 47
Short rakers on				
ant. gill arch	7/9	7	8.6	10 27
Ant. dorsal ray				
above vertebra no.	3	3	3.7	5 24
Ant. anal ray below				
dorsal ray no.	22	22	26.5	29 23
Ant. anal ray below				
vertebra no.	14	14	16.5	18 23
MORPHOMETRIC CHARACTERS*				
in % of SL				
Head length	21.5	18.0	20.1	21.5 29
Depth at 1st anal ray	14.5	8.0	11.9	14.0 30
Upper jaw	11.0	8.7	10.1	11.5 28
Preventral	17.5	13.5	16.2	19.5 18
Preanal	35.0	34.0	37.1	40.5 21
Predorsal	19.5	16.5	18.4	20.5 20
Base of ventral				
fin to anal fin	20.3	19.0	22.2	24.5 23
Ventral fin-length	-	12.0	15.6	17.5 12

* The values for the holotype are slightly overestimated as about 3 cm is missing of the caudal part.

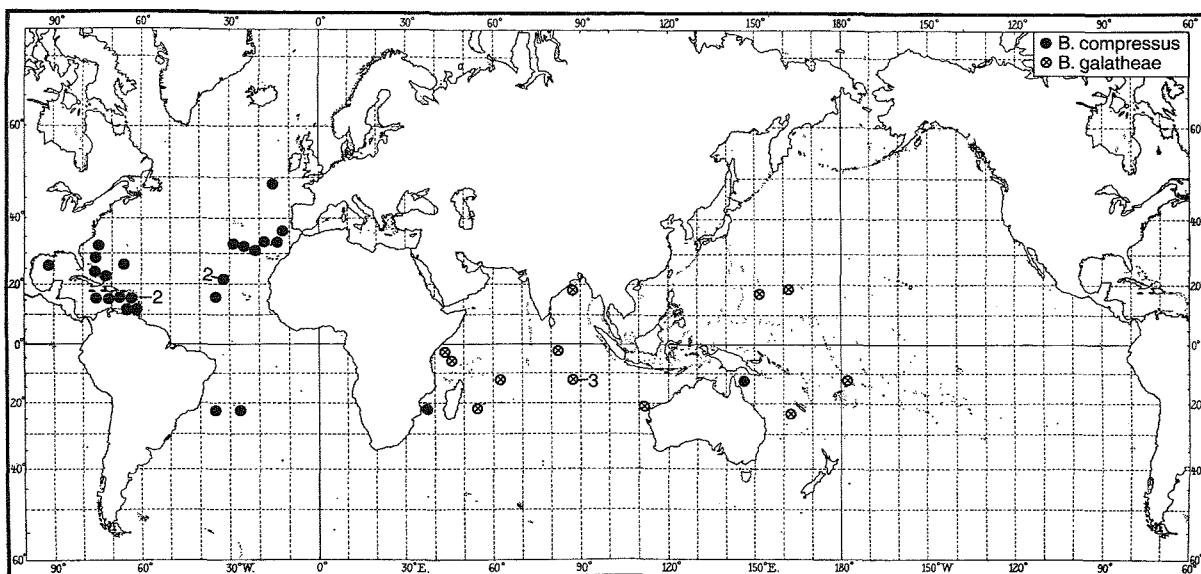


Fig. 10. Records of *Bassozetes compressus* and *galathea* - the numbers indicate the number of neighbouring stations.

pressed tapering caudally, depth of body at origin of anal fin shows positive allometric growth (8.0% SL in 103 mm and 14.2% SL in 620 mm specimens), preanal rather long (34.0-40.5% SL), distance between base of ventral fins and anal fin 19.0-25.0% SL, oblique scale rows 15-20, diameter of eye 3-5 times in snout, vomer v-shaped, a single basibranchial tooth patch (Fig. 9A), sagittal otolith short and thick hemispherical in shape (Fig. 9B), pectoral finrays 24-27, ventral fins reaching about 2/3 from its base to anal fin, 11-14 long gill rakers on anterior arch, precaudal vertebrae 11-14.

Description: Principal meristic and morphometric characters are given in Tables 4 and 5.

Head rather short and high, body compressed and tapering, depth at origin of anal fin shows positive allometric growth, scales large with 15-25 rows in an oblique line from anus and forward, eye diameter 3-5 times in length of snout, posterior nostril larger than anterior, cephalic discs (cf. p. 9) observed in all but two specimens, upper jaw ends well beyond eye, granular teeth in several rows most often somewhat larger teeth on vomer and palatines, vomer v-shaped with enlarged head in some not in others, basibranchial tooth patch oblong (Fig. 9A), anterior gill arch with 3-5 short rakers on upper branch, one long raker in the angle and lower branch with 10-13 long and 4-6 short rakers, ventral fins reach about 2/3 to anal fin, dis-

tance between base of ventral fins and anal fin shows positive allometric growth.

Sagittal otolith (Fig. 9B) small and robust with a large, undivided more or less centrally placed sulcus, a just visible ostial channel and with an oval outer form except for a process in the posterior end; it is almost twice as long as high and 2-3 times as long as thick. All three specimens from the three shallowest stations (2562-3240 m) have large sagittas (6.1-6.6 mm, SL 410-540) while of the specimens from greater depths (4000-5440 m) 11 have small sagittas (3.3-4.8 mm, SL 300-520) and the two longest have large otoliths (6.4-6.8 mm, SL 550-620). In fig. 7B the length of the sagitta is plotted against the SL.

Axial skeleton (from radiographs): Tips of neural spines 2-7 blunt, remaining neural and haemal spines pointed, second neural spine 2-3 times length of anterior spine and following 6-9 spines all shorter, neural spines 3-12 with enlarged basal part, anterior 3-4 vertebrae without parapophyses, pleural ribs on vertebra 3 and posteriorad, epipleural ribs indistinct.

Coloration: Newly caught, unfixed specimens showed a light brown body and head and peritoneum bluish dark brown.

Biology: The material comprises 18 females, five of which (SL 232-500) are more or less ripe with eggs up to 0.5 mm in diameter, eight unripe males

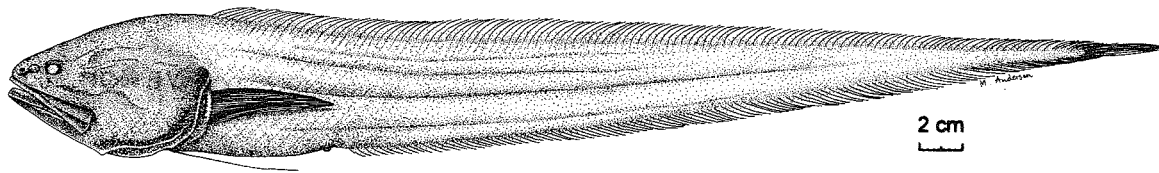


Fig. 11. *Bassozetus elongatus*. MNHN 1994-709, SL 475.

and 21 unsexed specimens. The two specimens from the Indo-West Pacific are from the continental slope and upper rise while the Atlantic specimens are from middle rise to abyssal depths. No identifiable stomach contents were observed.

Distribution: Fig. 10 shows the 27 known localities. The depths of the 25 Atlantic localities vary between 3180 and 5456 m while the two Indo-West Pacific ones are shallower viz. 1555-2562 m (Table 1). That the species seems more common in the Atlantic than in the Indo-West Pacific is probably due to the fact that more abyssal trawl hauls have been taken in the Atlantic.

***Bassozetus elongatus* Smith & Radcliffe, 1913**

Figs. 1, 11-13

Bassozetus elongatus Smith & Radcliffe in Radcliffe, 1913: 157, pl. 11. fig. 4 (type locality 0°8'S, 121°19'E).

Bassozetus elongatus: de Beaufort & Chapman 1951: 433; Böhlke 1953: 102; Cockerell 1916: 322; Grey 1956: 209; Iwai 1976: 149 (=galathea); Nielsen 1997: 56.

Material examined (10 specimens, SL 172-480):

Holotype: ♂, SL 438, off Celebes, 0°8'S, 121°19'E, R/V ALBATROSS st. 5608, beam trawl, 1993 m, 18 Nov. 1909, USNM 74141.

Non-types: 1♀, SL 348, Gulf of Tomini, Celebes, R/V ALBATROSS 1909, CAS 125627*. - 1♀, SL 410, off Kenya, 4°47'S, 46°19'E, R/V GALATHEA st. 235, herring otter trawl, 4810 m, 11 Mar. 1951, ZMUC P771213. - 2♂ and 1♀, SL 172-220, off Celebes, 1°50'N, 119°20'E, R/V GALATHEA

st. 450, herring otter trawl, 4940-4970 m, 21 Aug. 1951, ZMUC P771169-1171. - 1♂, SL 203, Coral Sea, 11°31.5'S, 152°12'E, R/V DIMITRI MENDELEV st. 1235, 3070-3080 m, 16 Dec. 1975, ZIL 45340. - 1♂, SL 450, off New Caledonia, 21°16.49'S, 166°43.56'E, BIOCAL st. CP 05, beam trawl, 2340 m, 11 Aug. 1985, MNHN 1994-708. - 1♀, SL 475, off New Caledonia, 22°9.02'S, 167°33.18'E, BIOCAL st. CP 72, beam trawl, 2100 m, 4 Sep. 1985, MNHN 1994-709. - 1♂, SL 480, off New Caledonia, 21°12'S, 166°59.8'E, BIOGEOCAL st. CP 321, beam trawl, 2190-2205 m, 3 May 1987, ZMUC P771150.

Condition of material: Good, but scales most often missing.

Diagnosis: Body slender tapering caudally, rather small head with pointed snout, mouth opening slightly oblique, head and body with rather large scales, 15-20 oblique scale rows, one robust basibranchial tooth patch and a v-shaped vomer (Fig. 12A), sagittal otolith small and thick (Fig. 12B), 21-26 pectoral finrays, ventral finrays long (18-25% SL) reaching beyond anus, 11-16 long gill rakers on anterior arch, precaudal vertebrae 11-13.

Description: The principal meristic and morphometric characters are given in Tables 4 and 6. Body slender, compressed and tapering caudally, head rather short with pointed snout, head length about twice the depth of body at anus, oblique scale rows 15-20, mouth almost horizontal ending far beyond eyes, opening of anterior nostril smaller than that of posterior nostril, diameter of eye 2-3 times in length of snout, teeth granular, vomer v-shaped with the head becoming larger with increasing standard length, basibranchial tooth patch varying in length but always rather broad, anterior gill

*CAS 125627 is catalogued as a paratype. This seems to be a mistake as the original description of *B. elongatus* is based on one specimen only.

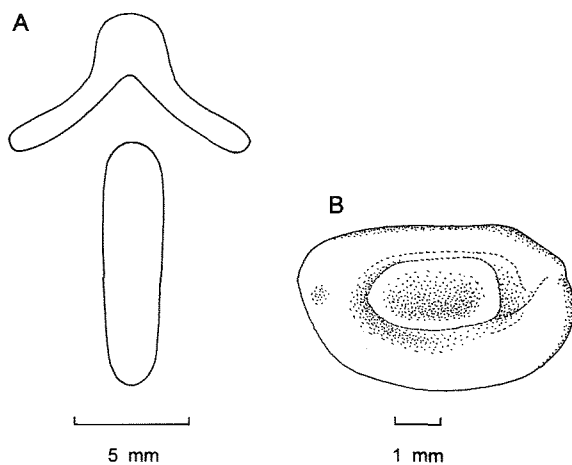


Fig. 12. *Bassozetus elongatus*. A, vomer and basibranchial tooth patch of holotype, SL 438; B, median view of left sagitta of MNHN 1994-709, SL 475.

arch with 3-5 short rakers on upper branch, one long raker in the angle and lower branch with 10-15 long and 3-5 short rakers, ventral finrays long reaching beyond anus.

Sagittal otolith (Fig. 12B) rather small and robust with a large undivided sulcus placed closer to dorsal than to ventral rim, an indistinct ostial channel and an oval outer form; it is twice as long as high and 2-3 times as long as thick.

Axial skeleton (from radiographs): Number of precaudal vertebrae few (11-13), tips of neural and haemal spines pointed, anterior neural spine about half length of second spine, the following spines become shorter, depressed and with enlarged basal part, from vertebra 8-10 the neural spines become again less depressed and longer, parapophyses developed on all precaudal vertebrae except for anterior three, pleural ribs found on vertebrae three to 11-12, epipleural ribs indistinct.

Coloration: Head and abdomen dark brown. The rest of the body light brown.

Biology: The material consists of six males and four females none of which is ripe. There are no identifiable contents in stomachs and intestines. The specimens were caught on or near the bottom from upper slope to abyssal depths.

Distribution: *B. elongatus* is known from eight localities (Fig. 13) from north of Madagascar through the Philippines to New Caledonia at depths between 1993 and 4970 m (Table 1). Iwai (1976) reported a specimen from off the Hawaiian Islands,

but according to the brief description (i.a. small scales) it rather seems to belong to *B. galathea*.

***Bassozetus galathea* n. sp.**

Figs. 10, 14, 15

Bassozetus elongatus: Iwai 1976: 179, fig. 21.

Bassozetus glutinosus: Shcherbachev 1980 (non Alcock): 119; Nielsen & Quéro 1991 (non Alcock): 119.

Bassozetus n. sp. 1: Nielsen et al. 1999: 58.

Material examined (22 specimens, SL 109-573):

Holotype: ♂, SL 415, eastern Indian Ocean, 3°3'S, 83°2.5'E, R/V PROFESSOR MESJATSEV, bottom trawl, 1680-1800 m, 9 Mar. 1979, ZM MGU P-15136.

Table 6. Meristic and morphometric characters of *B. elongatus*.

	Holotype USNM 74141	Holotype and 9 specimens 172-480		
Standard length	438			
MERISTIC CHARACTERS				
Dorsal finrays	121	120	124.3	129 10
Caudal finrays	8	8	8	8 9
Anal finrays	102	101	105.0	108 10
Pectoral finrays	24	21	23.7	26 10
Precaudal vertebrae	11	11	12.0	13 10
Total vertebrae	66	60	67.3	70 10
Developed rakers on ant. gill arch	16	11	13.5	16 10
Short rakers on ant. gill arch	9	7	8.0	9 9
Ant. dorsal ray above vertebra no.	3	3	3.7	4 10
Ant. anal ray below dorsal ray no.	23	21	23.5	26 10
Ant. anal ray below vertebra no.	15	13	14.8	16 10
MORPHOMETRIC CHARACTERS				
in % of standard length				
Head length	18.5	17.5	18.6	20.5 8
Depth at 1st anal ray	8.2	8.2	9.6	11.0 10
Upper jaw	9.4	8.8	9.6	10.5 9
Preventral	—	13.5	15.7	19.1 8
Preanal	31.5	29.0	32.0	35.0 10
Predorsal	17.4	16.0	17.8	20.0 10
Base of ventral fin to anal fin	18.0	16.5	17.7	20.0 10
Ventral fin-length	—	18.0	21.3	25.0 4

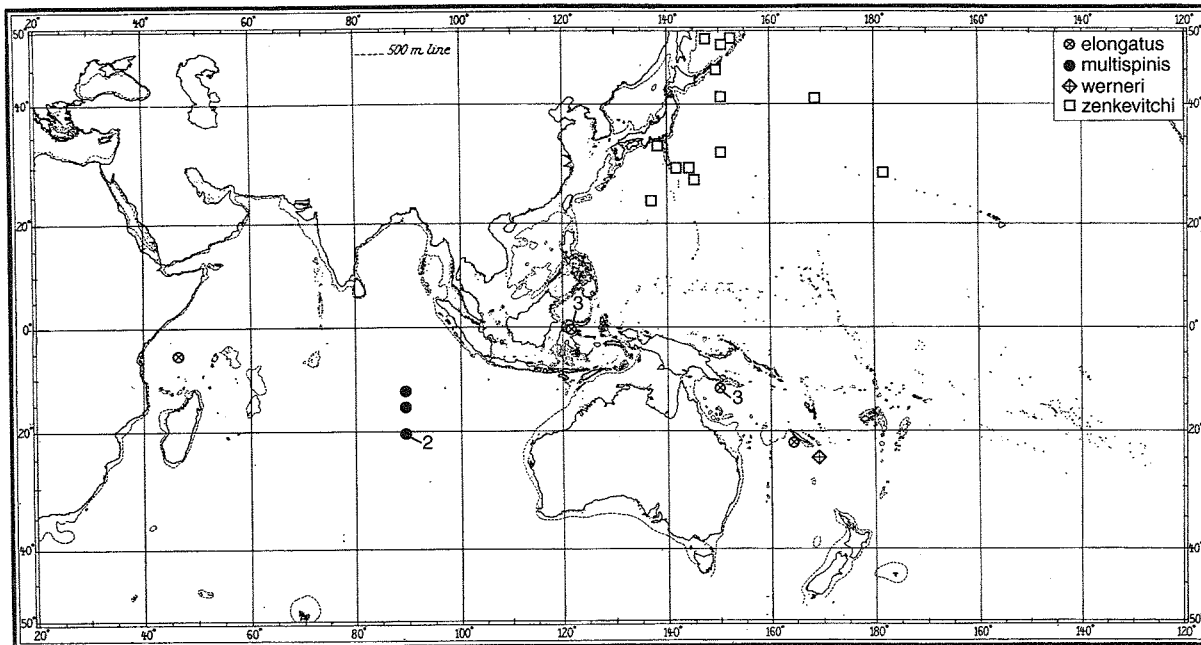


Fig. 13. Records of *Bassozetus elongatus*, *multispinis*, *wernerii* and *zenkevitchi*. The numbers indicate the number of neighbouring stations.

Paratypes: 1♂, SL 118, off Kenya, 3°23'S, 44°4'E, R/V GALATHEA st. 238, herring otter trawl, 3960 m, 13 Mar. 1951, ZMUC P771214. - 1♀ and 1♂, SL 109-215, Bay of Bengal, 17°10'N, 84°30'E, R/V GALATHEA st. 299, herring otter trawl, 2820 m, 24 Apr. 1951, ZMUC P771215-1216. - 2♂, SL 530-555, eastern Indian Ocean, 11°24.3'S, 88°50'E, R/V FIOLENT cr. 9 trawl 22,

1500-1600 m, 13 June 1977, ZM MGU P-15058. - 1♂, SL 573, western Indian Ocean, 11°25'S, 88°51.7'E, R/V FIOLENT cr. 9 trawl 23, 1600 m, 14 June 1977, ZM MGU P-15059. - 2♂, SL 325, southwestern Indian Ocean, 12°45'S, 61°11'E, R/V FIOLENT cr. 9 trawl 50, 1500 m, 31 Aug. 1977, ZM MGU P-15060. - 1♂, SL 274, eastern Indian Ocean, 11°31'S, 88°55'E, R/V PROFES-

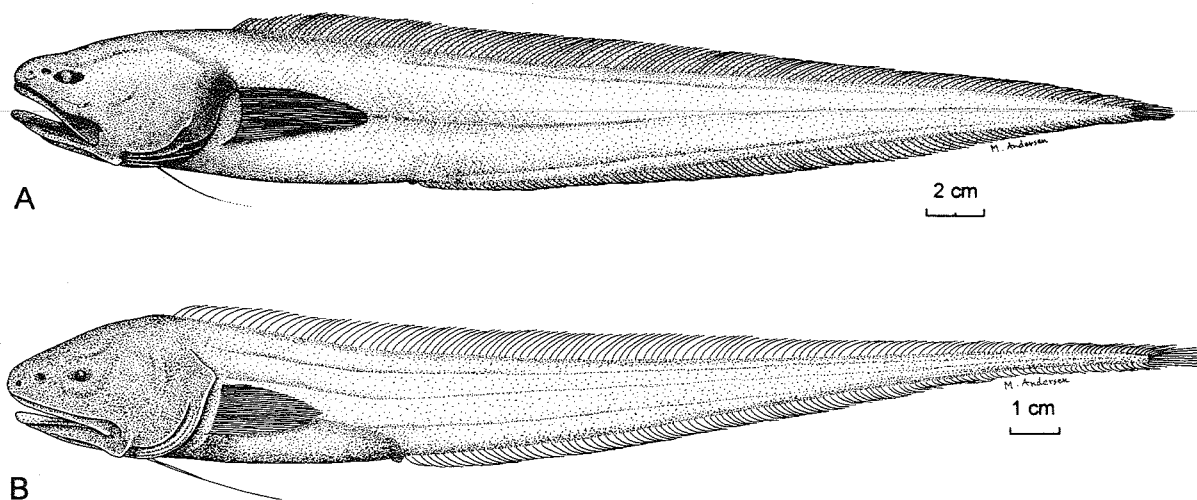


Fig. 14. *Bassozetus galathea*. A, holotype, ZM MGU P-15136, SL 415; B, tentatively referred specimen, ZMUC P771219, SL 232.

SOR MESJATSEV, bottom trawl, 1600-1700 m, 18 Feb. 1979, ZM MGU P-15130. - 1♂, SL 370, same data as for holotype, ZMUC P771217. - 1♂, SL 225, off Reunion, 20°21.2'S, 55°38.2'E, R/V MARION DUFRESNE cr. 32, ch.p. 140, bottom trawl, 1612-1690 m, 3 Sep. 1982, MNHN 1988-1943. - 1♀ and 2♂, SL 230-380, eastern Indian Ocean, 21°58.7'S, 113°8.7'E, FRV SOELA Surv. st. SS1/91/12, bottom trawl, 1460-1700 m, 25 Jan. 1991, AMS I.31151-003(2) and CSIRO H 2551-01. - 1♂, SL 555, southwestern Pacific, 25°7'S, 162°51'E, CAPE QUIET, otter trawl, 1100-1130 m, Apr. 1978, ZM MGU uncat. - 1♂, SL 385, northwestern Pacific, 19°43.2'N, 160°18.1'E, R/V CHRONOMETZ trawl 52, 1400 m, 7 Apr. 1984, ZM MGU P20515. - 2♂ and 1♀, SL 395-502, northwestern Pacific, 17°0.9'N, 150°49'E, R/V CHRONOMETZ trawl 60, 1287-1430 m, 19 Apr. 1984, ZM MGU P20516(2) and ZMUC P771218(1). - 1♀, SL 430, southwestern Pacific, 12°35'S, 178°11.5'W, MUSORSTOM 7 st. CP 621, beam trawl, 1280-1300 m, 25 May 1992, MNHN 1995-670.

Tentatively referred specimen*: 1♀, SL 232, off Kenya, 4°47'S, 46°19'E, R/V GALATHEA st. 235, herring otter trawl, 4810 m, 11 Mar. 1951, ZMUC P771219.

Condition of material: Due to the relatively shallow depths of capture most specimens have not been damaged in the net and are in a fair condition. Scales are often lost.

Diagnosis: Body elongate, tapering caudally, scales on head and body rather small with 25-35 oblique scale rows, snout rather pointed, mouth terminal, a single basibranchial tooth patch with a slight constriction centrally and a v-shaped vomer (Fig. 15A and B), sagittal otolith large with a small sulcus and no ostial channel (Fig. 15D), dorsal finrays 132-142, anal finrays 108-114, pectoral finrays 26-29, ventral finrays not reaching anus, total number of vertebrae 71-76, 14-17 long gill rakers on anterior arch.

Description: The principal meristic and morphometric characters are given in Tables 4 and 7.

Holotype: Body elongate and caudal part compressed, head and body fully scaled with 30-35 oblique scale rows, origin of dorsal fin above hindmargin of opercle, mouth terminal, horizontal diameter of eye twice in length of snout, posterior nostril larger than anterior both a mere hole, upper jaw ends well behind eyes with posterior end partly sheathed, teeth granular, denticerous part of vomer v-shaped with heavy head, basibranchial tooth patch rather broad with a slight medial constriction (Fig. 15A), anterior gill arch with four short and one long raker on upper branch, one long raker in the angle and lower branch with 12 long and four short rakers, longest gill filaments on anterior arch 4.4% length of head, ventral finrays broken.

Sagittal otolith large (Fig. 15D) and thin with a long, centrally placed, undivided sulcus and no ostial channel, with anterior and posterior ends rounded as is the ventral rim and the dorsal rim concave; it is 2-3 times as long as high and 4-5 times as long as thick.

Axial skeleton (from radiograph): Number of precaudal vertebrae 16, of which the neural spines of the anterior 11 end bluntly while the remaining neural and all haemal spines are pointed, anterior neural spine twice in 2nd spine, the following precaudal neural spines decrease slightly in length and increase again so that the anterior caudal neural spine is equal in length to the 2nd precaudal neural spine, except for the anterior two all precaudal vertebrae with enlarged basal part of neural spine, parapophyses on vertebrae 4 and posteriorad, pleural ribs on nos. 4-15 and epipleural ribs indistinct.

Coloration: Body light brown and head darker.

Paratypes: Most of the variation in meristic and morphometric characters appears from Tables 4 and 7. Both head and body more pigmented. One specimen, CSIRO H 2551-01, with anterior nostril forming a tube, two specimens (MNHN 1988-1943 and ZM MGU P-15058) have a few cephalic discs on head (see p. 9) and ZM MGU P-15058 has two basibranchial tooth patches placed alongside each other unsymmetrical to the median axis. The distance between base of ventral fins and anal fin shows a positive allometric growth; the two low numbers (17% SL) in Table 4 derive from the smallest specimens (SL 109 and 135 mm) while the remaining

* This specimen differs from the rest of the material in so many characters that it is not considered a paratype and is treated separately in Table 7 and in the text.

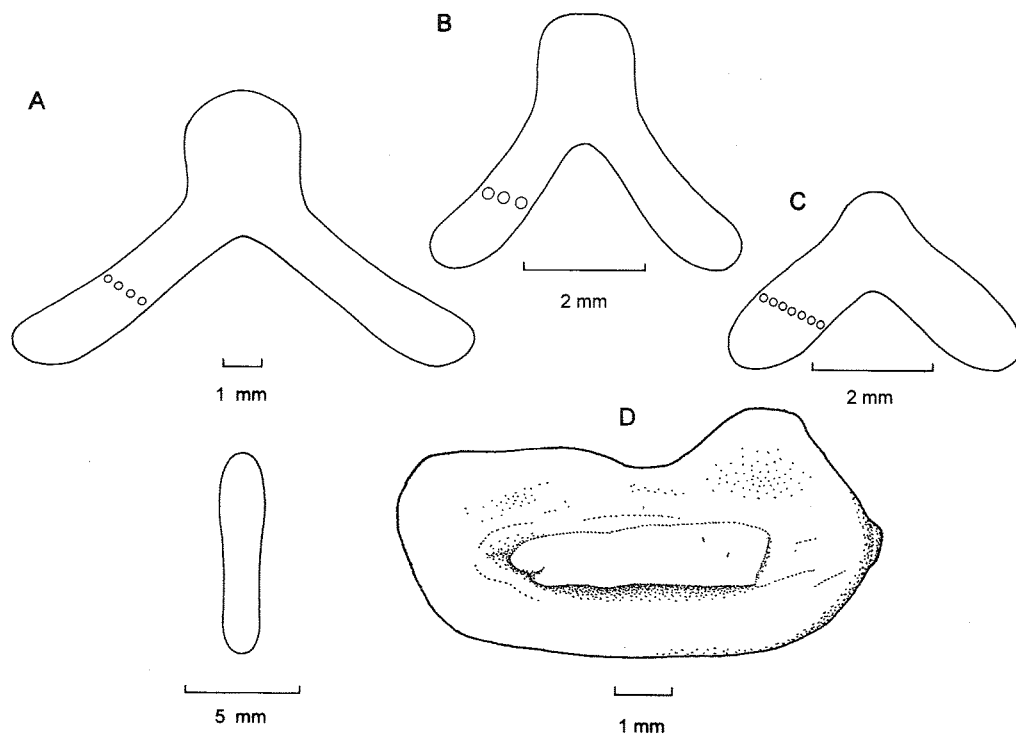


Fig. 15. *Bassozetus galathea*. A, vomer and basibranchial tooth patch of holotype, SL 415; B, vomer of AMS I.31151-003, SL 230; C, vomer of ZMUC P771219 (tentatively referred specimen), SL 232; D, median view of left sagitta of holotype.

specimens are between 215 and 573 mm SL. In some specimens the length of the precaudal neural spines does not decrease. Epipleural ribs are observed on some specimens on precaudal vertebrae 3-15. In Fig. 7A the length of the sagitta is plotted against the SL showing an even growth.

Tentatively referred specimen: This 232 mm specimen is a fully ripe female in good condition except for lacking most of its scales. Also the otoliths are lacking as the specimen was kept in formalin for a long period. Tables 4 and 7 show that it differs from the type material of *B. galathea* (21 specimens) in quite a few characters: anal fin rays 115 vs 108-114, origin of dorsal fin well in front of hindmargin of opercle vs above hindmargin of opercle, precaudal vertebrae 13 vs 14-17, long rakers on anterior gill arch 18/19 vs 14-17, length of upper jaw 8.2% SL vs 8.4-10.0, preventral length 13.0% SL vs 14.0-16.5, predorsal length 15.5% SL vs 16.0-19.5. Also it differs in the form of the vomer when compared to a paratype of the same length (Fig. 15C) by not having developed a "vomer head" and by having more and smaller teeth (7 vs 3 across a "vomer-arm").

Biology: Of the 22 examined specimens 16 are males, including a 555 mm SL specimen with spent testes. One of the six females, the tentatively referred specimen SL 232, had fully ripe ovaries with eggs of about 0.5 mm in diameter. They were caught on or near the bottom mostly at slope depths but also extending into the abyss. Identifiable contents from the digestive tract were found in six specimens: scales and vertebrae from fish, dorsal felt from polychaetes and remains of crustaceans.

Distribution: *B. galathea* is reported from 14 localities from off Kenya to Fiji Is. (Fig. 10) at depths between 1100 and 3960 m and 4810 m for the tentatively referred specimen. Eleven of the localities range from 1100 to 1800 m while the three Galathea stations were in depths between 2820 and 4810 m (Table 1). Bottom trawls were used on all 14 localities. Iwai (1976) reported a 630 mm specimen of *B. elongatus* from a depth of 1300 m off the Hawaiian Islands, but it rather seems to belong to this species; the specimen was not seen by us.

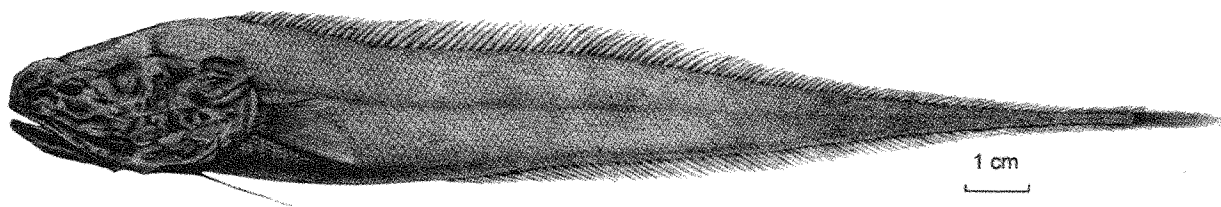


Fig. 16. *Bassozetus glutinosus*. Syntype, SL ca. 170. (From Alcock 1892).

Etymology: This species is named for the Danish research vessel GALATHEA which caught the first specimens during its global circumnavigation in 1950-52.

***Bassozetus glutinosus* (Alcock, 1890)**

Figs. 1, 16-18

Bathyonus glutinosus Alcock, 1890: 211 (locality of lectotype 18°26'N, 85°24'E).

Bassozetus compressus (non Günther): Günther 1887: 109 (the two smaller Indo-Pacific syntypes).

Bassozetus glutinosus: Goode & Bean 1896:322; Alcock 1899: 88; Norman 1939: 77; Shcherbachov 1980: 22; Nielsen 1997: 56, fig. 5.

Bathyonus glutinosus: Alcock 1892: pl.1, fig. 3; Menon & Yazdani 1968: 147.

Material examined (36 specimens, SL 68-368): Lectotype (here selected): ♂, SL 183, Bay of Bengal, 18°26'N, 85°24'E, R/V INVESTIGATOR st. 97, bottom trawl, 2397 m, 4 Mar. 1890, BMNH 1890.11.2.8.37, former ZSI 12828.

Paralectotypes: Same data as for lectotype, ZSI 12824(SL 170) and 12825(SL 116+); MNHN 90-

Table 7. Meristic and morphometric characters of *B. galathea*.

	Holotype ZM-MGU P-15136 415	Holotype and 20 paratypes 109-573				Tentatively refer. spm. ZMUC P771219 232
Standard length	415					
MERISTIC CHARACTERS						
Dorsal finrays	138	Min 132	Mean 137.3	Max 142	No 21	137
Caudal finrays	8	8	8.0	8	21	8
Anal finrays	111	108	111.2	114	21	115
Pectoral finrays	27	26	27.3	29	20	28
Precaudal vertebrae	16	14	16.1	17	21	13
Total vertebrae	74	71	74.2	76	21	74
Developed rakers on ant. gill arch	14	14	15.3	17	21	18/19
Short rakers on ant. gill arch	8	8	8.5	10	21	10/11
Ant. dorsal ray above vertebra no.	3	3	3.5	5	21	3
Ant. anal ray below dorsal ray no.	29	25	30.8	33	21	27
Ant. anal ray below vertebra no.	18	16	18.5	20	21	16
MORPHOMETRIC CHARACTERS						
in % of standard length						
Head length	19.5	17.5	18.9	20.5	21	16.5
Depth at 1st anal ray	11.5	6.9	10.5	12.6	21	9.1
Upper jaw	9.5	8.4	9.3	10.0	21	8.2
Preventral	14.0	14.0	15.0	16.5	21	13.0
Preanal	38.0	26.5	35.0	40.5	21	31.5
Predorsal	19.0	16.0	17.3	19.5	21	15.5
Base of ventral fin to anal fin	25.5	17.0	22.6	25.5	21	20.5
Ventral fin-length	–	11.0	14.7	17.0	18	14.5

344, former ZSI 12826 (♂, SL 160); USNM 231712, former ZSI 12827 (SL 145+).

Non-types: ♂, SL 111, off New Guinea, Raine Is., 12°8'S, 145°10'E, R/V CHALLENGER st. 184, bottom trawl, 2562 m, 29 Aug. 1874, BMNH 1887.12.7.48 (former syntype of *B. compressus*). - ♂, SL 130, off Philippine Is., 16°42'N, 119°42'E, R/V CHALLENGER st. 205, bottom trawl, 1922 m, 13 Nov. 1874, BMNH 1887.12.7.49 (former syntype of *B. compressus*). - 2, SL 190-193, Laccadive Sea, 10°33'N, 74°45.3'E, R/V INVESTIGATOR st. 274, bottom trawl, 2123 m, 3 Jan. 1901, ZSI 921/1-922/1. - SL 245, Bay of Bengal, 18°57.8'N, 92°32.5'E, R/V INVESTIGATOR st. 311, bottom trawl, 2181 m, 17 Mar. 1903, ZSI 1052/1. - SL 240+, Bay of Bengal, 18°30'N, 92°58.5'E, R/V INVESTIGATOR st. 326, bottom trawl, 2013 m, 4 Mar. 1904, ZSI 1111/1. - 1♀ and 2♂, SL 201-210, Bay of Bengal, 17°10'N, 84°30'E, R/V GALATHEA st. 299, bottom trawl, 2820 m, 24 Apr. 1951, ZMUC P 771269-1271. - 1♀ and 2♂, SL 193-240, Bay of Bengal, 15°54'N, 90°17'E, R/V GALATHEA, st. 314, bottom trawl, 2600 m, 3 May 1951, ZMUC P 771272-1274. - ♂, SL 150, Bay of Bengal, 19°41'N, 90°57'E, R/V VITYAZ cr. 33 st. 4962, bottom trawl, 2142 m, 28 Feb. 1961, IORAN uncat. - SL 68, off Maldive Is., 0°14'S, 65°3'E, R/V ANTON BRUUN cr. 6 st. 337B, IKMT, 0-2250 m (pelagic), 28 May 1964, USNM 206931. - ♀, SL 368, northwestern Pacific, 19°17.6'N, 164°52.1'E, 1440 m, 10 Oct. 1972, BSKU 47484. - ♂, SL 278, off Madagascar, 11°59'S, 45°42'E, Maugé coll, st. CH 82, bottom trawl, 3450 m, 1 Apr. 1977, MNHN 1999-995. - 1♂, SL 255, off New Caledonia, 22°45.8'S, 166°20.3'E, R/V JEAN CHARCOT cr. BIOCAL st. CP 23, bottom trawl, 2040 m, 28 Aug. 1985, MNHN 1994-710. - 2♀, 1♂ and 1?, SL 110-292, off New Caledonia, 22°5.5'S, 166°26.4'E, R/V JEAN CHARCOT cr. BIOCAL st. CP 27, bottom trawl, 1850 m, 28 Aug. 1985, MNHN 1994-711 and ZMUC P771151-1152. - ♂, SL 225, off New Caledonia, 24°1.5'S, 167°8.7'E, R/V JEAN CHARCOT cr. BIOCAL st. CP 60, bottom trawl, 1505 m, 2 Sep. 1985, MNHN 1994-712. - 3♂, SL 150-160, off New Caledonia, 21°00'S, 167°58.3'E, R/V CORIOLIS cr. BIOGEOCAL st. CP 260, bottom trawl, 1900 m, 17 Apr. 1987, MNHN 1994-713. - 2♂, SL 92-175, off New Caledonia, 21°4.1'S, 167°0.4'E, R/V CORIOLIS cr. BIOGEOCAL st. CP 265, bottom trawl, 1815 m,

18 Apr. 1987, MNHN 1994-714. - SL 172, Mozambique Channel, 14°48.4'S, 43°16.6'E, R/V VITYAZ cr. 17 st. 2610, bottom trawl, 3328 m, 16 Nov. 1988, IORAN uncat. - ♂+?, SL 115+-230, off Western Australia, 22°0.5'S, 113°8.7'E, R/V SOELA, bottom trawl, 1580 m, 25 Jan. 1991, AMS I.31151-003 and 011. - ♂, SL 257, Norfolk Ridge, 25°2.9'S, 168°45.4'E, HALIPRO 2 st. BT55, bottom trawl, 1289 m, 17 Nov. 1996, MNHN 1997-651.

Condition of material: Except for the type material the specimens are in a good condition but with most scales missing.

Notes to type series: According to Alcock (1890: 212) the type material consists of five specimens; a holotype was not designated so they must be considered syntypes. Three of the syntypes were later sent to the following museums: NHM (ZSI F 12828), MNHN (ZSI F 12826) and USNM (ZSI F 12827) leaving two (F 12824 and F 12825) at ZSI, Calcutta. However, Menon & Yazdani (1968: 147) only mentioned one syntype at the ZSI (cat. no. F 12824). During a recent visit to ZSI the second author (NRM) found two specimens from the type series: 12824, erroneously marked holotype, and 12825, marked syntype. We here select as lectotype the syntype at the NHM (BMNH 1890.11.28.37 former ZSI F 12828) as it is the best preserved specimen.

Diagnosis: Head short, depth of body 8.5-13.5% SL at origin of anal fin, caudal part tapering, pre-anal length 30.0-39.5% SL, distance between base of ventral fins and anal fin 16.0-23.5% SL, 25-35 oblique scale rows, diameter of eye 2-3 times in length of snout, sagittal otolith small (Fig. 17B), anal fin rays 98-108, pectoral fin rays 24-29, ventral fins reaching anal fin in some specimens (14.5-19.0% SL), 15-21 long gill rakers on anterior arch, precaudal vertebrae 13-15.

Similarity: *B. glutinosus* is very similar to *B. nasus* and *normalis* (see p. 15, Fig. 5 and Table 2).

Description: The principal meristic and morphometric characters are given in Tables 4 and 8. Body slender and compressed with tapering caudal part, head length about twice the depth of body at anus, scales small with 25-35 rows in an oblique

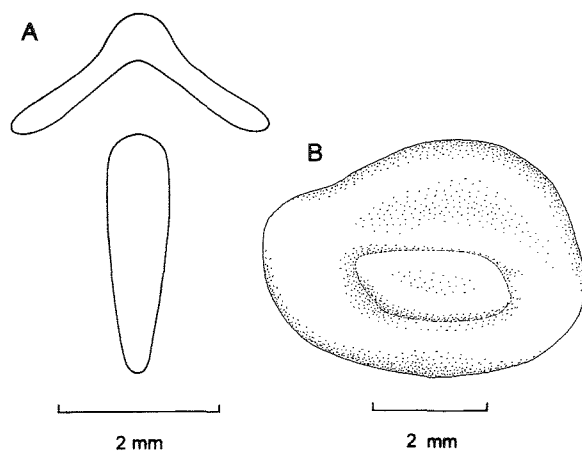


Fig. 17. *Bassozetus glutinosus*. Lectotype, BMNH 1890.11.28.37, SL 183. A, vomer and basibranchial tooth patch; B, median view of left sagitta.

line from anus and forward (Fig. 1), most specimens with distinct cephalic discs (cf. p. 9), mouth horizontal, ending well behind eyes, diameter of eye 2-3 times in length of snout, opening of the two nostrils most often equal in size but in a few

specimens with the posterior the largest, teeth small and close-set with those on vomer and palatines somewhat larger than those on premaxillaries and dentaries, vomer v-shaped, basibranchial tooth patch rather narrow and elongate (Fig. 17A), anterior gill arch with 4-5 short and one long raker on upper branch, one long raker in the angle and lower branch with 13-19 long and 3-5 short rakers, ventral fins almost reaching anus.

Sagittal otolith small (Fig. 17B) and robust with an undivided sulcus and no ostial channel, sulcus closer to ventral than to dorsal rim which is highest in anterior end and outer form rounded; it is just a little longer than high and 2-3 times as long as thick.

Axial skeleton (from radiographs): Tips of neural and haemal spines pointed except for a few specimens where neural spines 3-6 are blunt, second neural spine 2-3 times the length of anterior spine and the following 8-10 spines are shorter, neural spines of vertebrae 3-12 with enlarged basal part, anterior 4-5 vertebrae without parapophyses, pleural ribs from vertebra three posteriorad, epi-pleural ribs indistinct.

Table 8. Meristic and morphometric characters of *B. glutinosus*.

	Lectotype BMNH 90.11.28.37 183		Paralecto- type* MNHN 90-344 160		LT and PLT and 31 specimens 68-368
MERISTIC CHARACTERS					
Dorsal finrays	125	Min	Mean	Max	No
Caudal finrays	8	124	120	123.3	129
Anal finrays	101	8	8	8.0	8
Pectoral finrays	26	103	98	102.2	108
Precaudal vertebrae	14	26/27	24	26.9	29
Total vertebrae	68	13	13	13.7	15
Developed rakers on ant. gill arch	17/18	68	66	68.2	71
Short rakers on ant. gill arch	9/10	16/17	15	17.4	21
Ant. dorsal ray above vertebra no.	4	7/10	7	7.8	10
Ant. anal ray below dorsal ray no.	25	4	3	3.4	4
Ant. anal ray below vertebra no.	16	25	22	24.6	26
		15	14	15.4	17
MORPHOMETRIC CHARACTERS					
in % of standard length					
Head length	20.5	20.0	17.0	18.9	21.0
Depth at 1st anal ray	10.5	9.7	8.5	10.4	13.5
Upper jaw	10.0	11.0	7.9	9.7	11.0
Preventral	15.0	14.5	?	?	
Preanal	39.5	37.0	30.0	33.6	39.5
Predorsal	19.0	21.0	15.5	17.8	21.0
Base of ventral fin to anal fin	23.5	23.0	16.0	20.2	23.5
Ventral fin-length	-		14.5	15.4	19.0

* Only characters from 1 paralectotype are included in Table 8 as the other 3 paralectotypes are in poor condition.

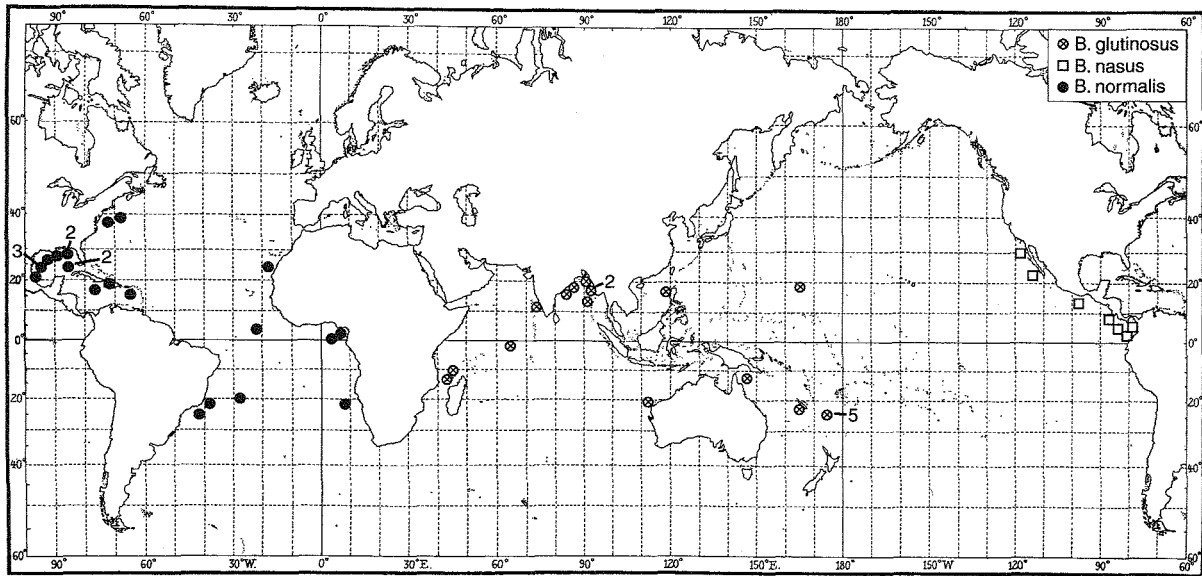


Fig. 18. Records of *Bassozetes glutinosus*, *nasus* and *normalis*. The numbers indicate the number of neighbouring stations.

Coloration: A specimen caught in 1996 shows dark brown head and abdomen, bluish eyes, brown fins and body light brown with margin of scale pockets dark brown.

Biology: The material contains 20 males and five females, none of which is ripe and 11 unsexed specimens. They live on or near the bottom from slope to lower rise depths except for the smallest recorded specimen (SL 68 mm) which was taken

pelagically in an IKMT between the surface and 2250 m. Radiographs showed no recognizable contents from stomachs and intestines.

Distribution: Fig. 18 shows that *B. glutinosus* is recorded from the Indian and the West Pacific Oceans from 20 localities, of which 17 have depths between 1289 and 2820 m and the remaining two, both from northwest of Madagascar, have depths of 3328 and 3450 m (Table 1). Shcherbachev (1980:

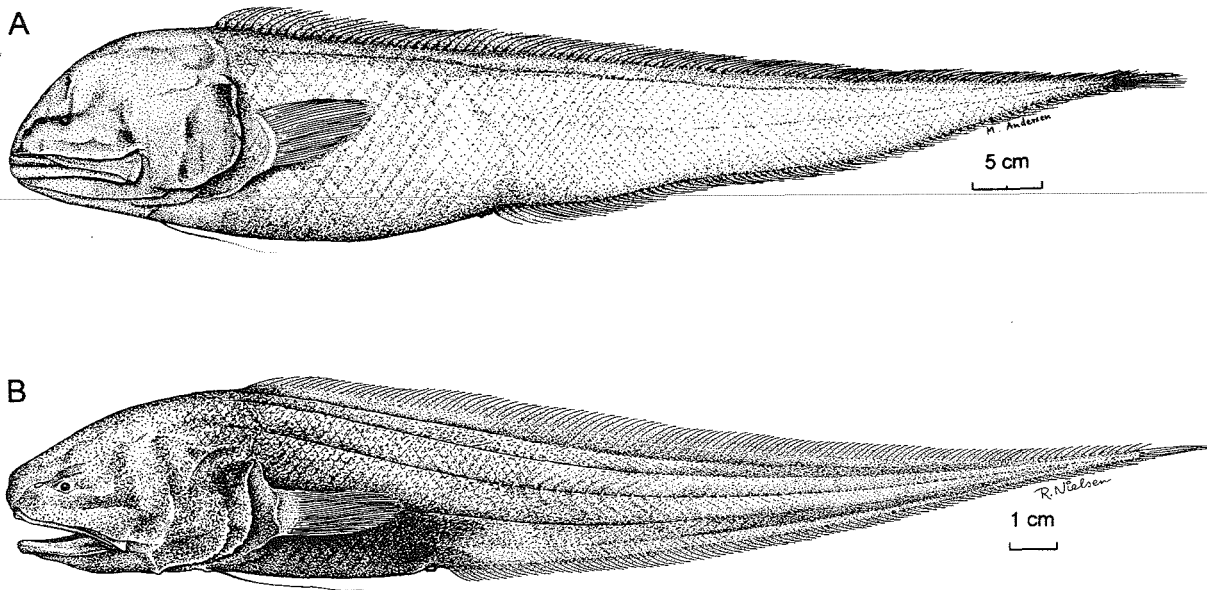


Fig. 19. *Bassozetes levistomatus*. A, ISH 971-1982, SL 770; B, ZMUC P771175, SL 233.

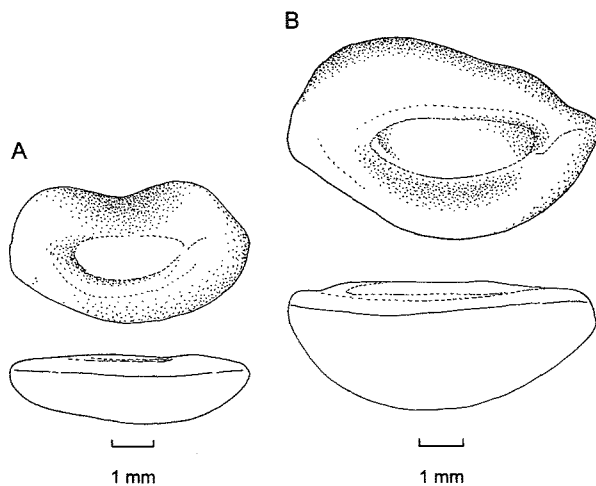


Fig. 20. *Bassozetus levistomatus*. Median and dorsal view of left sagitta. A, VIMS 06888, SL 185; B, BMNH 1994.5.6.1, SL 735.

25) mentioned that *B. glutinosus* apparently occurs off the Hawaiian Islands referring to an incorrectly identified specimen of *B. elongatus* recorded by Iwai (1976). However, we refer the Hawaiian specimen to *B. galathea* (cf. p. 30).

Bassozetus levistomatus Machida, 1989

Figs. 19-21

Bassozetus levistomatus Machida, 1989: 187, fig. 1-3 (type locality 31°10.4'N, 141°44'E).

Material examined (10 specimens, SL 185-805):

Holotype*: ♀, SL 498, off Japan, 31°10.4'N, 141°44'E, R/V SOYO MARU, beam trawl, 5160 m, 20 June 1973, NSMT-P29533.

Non-types: 1♀, SL 233, off Kenya, 4°47'S, 46°19'E, GALATHEA st. 235, herring otter trawl, 4810 m, 11 Mar. 1951, ZMUC P771175. - ♂, SL 180+, Caribbean Sea, 17°51'N, 65°42'W, R/V PILLSBURY st. 1401, bottom trawl, 4179 m, 12 July 1971, UMML 30570. - 1♀, SL 185, Caribbean Sea, 15°08.3'N, 69°20.1'W, BARTLETT st. E040, otter trawl, 3942-3993 m, 28 Oct. 1981, VIMS 06888. - 1♀, SL 770, off Spain, 42°32.4'N, 14°29.6'W, WALTHER HERWIG st. 62/82, Agassiz trawl, 5200 m, 30 May 1982, ISH 971-1982. - 1♀, SL 340, off California, 34°40'N, 123°5'W, NEW HORIZON st. 314, 16' otter trawl, 4125 m, 18 Feb. 1990, SIO90-35. - 1♀, SL 565, near Madei-

ra, 31°04.3'N, 21°19.1'W, DISCOVERY st. 12174#19, trawl, 4942-4958 m, 18 Aug. 1990, BMNH 1991.7.9.859. - 1♀ and 1♂, SL 735-805, off Northwest Africa, 20°53.6'N, 31°13.5'W, DISCOVERY st. 12600#12, trawl, 4490-4600 m, 29 Sep. 1993, BMNH 1994.5.6.1-2. - 1♂, SL 305+, northwestern Indian Ocean, 16°18'N, 60°9.4'E, METEOR 33-1 st. OT7, otter trawl, 4040 m, 4 Oct. 1995, ZMH 9165.

* Only photo- and radiograph examined.

Condition of material: Most of the specimens have lost their scales and in some even the scale-pockets have been rubbed off in the trawl. Also the bones in the head and the finrays are often damaged. This is probably not because this is a specially fragile species but rather that the depths of capture are between 3965 and 5200 m indicating that the specimens have spent a considerable length of time in the trawl.

Diagnosis: Heavy head especially in larger specimens (Fig. 19) and tapering caudal part, scales on head smaller than those on body, 25-30 oblique scale rows, mouth terminal, diameter of eyeball 5-10 times in length of snout, no basibranchial tooth patches, vomer edentate except for a 5 mm circular tooth patch in a 735 mm SL specimen, sagittal otoliths becoming relatively shorter and thicker with increasing SL (Fig. 20A and B) and with a small undivided sulcus without ostial channel, pectoral finrays 27-29, ventral fins not reaching anus (8-12% SL), 9-11 long gill rakers on anterior arch.

Similarity: See notes under *B. werner* (p. 51).

Description: The principal meristic and morphometric characters are given in Tables 4 and 9.

Body tapering and compressed in fixed material (freshly-caught specimens greatly hydrated and rounded in cross section), head broad becoming more robust with growth, depth at origin of anal fin relatively larger with growth, scales smaller on head than on body with 25-30 in an oblique row, profile of head convex due to inflated skin (illustration of holotype in Machida (1989, fig.1) shows concave head-profile, most probably an artefact of fixation), large specimens with steep head profile, eye-lens 4-5 times in length of snout in small specimens and 6-7 in larger specimens, upper jaw ends well behind eye, posterior end sheathed, teeth gran-

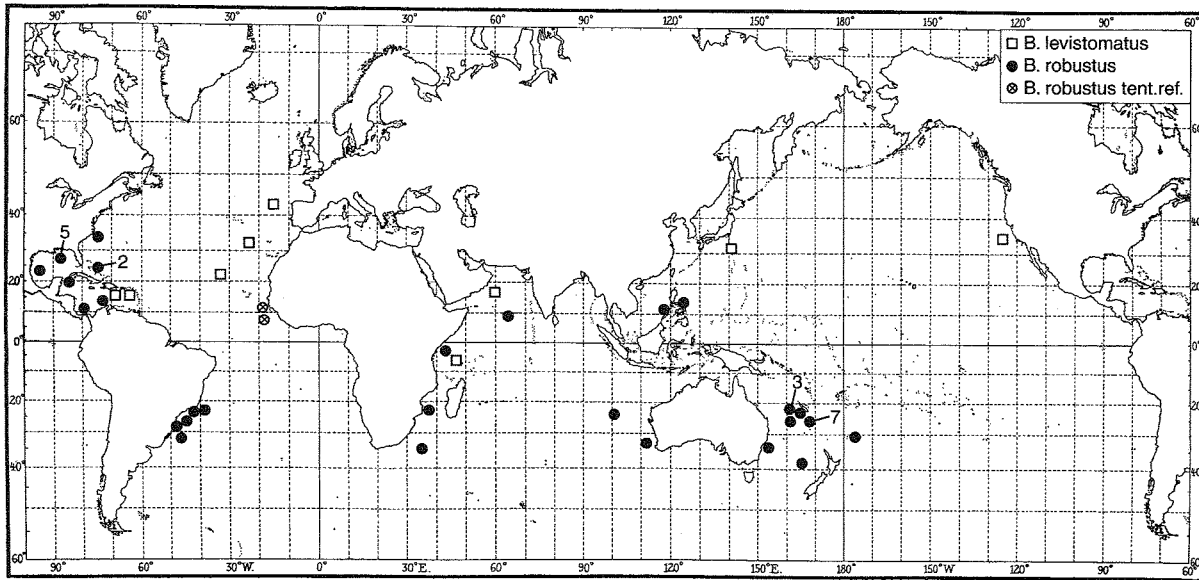


Fig. 21. Records of *Bassozetus levistomatus*, *robustus* and *robustus* tent. ref. The numbers indicate the number of neighbouring stations.

ular, basibranchials and (a 735 mm SL specimen has a small, circular, medially placed vomerine tooth patch of 5 mm in diameter) vomer edentate, anterior gill arch with three short rakers on upper branch, one long raker in the angle and lower branch with 8-10 long and 2-4 short rakers with shape of long rakers changing from slender in smaller specimens to relatively shorter and broader in larger specimens, short rakers very small knobs, pectoral and ventral fins not reaching anus, distance between base of ventral fins and anal fin in percentage of SL shows a positive allometric growth so that in Table 4 the four low values derive from specimens of 185-565 mm SL and the three high values from specimens of 735-805 mm SL.

Sagittal otoliths medium sized with faintly marked, apparently undivided, centrally placed sulcus and no ostial channel. Fig. 20 shows that the shape changes much with growth becoming relatively shorter and thicker with increasing SL, the dorsal rim is concave in small specimens and convex in larger specimens, length and thickness of a 185 mm and a 805 mm SL specimen are 3.0% and 1.1% SL in the former and 1.0% and 0.4% SL in the latter specimen. For a specimen 185 mm in SL the sagitta is twice as long as high and 4-5 times as long as thick. The sagitta from a specimen 735 mm in SL is 1.5 times as long as high and twice as long as thick.

Axial skeleton (from radiographs): All precaudal vertebrae with pointed, non-depressed neural

Table 9. Meristic and morphometric characters of *B. levistomatus*.

	Holotype NSMT- P29533	Holotype and 9 specimens			
Standard length	498	185-805			
MERISTIC CHARACTERS					
Dorsal finrays	115-120	Min	Mean	Max	No.
Caudal finrays	8	8	8.3	9	8
Anal finrays	93	93	95.7	105	8
Pectoral finrays	29	27	27.9	29	8
Precaudal vertebrae	15	14	14.9	16	9
Total vertebrae	65	64	65.6	68	7
Developed rakers on ant. gill arch	11	9	10.4	11	10
Short rakers on ant. gill arch	7	6	6.4	7	9
Ant. dorsal ray above vertebra no.	—	3	3.7	4	8
Ant. anal ray below dorsal ray no.	—	25	29.8	36	8
Ant. anal ray below vertebra no.	—	17	19.4	23	8
MORPHOMETRIC CHARACTERS in % of standard length					
Head length	23.5	21.0	22.1	23.5	6
Depth at 1st anal ray	13.5	10.5	14.0	19.0	8
Upper jaw	12.0	11.5	12.1	13.0	6
Preventral	17.5	15.0	16.6	18.0	6
Preanal	36.0	35.5	40.6	45.5	6
Predorsal	22.0	18.5	20.5	22.5	6
Base of ventral fin to anal fin	—	19.0	25.0	32.0	7
Ventral fin-length	9.8	8.1	9.8	12.0	4

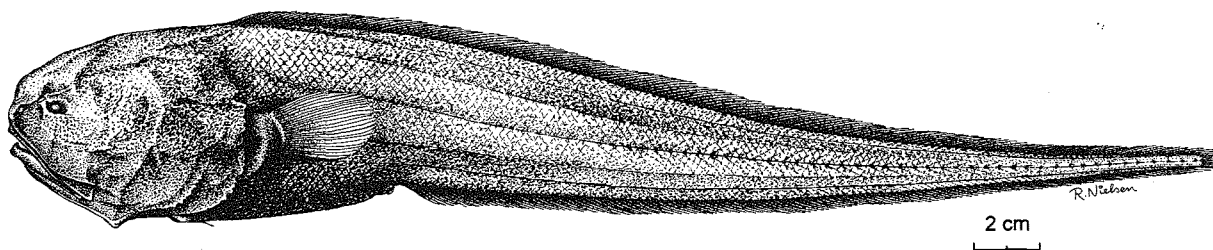


Fig. 22. *Bassozetus multispinis*. Holotype, ZM MGU P-15110, SL 403.

spines, anterior spine half the length of second spine, the following spines equal in length to the second or spines on vertebrae 3-14 shorter, except for the anterior two, neural spines on all precaudal vertebrae with enlarged base, pleural ribs from vertebra 4-5 and posteriorad, epipleural ribs indistinct.

Coloration: The holotype and an 805 mm specimen are chocolate brown. The rest are light yellow apparently because almost all scales and scale-pockets are rubbed off in the trawl.

Biology: The material contains seven females, all unripe except for a 805 mm spent specimen. Two of the three males are unripe and in the third, 735 mm SL, most of the entrails were lost leaving only part of a fully ripe testis. All specimens were apparently caught on or near the bottom at abyssal depths. Except for dorsal felt from a polychaete in the intestine of one specimen no identifiable remains were observed in any of the other specimens.

Distribution: *B. levistomatus* is reported from nine localities and is represented in all oceans (Fig. 21) at depths between 3965 and 5200 m (Table 1).

***Bassozetus multispinis* Shcherbachev, 1980**

Figs. 13, 22, 23

Bassozetus multispinis Shcherbachev, 1980: 124, figs. 1-2 (type locality 19°54.5'S, 87°52.5'E).

Material examined (17 specimens, SL 215-452):

Holotype: ♂, SL 403, Indian Ocean, 19°54.5'S, 87°52.5'E, R/V ZVEZDA KRYMA, bottom trawl, 1500-1550 m, 27 Oct. 1977, ZM-MGU P-15110.

Paratypes: 4♀, SL 215-451+, data as for holotype, ZM-MGU P-15154.

Non-types: 2, SL 406-452, Indian Ocean, 12°51'S, 88°49'E, PROFESSOR MASJATSEV, bottom trawl, 1720-1840 m, 17 Mar. 1979, ZM-MGU P-15155. - 8, SL 295-425, Indian Ocean, 14°31'S, 88°12'E, R/V PROFESSOR MASJATSEV, bottom trawl, 1820-1880 m, 18 Mar. 1979, ZM-MGU P-15156 (2♂ and 3♀, SL 323-447) and ZMUC P771210-P771212 (3♀, 295-425). - 2, SL 326-437, Indian Ocean, 19°45'S, 87°54'E, PROFESSOR MASJATSEV, 1560-1650 m, 22 Mar. 1979, ZM-MGU P-15157.

Condition of material: Most scales are lost but scale pockets distinct.

Diagnosis: Body elongate tapering caudally, head robust with a rather blunt snout, mouth opening oblique, head and body fully scaled with 30-35 scales in an oblique row, scales on body larger than those on head, a long and narrow basibranchial tooth patch and a boomerang-shaped vomer (Fig. 23A), sagittal otolith large with a small sulcus (Fig.

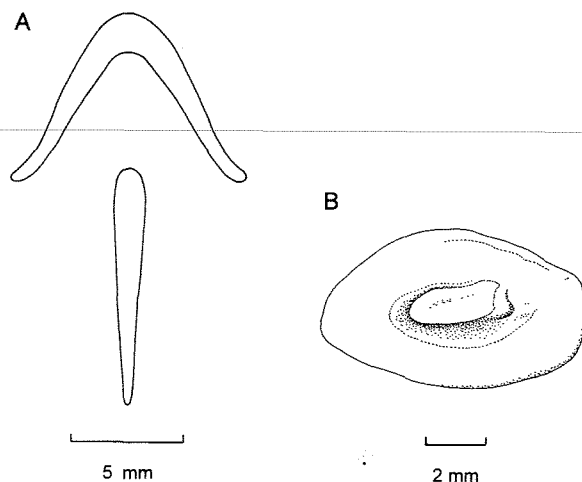


Fig. 23. *Bassozetus multispinis*. A, vomer and basibranchial tooth patch of holotype; B, median view of left sagitta of ZMUC P771212, SL 295.

23B), 23-24 pectoral finrays, ventral fins very short (1.1-3.0% SL), 16-22 long gill rakers on anterior arch.

Similarity: *B. multispinis* is similar to *B. zenkevitchi* in possessing very short ventral fin rays.

Description: The principal meristic and morphometric characters are given in Tables 4 and 10. Shcherbachev (1980) did not make a separate description of the holotype except for the characters mentioned in his Table 5, hence the description here.

Holotype: Body compressed, elongate and tapering caudally with rounded, swollen head, blunt snout, scales small, 30-35 in an oblique scale row, upper jaw ends well behind eye, posterior end of maxillary partly sheathed, diameter of eye 2-3 times in snout, teeth granular, dentigerous vomer boomerang-shaped, basibranchial tooth patch long and narrow (Fig. 23A), anterior gill arch with five short rakers on upper branch, one long raker in angle and lower branch with 20 long and four short rakers, gill filaments on anterior arch short (3.7% of length of head). Ventral finrays extremely short (1.2% SL).

Sagittal otolith (Fig. 23B) medium sized and robust with a small, undivided sulcus placed centrally, no ostial channel and outer form rounded; it is 1-2 times as long as high and about 3 times as long as thick.

Axial skeleton (from radiographs): Tips of all neural and haemal spines more or less pointed, spine of the 2nd vertebra twice as long as that of the first vertebra and longer than the following 12 spines, vertebrae 5-14 with basal part of neural spine enlarged, parapophyses developed on posterior ten precaudal vertebrae, pleural ribs on vertebrae 2-13 and epipleural ribs on nos. 3-10.

Coloration of head and body light brown, branchial cavity dark brown and fins brownish.

Variation: We find no reason to follow Shcherbachev (1980) by treating the 4 paratypes and the 12 non-types separately, so the variation indicated is based on 16 specimens. Tables 4 and 10 show the variation of some of the meristic and morphometric characters.

Colour of head much darker than in holotype. Length of ventral fins shows negative allometric growth from 3.0% SL in the smallest specimen (SL 215) to 0.8% in the largest specimen (SL 425).

Table 10. Meristic and morphometric characters of *B. multispinis*.

	Holotype ZM-MGU P-15110	Holotype, 4 paratypes and 12 non-types 215-452			
Standard length	403				
MERISTIC CHARACTERS					
Dorsal finrays	132	Min	Mean	Max	No
Caudal finrays	8	124	127.6	132	7
Anal finrays	109	8	8	8	3
Pectoral finrays	24	102	104.4	109	7
Precaudal vertebrae	14	23	23.7	24	8
Total vertebrae	71	13	13.9	14	7
Developed rakers on ant. gill arch	21	67	69.0	71	7
Short rakers on ant. gill arch	9	17	19.4	22	17
Ant. dorsal ray above vertebra no.	4	6	8.6	10	17
Ant. anal ray below dorsal ray no.	28	4	4.3	5	7
Ant. anal ray below vertebra no.	17	15	16.1	17	7
MORPHOMETRIC CHARACTERS					
in % of standard length					
Head length	21.0	20.5	21.7	23.0	16
Depth at 1st anal ray	11.0	10.5	12.1	14.0	15
Upper jaw	10.5	10.0	10.8	12.0	7
Preventral	17.0	15.5	17.5	19.0	16
Preanal	33.5	33.5	35.5	39.5	16
Predorsal	19.5	19.0	20.0	22.5	16
Base of ventral fin to anal fin	19.5	19.0	20.6	23.0	7
Ventral fin-length	1.2	0.7	1.3	3.0	14
Longest gill fila- ments on ant. arch in % of head-length	3.7	2.7	3.1	3.7	7

Also the length of the sagitta shows negative allometric growth from 4.1% SL (SL 215) to 2.1% SL (SL 425). No other *Bassozetus* specimen has so relatively long a sagitta as the 215 mm SL paratype.

Biology: Of the 17 specimens examined there are three males, six females and eight unsexed specimens. All, except a female with 0.5 mm eggs, were unripe. There are no identifiable contents in stomachs and intestines. This species occurs on or near the bottom at continental slope depths.

Distribution: *B. multispinis* is known from four localities on the eastern Indian Ridge in the southern Indian Ocean (Fig. 13) at depths between 1500 and 2000 m (Table 1). Since this species is easily recognizable and occurs in relatively shallow water

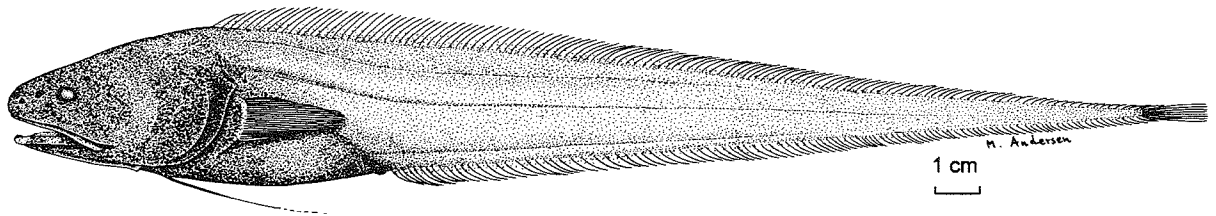


Fig. 24. *Bassozetus nasus*. ZMUC P771230, SL 251.

the restricted distribution indicated from the known specimens may reflect the true situation and not its low frequency of capture.

***Bassozetus nasus* Garman, 1899**

Figs. 18, 24, 25

Bassozetus nasus Garman, 1899: 159, pls. 77 and 78 (locality of lectotype 4°56'N, 80°52'30'W).
Bassozetus nasus: Lendenfeld 1905: 197, pl. 4;
 Grey 1956: 209; Thiel 1992: 263, fig.
Bassozetus sp.: Cohen & Haedrich 1983: 375.

Material examined (48 specimens, SL 80-465):
 Lectotype (here selected): ♂, SL 282, Gulf of Panama, 4°56'N, 80°52'30'W, R/V ALBATROSS st. 3381, bottom trawl, 3243 m, 6 Mar. 1891, MCZ 28646.

Paralectotypes: 1♂, SL 204, Gulf of Panama, 6°17'N, 82°50'W, R/V ALBATROSS st. 3360, bottom trawl, 3060 m, 24 Feb. 1891, MCZ 28647. - 1♀ and 1?, SL 247-258, same data as for lectotype, MCZ 28646. - 3♀ and 2♂, SL 122+-260, Gulf of Panama, 14°46'N, 98°40'W, R/V ALBATROSS st. 3415, bottom trawl, 3439 m, 10 Apr. 1891, MCZ 28648 and USNM 57852.

Non-types: 7♀, 23♂ and 2?, SL 135-273, Gulf of Panama, 9°23'N, 89°32'W, R/V GALATHEA st. 716, herring otter trawl, 3570 m, 6 May 1952, ZMUC P771230-1261. - 1♀ and 2♂, SL 134-278, Gulf of Panama, 5°49'N, 78°52'W, R/V GALATHEA st. 726, herring otter trawl, 3270-3670 m, 11 May 1952, ZMUC P771172-1174. - 1♀, SL 465, off Baja California, 31°16.4'N, 117°34.2'W, R/V SPENCER F. BAIRD, 30' otter trawl, 2068-2086 m, 13 Feb. 1960, SIO60-47. - 2♀ and 1?, SL 80-232, off Baja California, 24°45.2'N, 113°25'W, R/V HORIZON st. A-36, IKMT (hit the bottom), 3389-3594 m, 6 Feb. 1964, SIO64-26.

Condition of material: The type material has been

dissected and most specimens are in a poor condition. Furthermore, all of the 35 specimens taken by the Galathea are practically scaleless and were kept so long in formalin that the otoliths were dissolved.

Notes on type series: Garman (1899) did not indicate a holotype but described an 11 inch specimen in great detail. However, he presents variation in the meristic characters so there is more than one specimen in the type series. According to Karsten Hartel (pers. comm.) nine specimens are considered syntypes and we have here selected a 282 mm long specimen in rather good condition as the lectotype.

Diagnosis: Head short, body low (7-12% SL at origin of anal fin) and caudal tapering, scales rather small with 25-35 scale rows in an oblique line from anus and forward, diameter of eye 2-3 times in length of snout, sagittal otolith small (Fig. 25B),

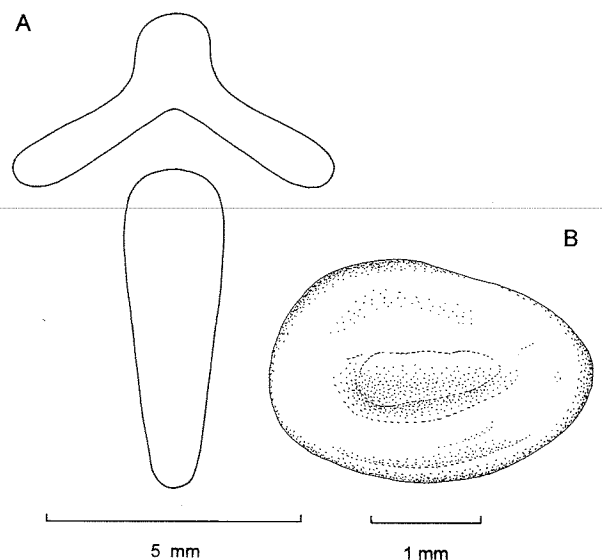


Fig. 25. *Bassozetus nasus*. A, vomer and basibranchial tooth patch of lectotype, MCZ 28646, SL 282; B, median view of left sagitta of paralectotype, MCZ 28648, SL 232.

anal finrays 102-110, pectoral finrays 22-26, ventral fins reaching about 3/4 to anal fin (13.5-15.5% SL), 13-17 long gill rakers on anterior arch, pre-caudal vertebrae 13-15.

Similarity: *B. nasus* is very similar to *B. glutinosus* and *normalis* (see p. 14, Fig. 5 and Table 2).

Description: The principal meristic and morphometric characters are given in Tables 4 and 11. - Body compressed and shallow with a long tapering caudal part, head and body covered by rather small scales (most often only scalepockets remain) with 25-35 scale rows in an oblique line from anus and forward, most specimens with distinct cephalic discs (cf. p. 9), teeth small and close-set with several rows on dentary and premaxillary and with somewhat larger and fewer on vomer and palatines, especially in smaller specimens, dentigerous vomer v-shaped with more or less pronounced head (Fig. 25A), median basibranchial tooth patch rather broad anteriorly, diameter of eye 2-3 times in length of snout, nostrils simple holes, anterior gill arch with 3-5 short and one long raker on upper

branch, one long raker in the angle and lower branch with 11-15 long and 3-5 short rakers.

Sagittal otolith (Fig. 25B) small and robust with a rather small, undivided and centrally placed sulcus, no ostial channel and outer form rounded; it is about 1.5 times as long as high and 3-4 times as long as thick.

Axial skeleton (from radiographs): Tips of neural spines pointed except in some specimens with spines on vertebrae 3-8 blunt, second neural spine three times longer than the weak anterior spine and the following 10-12 spines all shorter, neural spines 3-13 with much enlarged basal part, anterior 5-6 vertebrae without parapophyses, pleural ribs from vertebrae 3 posteriorad, epipleural ribs faint.

Coloration: All specimens, whether they are the oldest caught from 1891 or the latest from 1964, with a light brown to faintly purple body and a somewhat darker brown head. Photos (Thiel 1992) most probably of *B. nasus* show that live specimens have a dark blue head, lighter blue fins and a brownish body (photo on Pl. 1 most kindly made available by Hjalmar Thiel).

Table 11. Meristic and morphometric characters of *B. nasus*.

	Lectotype MCZ 28646	Paralecto- types 8 spms. 169-260				LT and PLT's and 39 specimens 80-465			
Standard length	282								
MERISTIC CHARACTERS									
Dorsal finrays	128	Min 124	Mean 127.1	Max 130	No 7	Min 124	Mean 127.6	Max 133	No 34
Caudal finrays	8	8	8.0	8	7	7	8.0	8	42
Anal finrays	106	103	105.6	108	7	102	106.4	110	35
Pectoral finrays	23	22	23.0	25	8	22	23.1	26	34
Precaudal vertebrae	15	15	15.0	15	8	13	14.5	15	46
Total vertebrae	70	68	69.1	70	7	68	69.8	72	45
Developed rakers on ant. gill arch	13/14	14	14.8	16	8	13	14.8	17	47
Short rakers on ant. gill arch	8	7	8.3	9	8	5	7.6	9	47
Ant. dorsal ray above vertebra no.	4	3	3.7	4	7	3	3.9	5	37
Ant. anal ray below dorsal ray no.	25	25	25.6	27	7	23	24.8	27	37
Ant. anal ray below vertebra no.	16	16	16.4	17	7	15	16.3	17	39
MORPHOMETRIC CHARACTERS									
in % of SL									
Head length	17.5	17.5	18.6	19.5	6	17.5	18.5	19.5	28
Depth at 1st anal ray	10.5	8.1	9.1	10.0	6	7.7	9.6	11.5	39
Upper jaw	9.1	8.7	9.2	9.9	5	8.6	9.3	10.5	26
Preanal	34.0	32.5	34.4	37.5	5	30.0	33.3	37.5	26
Predorsal	17.5	16.5	17.5	18.5	5	16.5	17.5	21.0	26
Base of ventral fin to anal fin	21.0	20.0	21.1	22.5	5	18.0	20.4	22.5	37
Ventral fin-length	-		13.5		1	13.5	14.4	15.5	12

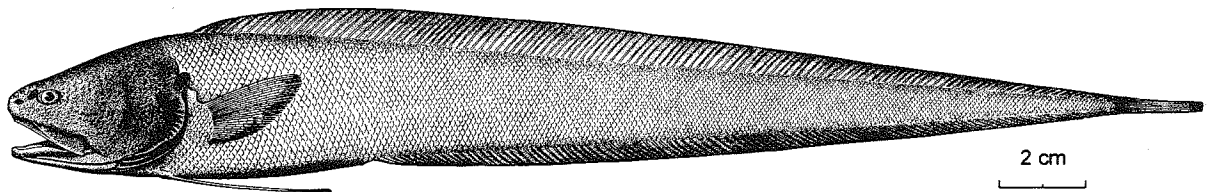


Fig. 26. *Bassozetus normalis*. Holotype, USNM 33306, SL 276. (From Goode & Bean 1896).

Biology: The material contains 29 males, two of which are ripe (SL 197-243 mm), and 15 females with two ripe specimens (SL 278-465 mm and egg-diameter 0.5 mm). Radiographs revealed no identifiable contents in stomach and intestine. They were caught relatively close to the coast (Fig. 18) on or near the bottom at continental rise depths.

Distribution: Known from seven localities in the easternmost part of the East Pacific (Fig. 18) at depths between 2068 and 3670 m (Table 1).

Photo from an area 4150 m deep about 600 km south of the Galapagos Islands (Thiel 1992) shows *B. nasus* or a very similar species (Plate 1).

***Bassozetus normalis* Gill, 1884**

Figs. 18, 26, 27

Bassozetus normalis Gill, 1884: 259 (type locality 39°33'N, 68°26.75'W).

Bassozetus normalis: Günther 1887: 99; Goode & Bean 1896: 322, fig. 287; Jordan & Evermann 1898: 2507; Grey 1956: 208; Anderson et al. 1985.

Material examined (37 specimens, SL 60-276): Holotype: SL 276, northwestern Atlantic, 39°33'N, 68°26.75'W, R/V ALBATROSS st. 2042, bottom trawl, 2846 m, 30 July 1883, USNM 33306.

Non-types: ♂, SL 240, Gulf of Mexico, 28°2.5'N, 87°43.8'W, R/V ALBATROSS st. 2380, bottom trawl, 2617 m, 2 Mar. 1885, USNM 39416. - 1♀ and 2♂, SL 205-222, off San Tomé, 1°42'N, 7°51'E, R/V GALATHEA st. 52, bottom trawl, 2620 m, 30 Nov. 1950, ZMUC P771262-1264. - 1♀ and 3?, SL 105+-187, off Loanda, 8°40'S, 11°10'E, R/V GALATHEA st. 99, bottom trawl, 2710 m, 11 Dec. 1950, ZMUC P771265-1268. - 1♀ and 2♂, SL 137-165, Gulf of Mexico, 25°21'N,

91°2'W, R/V OREGON st. 2567, bottom trawl, 3179 m, 25 July 1959, USNM 206918 and 206921. - 2♀ and 1?, SL 105-185, Gulf of Mexico, 27°6'N, 89°13'W, R/V OREGON st. 2575, bottom trawl, 2196 m, 29 July 1959, USNM 206939. - ♂, SL 221, off San Thomé, 1°13'N, 7°46'E, R/V PILLSBURY st. 266, bottom trawl, 2525 m, 17 May 1965, UMML 21734. - ♂, SL 155, Gulf of Mexico, 23°44'N, 92°36'W, R/V ALAMINOS st. 68A3-58, 3843 m, 18 Mar. 1968, TCWC 3798.01. - ♀, SL 208, Gulf of Mexico, 23°52.1'N, 91°2'W, R/V ALAMINOS st. 68A3-7D, bottom trawl, 3715 m, 19 Mar. 1968, TCWC 7348.02. - ♂, SL 125, Gulf of Mexico, 25°20'N, 86°7'W, R/V ALAMINOS st. 68A7-4A, bottom trawl, 3239 m, 28 July 1968, TCWC 3806.02. - ♀, SL 148, Gulf of Mexico, 28°51'N, 87°36'W, R/V ALAMINOS st. 68A7-14C, bottom trawl, 2105 m, 8 Aug. 1968, TCWC 3911.03. - 2♂, SL 121-175, Gulf of Mexico, 21°44'N, 96°46'W, R/V ALAMINOS st. 69A11-87, bottom trawl, 1775 m, 25 Aug. 1969, TCWC 6179.03. - ♀, SL 160, West Indies, 19°14'N, 73°14'W, R/V PILLSBURY ST. 1178, bottom

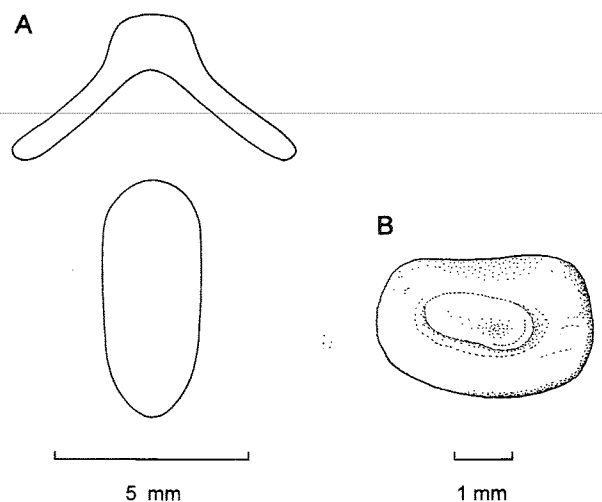


Fig. 27. *Bassozetus normalis*. Holotype. A, vomer and basi-branchial tooth patch; B, median view of left sagitta.

trawl, 1760 m, 30 June 1970, UMML 28470. - 2♂, SL 154-185, Caribbean Sea, 15°50'N, 77°24.5'W, R/V ALAMINOS st. 70A10-50, bottom trawl, 2722 m, 25 July 1970, TCWC 5692.02. - SL 155, Gulf of Mexico, 25°21.3'N, 86°6.5'W, R/V ALAMINOS st. 70A10-58, bottom trawl, ? m, 30 July 1970, TCWC 3404. 01. - 1♀ and 1♂, SL 205-210, Gulf of Mexico, 25°52'N, 93°15.8'W, R/V ALAMINOS st. 71A8-13, bottom trawl, 3267 m, 31 July 1971, TCWC 6326.03. - ♀, SL 230, mid-Atlantic, 6°30.5'N, 22°6'W, R/V GILLISS st. 93, bottom trawl, 3469 m, 19 Aug. 1973, VIMS uncat. - SL 60, Norfolk Canyon, 36°37'N, 70°21.8'W, R/V GILLISS cr. GI-7404 st. 85, bottom trawl, 1823 m, 19 Nov. 1974, VIMS 03381. - 2♂, SL 210-245, off northwestern Africa, 20°50.1'N, 18°55.5'W, R/V DISCOVERY st. 9132#5, bottom trawl, 3875 m, 18 Nov. 1976, BMNH 1999.8.4:11. - 1♂, SL 145, Caribbean Sea, 13°26.6'N, 64°47.3'W, R/V BARTLETT cr. E091 st. 1301-82, bottom trawl, 3477 m, 27 Nov. 1981, VIMS 06887. - SL 210, off Brazil, 23°4.3'S, 40°19.9'W, R/V MARION DUFRESNE cr. MD-55 st. 02CP01, bottom trawl, 2375 m, 8 May 1987, MNHN 1989-394. - 1♂ and 1?, SL 215-255, off Brazil, 21°8.4'S, 38°24.6'W, R/V MARION DUFRESNE cr. MD-55 st. 08CP17, bottom trawl, 3260 m, 11 May 1987, MNHN 1989-395. - ♂, SL 205, off Brazil, 20°28.8'S, 28°26.5'W, R/V MARION DUFRESNE cr. MD-55 st. 34DS57, dredge, 5062 m, 21 May 1987, USU 01503.

Condition of material: Except for the holotype and a few more specimens the material is in a good condition.

Diagnosis: Body shallow (8.4-11.0% SL at origin of anal fin), compressed and tapering caudally, scales small with 25-35 in an oblique row, diameter of eye 2-3 times in length of snout, sagittal otolith small (Fig. 27B), anal finrays 99-108, pectoral finrays (22)24-28, ventral fins almost reaching anal fin (14.5-19.0% SL), 13-17(20) long gill rakers on anterior arch, precaudal vertebrae 13-15.

Similarity: *B. normalis* is very similar to *B. glutinosus* and *nasus* (see p. 14, Fig. 5 and Table 2).

Description: The principal meristic and morphometric characters are given in Tables 4 and 12. - Body compressed and shallow with a long tapering caudal part, head and body covered by rather small

scales (the major part lost in most specimens) with 25-35 scale rows in an oblique line from anus and forward, some specimens with distinct cephalic discs (cf. p. 9), teeth small and close-set with several rows on dentary and premaxillary and with somewhat larger and fewer teeth on vomer and palatines, dentigerous vomer v-shaped with a more or less pronounced head (Fig. 27A), median basibranchial tooth patch rather short and broad, diameter of eye 2-3 times in length of snout, nostrils simple holes, anterior gill arch with 4-5 short and one long raker, one long raker in the angle and lower branch with 11-18 long and 3-5 short rakers.

Sagittal otolith (Fig. 27B) small and robust with a large, undivided and centrally placed sulcus, no ostial channel and rounded outer form; it is 1.5 times as long as high and 3 times as long as thick. In Fig. 7B the length of the sagitta is plotted against the SL showing an even growth.

Table 12. Meristic and morphometric characters of *B. normalis*.

	Holotype USNM 33306	Holotype and 34 specimens 60-255			
Standard length	276				
MERISTIC CHARACTERS					
Dorsal finrays	128	Min	Mean	Max	No
Caudal finrays	8	121	126.1	132	25
Anal finrays	107	7	8.0	8	25
Pectoral finrays	26	99	103.7	108	28
Precaudal vertebrae	15	22	25.2	28	18
Total vertebrae	70	13	14.5	15	32
Developed rakers on ant. gill arch	16	67	69.0	71	31
Short rakers on ant. gill arch	8	13	15.7	20	32
Ant. dorsal ray above vertebra no.	3/4	8	8.0	10	27
Ant. anal ray below dorsal ray no.	28	3	3.5	4	27
Ant. anal ray below vertebra no.	17	24	26.2	27	27
MORPHOMETRIC CHARACTERS in % of standard length					
Head length	18.0	15	16.3	20	26
Depth at 1st anal ray	11.5	16.5	18.1	20.5	24
Upper jaw	8.5	8.4	9.8	10.8	26
Preventral	14.0	7.5	8.7	9.5	16
Preanal	35.0	12.0	13.9	18.0	25
Predorsal	16.5	29.5	32.9	37.5	26
Base of ventral fin to anal fin	22.0	15.0	16.7	18.5	27
Ventral fin-length		16.0	19.5	22.5	30
		14.5	16.5	19.0	19

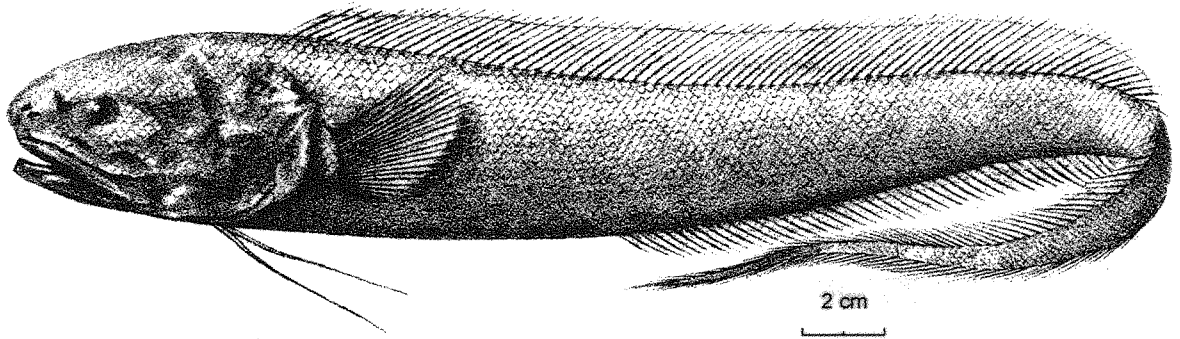


Fig. 28. *Bassozetus oncercephalus*. Holotype, MNHN 86-541, SL 225. (From Vaillant 1888).

Axial skeleton (from radiographs): Tips of neural spines pointed except for a few specimens with blunt tips on vertebrae 3-7, second neural spine 2-3 times longer than the weak anterior spine, length of spine on vertebrae 3-14 only slightly shorter than second spine, neural spines 4-13 with enlarged basal part, anterior 4-5 vertebrae without parapophyses, pleural ribs from vertebra three posteriorad, epipleural ribs indistinct.

Coloration: All specimens are much bleached with body yellow brown and head and peritoneum darker brown to bluish.

Biology: The material contains 17 males and nine females, none of which is ripe, and eight unsexed specimens. Radiographs showed no identifiable contents in stomach and intestine. They were caught from lower slope to abyssal depths, but mainly on the continental rise.

Distribution: Known from 23 localities with 18 in the West and five in the East Atlantic (Fig. 18). *B. normalis* is found at a great variety of depths (1760-5062 m). However, its depth range was

1760-3875 m at all localities except for one at 5062 m (Table 1).

***Bassozetus oncercephalus* (Vaillant, 1888)**

Figs. 28-30

Sirembo oncercephalus Vaillant, 1888: 277, pl. XXIV, fig. 6 (type locality between Dakar, Senegal, and la Praya, Cape Verde Is.).

Bassozetus oncercephalus: Norman 1939: 87; Grey 1956: 210; Nybelin 1957: 285.

Dicromita oncercephalus: Goode & Bean 1896: 321; Fowler 1925: 5 and 1936: 1060 (fig. 440).

Pterodicromitra oncercephalus: Fowler 1936: 5.

Material examined (1 specimen, SL 225): Holotype: ♂, SL 225, between Dakar, Senegal, and la Praya, Cape Verde Is., R/V TRAVAILLEUR/TALISMAN st. 101, bottom trawl, 3200 m, MNHN 86-541.

Condition of material: Very soft specimen with hardly any scales remaining.

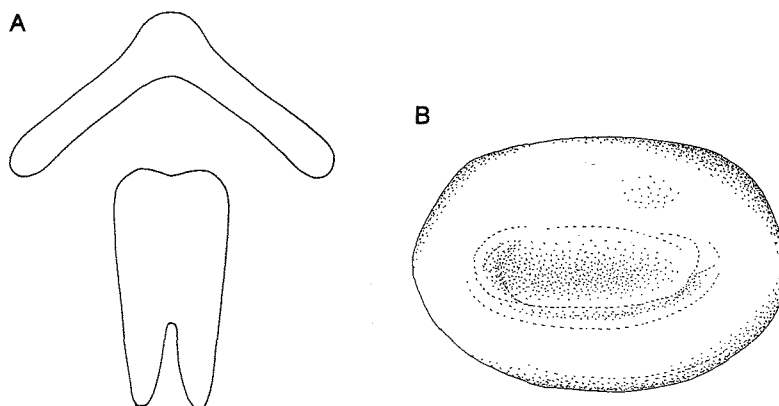


Fig. 29. *Bassozetus oncercephalus*. Holotype. A, vomer and basi-branchial tooth patch; B, median view of left sagitta.

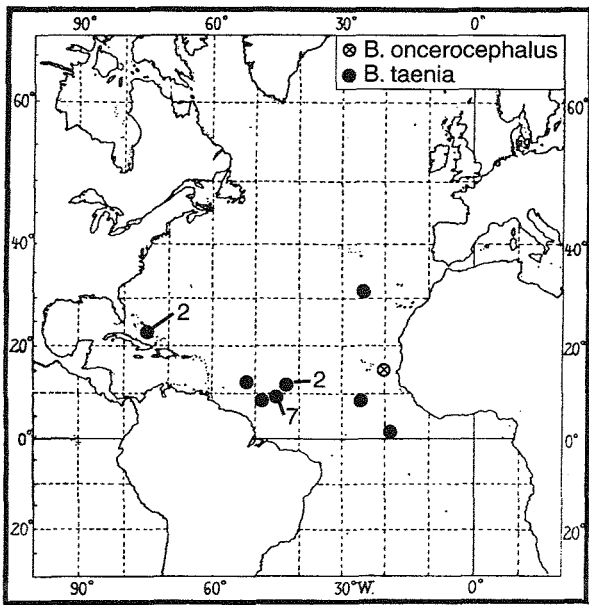


Fig. 30. Records of *Bassozetus oncerocephalus* and *taenia*. The numbers indicate the number of neighbouring stations.

Diagnosis: Head short, body slender and low (8.7% SL) tapering caudally, preanal length short (34.0% SL), distance between base of ventral fins and origin of anal fin 23.5% SL, about 25 oblique scale rows, diameter of eye 2-3 times in length of snout, vomer v-shaped, a single basibranchial tooth patch with an incision posteriorly (Fig. 29A), probably an abnormality, sagittal otolith short and thick (Fig. 29B), pectoral finrays 27, ventral fins reaching halfway to anus, 15 long gill rakers on anterior arch, precaudal vertebrae 16.

Similarity: *B. oncerocephalus* seems most similar to *B. taenia* from which it differs mainly by the longer distance between the base of the ventral fins and the origin of the anal fin (23.5 vs 15.0-19.0% SL), a higher number of precaudal vertebrae (16 vs 12-14), by the position of the anterior anal fin ray in relation to the dorsal fin rays (27 vs 21-25) and probably in the form of the basibranchial tooth patch (compare Figs. 29 and 34).

Description of holotype: The principal meristic and morphometric characters are given in Tables 4 and 14. Due to the present condition of the holotype we have used the illustration from Vaillant (1888).

Body compressed tapering caudally, depth at origin of anal fin rather shallow (8.7% SL) about

twice in head length, head and body covered with rather large scales with 20-25 oblique scale rows, teeth granular, vomer v-shaped and median basibranchial tooth patch with a posterior incision (Fig. 29A), diameter of eye about twice in snout, both nostrils simple holes. Anterior gill arch with 4-5 short rakers on upper branch, one long raker in angle and lower branch with 13-14 long and four short rakers, gill filaments short (3.2% head length).

Sagittal otolith (Fig. 29B) small and robust with a large, undivided and centrally placed sulcus, no ostial channel and rounded outer form; it is 1.4 times as long as high and about 3 times as long as thick.

Axial skeleton (from radiograph): Tips of neural spines 3-8 blunt, the remaining neural and all haemal spines pointed, 2nd neural spine twice as long as 1st spine and hardly longer than the following ones, neural spines of vertebrae 5-13 with enlarged basal part, parapophyses developed on vertebrae 6-16, pleural and epipleural ribs on vertebrae 3-14.

Biology: The holotype is an unripe male with no recognizable contents in stomach and intestine, caught on the continental rise.

Distribution: *B. oncerocephalus* is known only from the holotype caught in a bottom trawl at a depth of 3200 m off tropical Northwest Africa (Fig. 30).

Remarks: In the original description (Vaillant 1888) the number of fin rays in dorsal and anal fins were not stated. Nybelin (1957) gave the number of dorsal fin rays as ca. 150 while based on a radiograph we counted 129 fin rays.

Bassozetus robustus Smith & Radcliffe, 1913

Figs. 21, 31, 32

Bassozetus robustus Smith & Radcliffe in Radcliffe, 1913: 156, pl. 11, fig. 3 (type locality 10°54'N, 118°26'20"E).

Bassozetus robustus: de Beaufort & Chapman 1951: 432, fig. 75; Shcherbachev 1980: 122; Nielsen & Cohen 1986: 345; Nielsen 1996: 7.
Bassozetus sp. A: Anderson et al. 1985: 799.

Brotulidae gen. sp.: Golovan 1978: 223.

Material examined (80 specimens, SL 78-640):

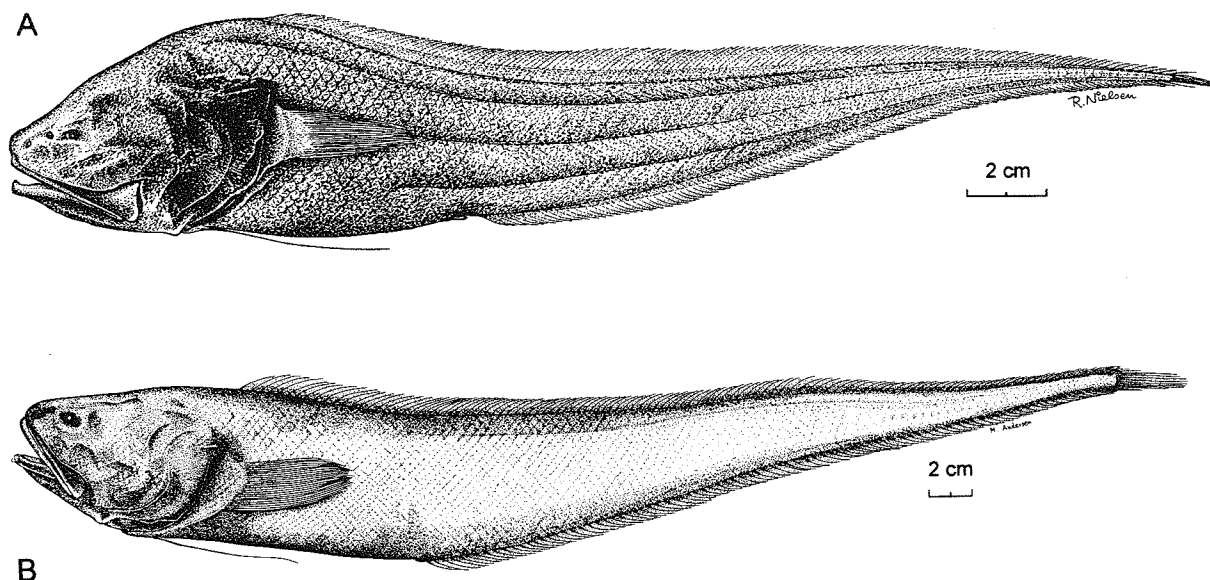


Fig. 31. *Bassozetus robustus*. A, holotype, USNM 74140, SL 325; B, tentatively referred specimen, ZM MGU P-20513, SL 435.

Indo-Pacific material (38 specimens, SL 78-640):
 Holotype: ♀, SL 325, Palawan Passage, 10°54'N, 118°26'20"E, R/V ALBATROSS st.5349, bottom trawl, 1336 m, 18 Oct. 1912, USNM 74140.

Non-types: 1♀, SL 413, southwestern Pacific, 30°8'S, 176°50'W, R/V DANA st. 3627I, 3 m ring trawl, fishing depth 0-2500 m, sounding > 5000 m, 14 Dec. 1928, ZMUC P771228. - 1♂, SL 400+, off Kenya, 4°00'S, 41°27'E, R/V GALATHEA st. 241, herring otter trawl, 1551 m, 15 Mar. 1951, ZMUC P771227. - 1♀, SL 410, Mocambique Channel, 21°18'S, 36°18'E, R/V ANTON BRUUN, st. 399C, shrimp trawl, 1555 m, 2 Oct. 1964, USNM 206916. - 2♂ and 3♀, SL 337-472, off southwest Australia, 33°42'S, 110°53'E, R/V DIMITRY MENDELEV st. 1388, 3285 m, 8 Mar. 1976, ZIL 44259. - 1♀, SL 585, southeastern Indian Ocean, 25°48'S, 100°11'E, R/V ZVEZDA KRYMA cr. 6 trawl 198, bottom trawl, 1655 m, 9 Oct. 1976, ZM MGU P-15057. - 1♂, SL 385, off southeast Africa, 33°6'S, 35°16'E, R/V ZVEZDA KRYMA, cr. 5 trawl 146, bottom trawl, 1410 m, 12 Mar. 1977, ZM MGU P-15109. - 1♀, SL 540, southwestern Pacific, 25°7'S, 162°51'E, R/V MYS TIKHIY, bottom trawl, 1120 m, Apr. 1978, ZMUC P771229. - 2♀, SL 308-335, Tasman Sea, 38°37.3S, 165°36'E, R/V TANGAROA st. U226, epibenthic sledge, 2350 m, 6 Oct. 1980, NMNZ P.33500. - 1♀, SL 520, off New Caledonia, 23°55.86'S, 166°41.71'E, BIOCAL st. CP 58, beam trawl,

2750 m, 2 Sep. 1985, MNHN 1994-715. - 1♀, SL 138, Tasman Sea, 33°52.5'S, 152°39'E, R/V COOK, 10' IKMT, 0-1800 m, sounding 4856-1700 m, 27 Apr. 1989, AMS I.28742-006. - 2♂ and 1♀, SL 142-202, off Luzon Id., 13°21.3'N, 124°12.3'E, R/V FISHER RESEARCHER I st. TI-95-5, 1069 m, 24 Sep. 1995, CAS 83059(SL188-202) and AMS I 36456-026(SL 142). - 1♀, SL 620, New Caledonia, 25°47.77'S, 167°11.52'E, HALIPRO 2 st. BT41, bottom trawl, 1350 m, 14 Nov. 1996, MNHN 1999-480. - 1♀, SL 573, New Caledonia, 25°34.29'S, 167°25.08'E, HALIPRO 2 st. BT42, bottom trawl, 1146 m, 15 Nov. 1996, MNHN 1999-481. - 1♀, SL 456, New Caledonia, 25°41.99'S, 167°25.60'E, HALIPRO 2 BT46, bottom trawl, 1247 m, 15 Nov. 1996, ZMUC P771177. - 1♀, SL 625, New Caledonia, 24°58.35'S, 168°42.31'E, HALIPRO 2 st. BT59, bottom trawl, 1416 m, 18 Nov. 1996, MNHN 1999-482. - 1♀, SL 563, New Caledonia, 24°48.20'S, 168°17.12'E, HALIPRO 2 st. BT68, bottom trawl, 1440 m, 1 Nov. 1996, MNHN 1999-483. - 1♀, SL 590, New Caledonia, 24°1.32'S, 168°0.40'E, HALIPRO 2 st. BT78, 1287 m, 21 Nov. 1996, MNHN 1999-484. - 3♂, SL 568-640, New Caledonia, 23°51.50'S, 168°25.98'E, HALIPRO 2 st. BT82, bottom trawl, 1854 m, 22 Nov. 1996, MNHN 1999-485. - 2♀ and 2♂, SL 510-594, New Caledonia, 23°56.86'S, 162°7.57'E, HALIPRO 2 st. BT95, bottom trawl, 1228 m, 25 Nov. 1996,

MNHN 1999-486(2♀, 1♂) and ZMUC P771176 (1♂). - 4♂, SL 442- 559, New Caledonia, 25°23.01'S, 162°35.40'E, HALIPRO 2 st. BT104, bottom trawl, 1121 m, 27 Nov. 1996, MNHN 1999-487(3♂) and ZMUC P771178(1♂). - 1♀, SL 531, New Caledonia, 25°42.93'S, 162°47.98'E, HALIPRO 2 st. BT105, bottom trawl, 1209 m, 27 Nov. 1996, MNHN 1999-488. - SL 78, Arabian Sea, 10°2'N, 65°E, R/V SONNE cr. 129 sample 52, baited trap, 4420 m, 14 Feb. 1998, SMF 28849.

Atlantic material (42 specimens, SL 115-485): 5♀, 2♂ and 3?, SL 115-333, Gulf of Mexico, 27°48'N, 88°45'W, R/V OREGON st. 2577, bottom trawl, 1785 m, 30 July 1959, CAS 167319(1♂, SL 277) and USNM 206920, 206926, 206927, 206929, 206930 and 215303. - 1?, SL 408, 28°35'N, 88°16.5'W, R/V OREGON st. 2820, bottom trawl, 1739 m, 15 July 1960, USNM 206932. - 1♀ and 2♂, SL 275-370, Gulf of Mexico, 28°47.5'N, 87°57'W, R/V OREGON st. 2821, bottom trawl, 1922 m, 16 July 1960, USNM 206922. - 1♀, SL 230, 24°8'N, 96°24'W, R/V OREGON st. 4812, bottom trawl, 1647 m, 11 Apr. 1964, USNM 206938. - 1♀, SL 485, West Caribbean Sea, 9°52'N, 79°35.5'W, R/V PILLSBURY st. 325, bottom trawl, 1715 m, 7 July 1966, UF 223232. - 2♀ and 1?, SL 253-480, 29°57'S, 47°35'W, R/V WALTHER HERWIG st. 65/68, bottom trawl, 1200 m, 27 Feb. 1968, ISH 1813-1968. - 1♂ and 1?, SL 365-395, off Brazil, 25°13'S, 44°33'W, R/V WALTHER HERWIG st. 85/68, bottom trawl, 1200 m, 1 Mar. 1968, ISH 1901-1968. - 1♂, SL 402, off Brazil, 23°56'S, 41°51'W, R/V WALTHER HERWIG st. 98/68, bottom trawl, 1200 m, 3 Mar. 1968, ISH 1959-1968. - 2♀ and 1♂, SL 390-406, off Brazil, 22°41'S, 40°8'W, R/V WALTHER HERWIG st. 103/68, bottom trawl, 1200 m, 9 Mar. 1968, ISH 1972-1968. - 1♂, SL 400, off Brazil, 26°47'S, 47°57'W, R/V WALTHER HERWIG st. 118/68, bottom trawl, 1200 m, 12 Mar. 1968, ISH 2001-1968. - 1♀, SL 480, off Venezuela, 11°57'N, 73°32'W, R/V PILLSBURY st. 782, bottom trawl, 1262 m, 30 July 1968, UF 234122. - 1♀, SL 225, Gulf of Mexico, 28°55'N, 87°23'W, R/V OREGON II st. 10876, bottom trawl, 1464 m, 15 Jan. 1970, USNM 206934. - 3♀ and 1♂, SL 145-375, Gulf of Mexico, 28°45.3'N, 88°13'W, R/V OREGON II st. 10897, bottom trawl, 1647 m, 28 Jan. 1970, USNM 206925 and 206936. - 2♂ and 2♀, SL

190-425, West Caribbean Sea, 20°11'N, 87°17'W, R/V OREGON II st. 11206, bottom trawl, 1464 m, 2 Sep. 1970, USNM 206924, 206933 and 206937. - 2♀, SL 173-292, 33°46.9'N, 75°50.9'W, R/V EASTWARD cr. E-8-71 st. 16986, bottom trawl, 1613 m, 11 May 1971, USNM 207649. - 1♂, SL 365, Exuma Sound, Bahamas, 24°14'N, 76°5'W, R/V COLUMBUS ISELIN cr. CI-8007 st. C008, bottom trawl, 1778 m, 2 Sep. 1980, VIMS 07066. - 1♂, SL 346, Tongue of the Ocean, Bahamas, 23°54.3'N, 77°14.7'W, R/V COLUMBUS ISELIN cr. CI-8007 st. C040, bottom trawl, 1378 m, 15 Sep. 1980, VIMS 07077.

Tentatively referred (2 specimens, SL 360-435): 1♂, SL 435, off Senegal, 12°00'N, 17°32'W, R/V ZVEZDA KRYMA st. 276, bottom trawl, 1380-1400 m, Feb. 1973, ZM-MGU P-20513. - 1♀, SL 360, off Senegal, 9°25'N, 17°36'W, R/V ZVEZDA KRYMA st. 281, bottom trawl, 1740-1920 m, 23 Feb. 1973, ZM-MGU P-20514.

Condition of material: Specimens of *B. robustus* are in better condition than most other *Bassozetus* spp. This is due to a less soft body and likely less damage in the trawl because of the relatively shallow occurrence of this species.

Diagnosis: Head heavy, body deep (10-19% SL at origin of anal fin), tail tapering, preanal length 31- 41.5% SL, scales small with 25-35 in an oblique row, diameter of eye about 3-4 times in length of snout, sagittal otolith large, its outline changes with growth (Fig. 32B-D), pectoral fin rays 24-28, ventral fins long almost reaching anal fin (16.5-20.5% SL), 11-16 long gill rakers on anterior arch, precaudal vertebrae 13-16.

Description: The principal meristic and morphometric characters are given in Tables 4 and 13. In Table 4 the characters of the specimens from the Atlantic Ocean and the Indo-Pacific area are kept separately and apparent differences are discussed below.

Body compressed with a tapering tail, height of head and body with positive allometric growth, so smaller specimens seem less robust than larger ones, head and body fully scaled with smaller scales on head, 30-40 scale rows in oblique line from anus and forward, many with one or more cephalic discs (cf. p. 9), posterior nostril larger than anterior nostril, diameter of eye 3-4 times length of snout, positive allometric growth in

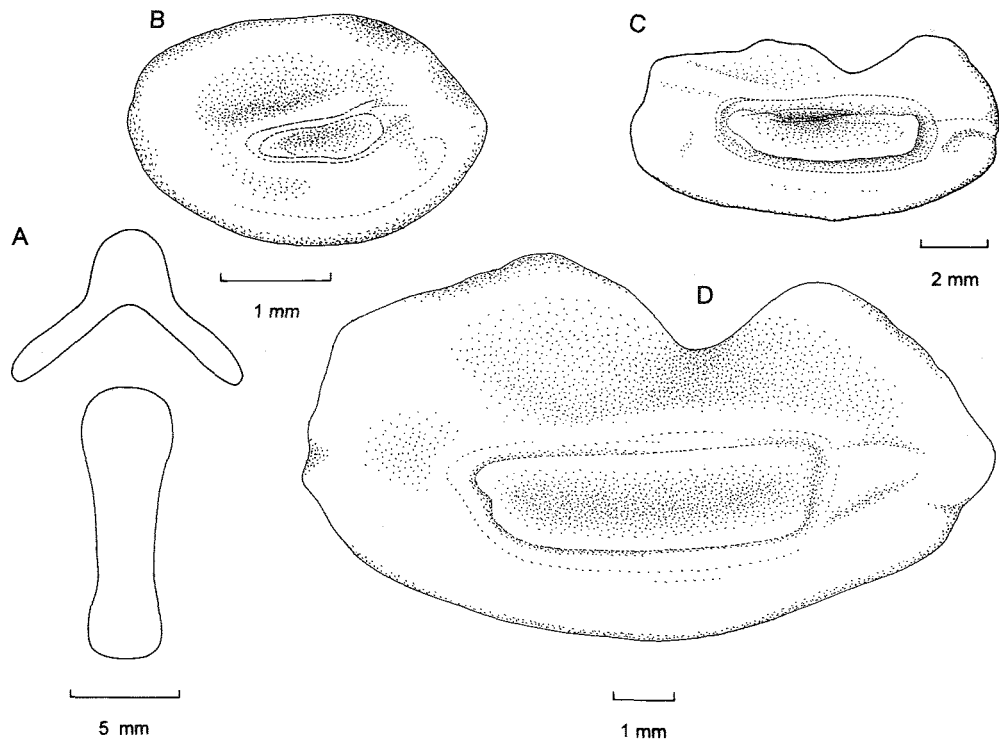


Fig. 32. *Bassozetus robustus*. A, vomer and basibranchial tooth patch of holotype; B, median view of left sagitta of SMF 28849, SL 78; C, median view of left sagitta of tentatively referred specimen, ZM MGU P-20513, SL 435; D, median view of left sagitta of MNHN 1999-486, SL 561.

length of ventral fins and in distance between base of ventral fins and anal fin (the three known ripe females are those with the relatively largest interspace indicating that the abdominal cavity becomes enlarged with ripening ovaries), teeth small and granular with several rows on dentary and premaxillary and fewer and somewhat larger teeth on palatines and vomer, small specimens have relatively few and larger teeth on palatines and vomer, head of vomer more pronounced with increasing SL, median basibranchial tooth patch oblong (Fig. 32A), anterior gill arch with 4-5 short and one long raker on upper branch, one long raker in the angle and lower branch with 10-14 long and 4-6 short rakers.

Sagittal otolith (Fig. 32B-D) large and thin with an undivided more or less centrally placed sulcus and an indistinct ostial channel; small specimens oval with an even dorsal rim and larger specimens more elongate with 1-2 deep, dorsal indentations and an even ventral rim; in a 78 mm SL specimen (Fig. 32B) the length is 1.5 times the height, 3-4 times the thickness and it forms 4.1% of the SL while in a 561 mm SL specimen (Fig. 32D) the length is about twice the height, 8-10 times the

thickness and it forms 2.0% of the SL. Sagittas from small specimens (Fig. 32B) have no indentation in the dorsal rim and are thus difficult to recognize belonging to *B. robustus*. In Fig. 7C the length of the sagitta is plotted against the SL showing an even growth.

Axial skeleton (from radiographs): Tips of neural spines 3-7 blunt, remaining neural and haemal spines pointed, second neural spine about three times longer than weak anterior spine and following 3-13 spines all shorter, vertebrae 4-13 all with enlarged basal part and short neural spine, anterior three vertebrae without parapophyses, pleural ribs on vertebra three and posteriorad, epipleural ribs indistinct.

Coloration: Newly caught specimens with dark brown head and abdomen, body light brown with darker rim around scales, dark fins, branchiostegal cavity dark brown and roof of mouth blue.

Tentatively referred specimens (Figs. 31 and 32): Two specimens (SL 360 and 435 mm) differ in certain characters from the remaining 78 specimens of *B. robustus* so they are treated separately. They are underlined in Table 4 and are shown

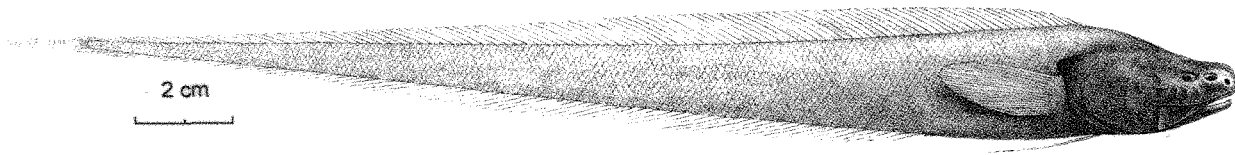


Fig. 33. *Bassozetus taenia*. Holotype, BMNH 1887.12.7.51, SL 237. (From Günther 1887).

in a separate column in Table 13. They were caught off Senegal at 1380-1920 m depth and in spite of a rather intensive trawling activity off northwestern Africa no typical *B. robustus* are recorded from here or from anywhere in the East Atlantic.

The coloration differs from that of typical *B. robustus* (when compared to equally sized specimens preserved for the same number of years) by having more swarthy lips, area surrounding nostrils, mouthcavity, branchiostegal rays, chin, abdomen and finrays. When compared to the few known newly caught specimens (from 1995) they differ by the roof of the mouth being dark brown vs blue. The anterior anal fin ray is situated below dorsal fin ray no. 23-24 vs 24-30, the number of dorsal and anal finrays and vertebrae is lower than in the

remaining Atlantic material and among the lowest of the Indo-Pacific material. When comparing Figs. 31A and 31B the holotype has a much higher head than the tentatively referred specimens. However, when compared to other typical *B. robustus* specimens the difference is not so evident. When excluding the three ripe females of the typical material, the larger of the tentatively referred specimens has the greatest distance between the base of ventrals and anal fin.

Biology: *B. robustus* is reported from 42 stations (Table 1) of which 36 are from the slope (1069-1922 m), three are from the rise (2350-3285 m), one is abyssal (4420 m taken in a trap) and two were caught pelagically (taken with an IKMT and

Table 13. Meristic and morphometric characters of *B. robustus*.

	Holotype USNM 74140		Holotype and 77 specimens 78-640		Tentatively referred 2 specimens 360-435
Standard length	325				
MERISTIC CHARACTERS					
	Min	Mean	Max	No	
Dorsal finrays	123	112	120.3	130	66
Caudal finrays	8	7	8.0	10	48
Anal finrays	101	92	98.4	103	64
Pectoral finrays	24	24	26.0	28	54
Precaudal vertebrae	14	13	14.2	16	54
Total vertebrae	66	63	65.1	69	54
Developed rakers on ant. gill arch	12	11	13.6	16	70
Short rakers on ant. gill arch	9	7	8.3	10	38
Ant. dorsal ray above vertebra no.	3	3	3.8	5	50
Ant. anal ray below dorsal ray no.	27	24	26.2	30	51
Ant. anal ray below vertebra no.	16	15	16.2	18	52
MORPHOMETRIC CHARACTERS					
in % of standard length					
Head length	22.5	18.0	20.6	24.5	52
Depth at 1st anal ray	13.5	10.0	13.4	19.0	68
Upper jaw	12.0	9.7	10.8	13.5	49
Preventral	17.5	12.5	16.3	23.0	40
Preanal	36.5	31.0	35.7	41.5	50
Predorsal	21.0	16.0	19.6	28.5	46
Base of ventral fin to anal fin	19.5	16.5	21.1	26.5	45
Ventral fin-length	-	16.5	18.4	20.5	25

ring-net, but omitted from Table 1) viz. 0-1800 m, sounding 5648-1700 m, and 0-2500 m, sounding 5750 m. The material contains 29 unripe males, 36 females, of which three contain eggs 0.5-1 mm in diameter, and 15 non-sexed specimens. Judging from radiographs there is no recognizable contents in the stomachs and intestines.

Distribution: Fig. 21 shows that *B. robustus* is caught in the Indo-Australian area, off East and West Africa (the two tentatively referred specimens) and in the western Atlantic. Considering that about 90% of the stations are from relatively shallow depths (1069-1922 m) it is surprisingly rarely caught (Table 1).

***Bassozetus taenia* (Günther, 1887)**

Figs. 30, 33-35

Bathyonus taenia Günther, 1887:110, pl.23, fig. A (type locality 2°N, 20°W).

Bassozetus taenia: Goode & Bean 1896: 323; Jordan & Evermann 1898: 2510; Roule 1935: 6; Fowler 1936: 1062; Nybelin 1953: 3 and 1957: 284; Nielsen 1975: 1; Shcherbachev 1980: 120; Hureau & Nielsen 1981: 7.

Bassozetus sp.: Nybelin 1951: 15.

Bassozetus sp. B: Anderson et al. 1985: 799 (in part.).

Material examined (29 specimens, SL 85-242): Holotype: ♂, SL 237, tropical Atlantic, 2°25'N, 20°1'W, R/V CHALLENGER st. 104, bottom trawl, 4575 m, 23 Aug. 1873, BMNH 1887.12.7.51.

Non-types: 1♂ and 1?, SL 93-225, East Atlantic, 9°38'N, 26°20'W, Swedish Deep-sea Exped. st. 329 (haul 3), bottom trawl, 5605 m, 3 July 1948, NHMG Pi. 1732-1733. - 1♀ and 1♂, SL 120-240, West Atlantic, 12°22'N, 52°00'W, Swedish Deep-sea Exped. st. 363 (haul 8), bottom trawl, 5038 m, 3 Aug. 1948, NHMG Pi. 1734-1735. - ♂, SL 212, trop. Atlantic, 10°58.3'N, 45°14.3'W, Campagne BIOVEMA st. A, CP01, bottom trawl 5100 m, 13 Nov. 1977, MNHN 1979-233. - ♂ and 2♀, SL 134-182, trop. Atlantic, 10°59'N, 45°15'W, Campagne BIOVEMA st. A, CP02 bottom trawl, 5073 m, 14 Nov. 1977, MNHN 1979-235-237. - 1♀ and 1♂, SL 105-168, Exuma Sound, Bahamas, 24°14.2'N, 76°6.5'W, R/V COLUMBUS ISELIN cr. CI8007

st. C008, bottom trawl, 1783 m, 2 Sep. 1980, VIMS 07066. - 1♂ and 1?, SL 221-225, Exuma Sound, Bahamas, 23°53.6'N, 75°33.2'W, R/V COLUMBUS ISELIN cr. CI8007 st. C010, bottom trawl, 2046 m, 3 Sep. 1980, VIMS 07058. - 1♂, SL 126, tropical Atlantic, 8°9'N, 49°2'W, R/V JEAN CHARCOT st. CP06, bottom trawl, 4450 m, 16 Sep. 1980, MNHN 1992-1223. - 1♀ and 1♂, SL 141-203, tropical Atlantic, 10°24'N, 46°47'W, R/V JEAN CHARCOT st. CP09, bottom trawl, 4850 m, 23 Sep. 1980, MNHN 1992-1224. - 1♂, SL 185, tropical Atlantic, 10°23'N, 46°47'N, R/V JEAN CHARCOT ST. CP11, bottom trawl, 4850 m, 25 Sep. 1980, MNHN 1992-1225. - 1♂, SL 220, tropical Atlantic, 10°21'N, 46°48'N, R/V JEAN CHARCOT st. CP12, bottom trawl, 4450 m, 26 Sep. 1980, MNHN 1992-1226. - 3?, SL 85-113, tropical Atlantic, 10°24'N, 46°45'N, R/V JEAN CHARCOT st. CP13, bottom trawl, 4850 m, 27 Sep. 1980, MNHN 1992-1227. - 1♀ and 1?, SL 140-205, tropical Atlantic, 10°24'N, 46°46'W, R/V JEAN CHARCOT st. CP14, bottom trawl, 4850 m, 28 Sep. 1980, MNHN 1992-1228. - 2♀ and 1?, SL 165-242, tropical Atlantic, 10°24'N, 46°46'W, R/V JEAN CHARCOT st. CP15, bottom trawl, 4850 m, 29 Sep. 1980, MNHN 1992-1229. - 1♀, SL 232, Northeast Atlantic, 31°12.8'N, 25°18.3'W, R/V DISCOVERY st. 11261#50, bottom trawl, 5440 m, 2 July 1985, BMNH 1995.1.12.1.

Tentatively referred specimens: 2♂, SL 89-162, trop. Atlantic, 10°59'N, 45°15'W, Campagne

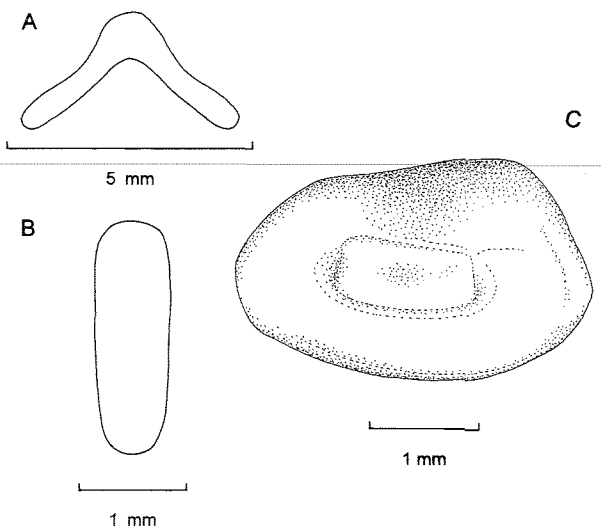


Fig. 34. *Bassozetus taenia*. A, vomer of holotype; B, basibranchial tooth patch of BMNH 1995.1.12.1, SL 238; C, median view of left sagitta of VIMS 07058, SL 225.

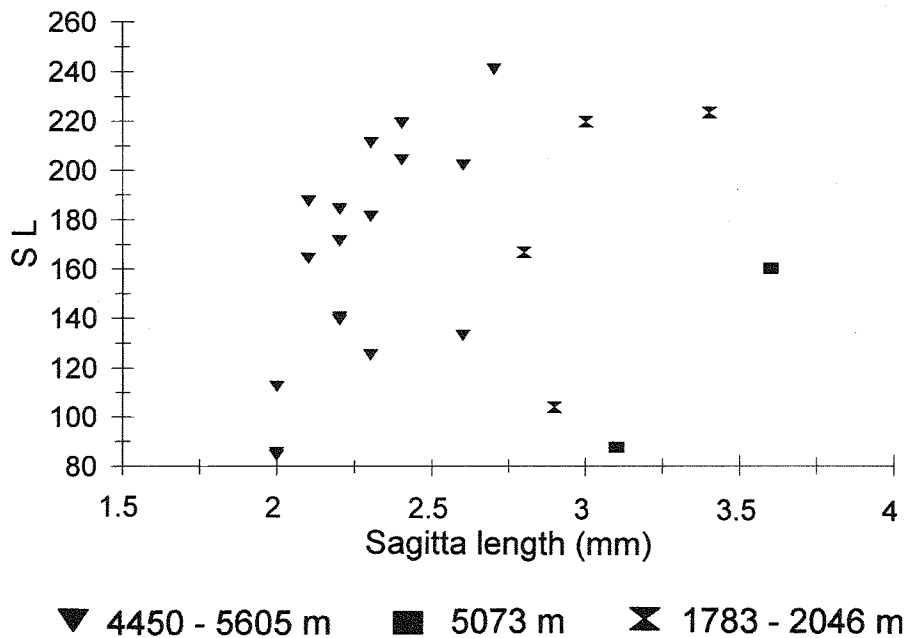


Fig. 35. Sagitta length versus SL in *Bassozetus taenia*.

BIOVEMA st. A, CP02 bottom trawl, 5073 m, 14 Nov. 1977, MNHN 1979-234 and 235.

Condition of material: The holotype is very soft and with hardly any scales left and most of the non-type specimens are also in such condition that the accuracy of many measurements is rather doubtful.

Diagnosis: Head short, body low (6.4-9.7% SL at origin of anal fin) and caudal part tapering, preanal length short (27.5-33.5% SL), distance between base of ventral fins and origin of anal fin short (15.0-19.0% SL), scales large with 15-20 oblique rows, diameter of eye about 3-5 times in length of snout, a single median basibranchial tooth patch (Fig. 34B), sagittal otolith small (Fig. 34C), pectoral finrays 25-27, ventral fins almost reaching anal fin origin (12-18% SL), 15-20 long gill rakers on anterior arch, precaudal vertebrae 12-14.

Similarity: *B. taenia* seems most similar to *B. oncercephalus* (see p. 42).

Description: The principal meristic and morphometric characters are given in Tables 4 and 14. Due to the poor condition of the material examined the illustration from Günther (1887) has been used.

Body compressed, shallow and tapering caudally with a short preanal length, head and body covered

with large scales (most often only scale pockets remain) with 15-20 scales in an oblique row, seven of the present specimens with one or more cephalic discs (cf. p. 9), teeth small and granular with several rows on dentary and premaxillary and fewer and somewhat larger on palatines and vomer, form of dentigerous part of vomer varies greatly from a flat to a high V and with a more or less pronounced head (Fig. 34A), median basibranchial tooth patch oblong, diameter of eye 3-5 times in length of snout, nostrils simple holes, the posterior one the larger, anterior gill arch with 3-5 short and one long raker on upper branch, one long raker in the angle and lower branch with 13-18 long and 3-5 short rakers.

Sagittal otolith (Fig. 34C) small and robust with a rather small, undivided, centrally placed sulcus, an indistinct ostial channel and a rounded outer form with the dorsal rim highest anteriorly; it is 1.5 times as long as high and about four times as long as thick.

Fig. 35 shows the lengths of the sagittas in relation to the SL. It should be kept in mind that with increasing depth the sagitta tends to become relatively shorter and more robust (cf. page 16). A somewhat confusing impression becomes more understandable when the specimens are divided into those from the open Atlantic (depth 4450-5605 m), those from Exuma Sound (depth 1783-2046 m)

and the two tentatively referred specimens (depth 5073 m). Sagittas from the open Atlantic show a linear, non-allometric growth. The sagittas from the four specimens caught in Exuma Sound are all larger than those from the Atlantic, but they are from much more shallow depths (1783-2046 vs 4450-5605 m). Finally, one of the reasons why two specimens are just tentatively referred to *B. taenia* is their great sagitta-lengths considering that they were caught at a depth of 5073 meters.

Axial skeleton (from radiographs): Tips of neural spines 3-6 blunt, the remaining neural and haemal spines pointed, the second neural spine twice the length of the first spine and the following 6-9 spines distinctly shorter, neural spines of vertebrae 3-12 with enlarged basal part, anterior four vertebrae without parapophyses, pleural ribs from vertebrae 3-4 posteriorad, epipleural ribs indistinct. Two specimens (SL 89 and 93 mm) have cylindrical vertebral centra while all the others have hour-glass shaped centra.

Coloration: Head and peritoneum bluish to dark brown and body light brown.

Tentatively referred specimens: Two specimens (SL 89 and 162 mm) differ so much from the remaining 27 *B. taenia* specimens that they are treated separately. They are included and underlined in Table 4 but not given in Table 14. They were caught in the tropical West Atlantic at a depth of 5073 m together with three typical *B. taenia* specimens. The main reasons for treating the specimens separately are that the lengths of the sagittas are considerably greater than that of sagittas of typical *B. taenia* of equal standard lengths (Fig. 35 and see above) and that the number of long gill rakers is 12-13 vs 15-20.

The condition of the smaller specimen (89 mm) makes the fin ray counts uncertain, and being much smaller than the typical *B. taenia* specimens from the same locality (89 vs 134-182 mm SL), allometric growth precludes the morphometric characters being relevant for comparison. The larger of the two (SL 162 mm) is more relevant to compare with the typical specimens and it shows minor differences in anal fin rays (110 vs 100-109), length of upper jaw (10.5 vs 7.1-8.8% SL) and length of head (20.5 vs 15.0-19.5% SL). All the remaining characters fall within the variation of the typical *B. taenia*.

Biology: The material contains 15 unripe males,

seven females of which one contains eggs 0.6 mm in diameter and seven specimens so unripe that they are not sexed. Judging from radiographs the intestines contained no recognizable contents. All the specimens were caught in the open Atlantic at abyssal depths (4450-5605 m, 25 specimens) and in Exuma Sound, Bahamas at lower slope depths (1783-2046 m, four specimens). Like Tongue of the Ocean, Exuma Sound is situated between some of the islands in the Bahama Archipelago. It has depths down to 2000-3000 m and is connected to the Atlantic Ocean by a narrow strait. For unknown reasons the fish fauna in this region has species in common with abyssal areas in the North Atlantic proper where species richness in the family Ophiidiidae is similar to that in the Macrouridae. In gen-

Table 14. Meristic and morphometric characters of *B. taenia* and *B. oncercephalus*.

	Holotype BMNH 1887. 12.7.51	<i>taenia</i> Holotype and 26 specimens*		<i>oncer- cephalus</i> Holotype MNHN		
Standard length	237	85-242		225		
MERISTIC CHARACTERS						
		Min	Mean	Max	No	
Dorsal finrays	126	122	125.8	128	12	129
Caudal finrays	–	8	8.0	8	14	8
Anal finrays	106	100	105.6	109	12	105
Pectoral finrays	26	25	25.8	27	14	27
Precaudal vertebrae	13	12	13.8	14	21	16
Total vertebrae	69	67	69.1	73	19	70
Developed rakers on						
ant. gill arch	16	15	16.1	20	25	15
Short rakers on						
ant. gill arch	9	7	8.1	10	26	9
Ant. dorsal ray						
above vertebra no.	3	3	3.4	4	16	3
Ant. anal ray below						
dorsal ray no.	23	21	23.5	25	18	27
Ant. anal ray below						
vertebra no.	15	14	15.5	16	17	17
MORPHOMETRIC CHARACTERS						
in % of standard length						
Head length	15.5	15.0	17.4	19.5	14	16.0
Depth at 1st anal ray	7.8	6.4	8.2	9.7	21	8.7
Upper jaw	7.1	7.6	8.3	10.4	10	8.4
Preventral	11.5	11.5	13.0	14.5	12	13.0
Preanal	30.0	27.5	30.2	33.5	18	34.0
Predorsal	15.5	13.0	15.8	19.0	16	16.0
Base of ventral						
fins to anal fin	18.5	15.0	17.2	19.0	23	23.5
Ventral fin-length	–	12.0	14.4	18.0	15	–

* The two tentatively referred specimens not included.

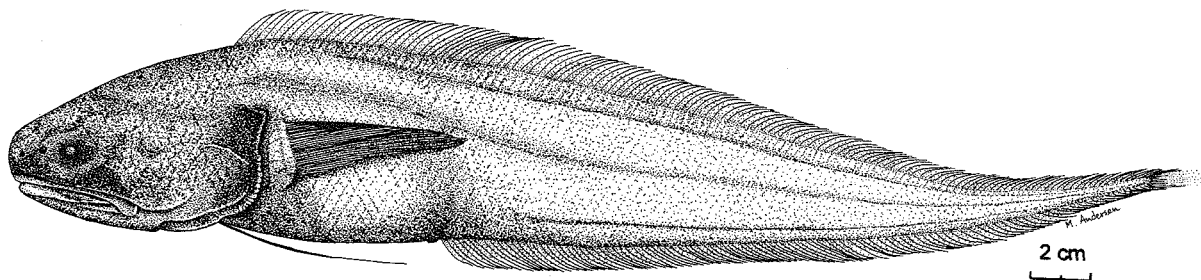


Fig. 36. *Bassozetus weneri*. Holotype, MNHN 1997-650, SL 375.

eral, at lower slope depths the Macrouridae is the most speciose group (Merrett & Haedrich 1997, fig. 2.16) and also the most abundant. In Exuma Sound, however, catches of ophidiids regularly exceed those of macrourids.

Distribution: Known from 15 localities from 2°-24°N in the Atlantic Ocean. The depths of the 13 localities from the open Atlantic are 4450-5605 m while the two from Exuma Sound, the Bahamas, were only 1783-2046 m (Table 1).

***Bassozetus weneri* n. sp.**

Figs. 13, 36, 37

Bassozetus sp. 2: Nielsen et al. 1999: 56.

Material examined (1, SL 375):

Holotype: ♀, SL 375, south of New Caledonia, 23°51.5'S, 168°25.98'E, HALIPRO 2 BT 082, bottom trawl, 1862-1846 m, 22 Nov. 1996, MNHN 1997-650.

Condition of material: The specimen is in an excellent condition except for skin partly missing on posterior half of body.

Diagnosis: Body elongate and compressed, snout rounded slightly protruding over tips of jaws, head fully scaled, body scales larger than those on head with 20 in an oblique row, basibranchial tooth patches absent, dentigerous vomer a minute, circular plate (Fig. 37A), sagittal otolith with a distinct pointed process at the anterior end (Fig. 37B), pectoral finrays 29, ventral fins almost reaching anus (17.5% SL), ten long gill rakers on anterior arch, coloration chocolate-brown.

Similarity: *B. weneri* is similar to *levistomatus* in lacking a basibranchial tooth patch and in possessing a reduced vomer. They differ by the longer ventral fins (17.5 vs 8.1-12.0% SL) and by the higher number of vertebrae, dorsal and anal fin rays in *B. weneri*, and in the shape of the sagitta (Figs. 20 and 37).

Description: The principal meristic and morphometric characters are given in Tables 4 and 15.

Holotype: Snout rounded, body deep and compressed and attenuated caudally, about 20 scale rows in an oblique line, head completely covered with scales smaller than those on body, upper jaw ends far behind eye, diameter of eye 3-4 times in snout, teeth granular, dentigerous vomer small and circular 2-3 mm in diameter (Fig. 37B), basibranchial tooth patches absent, anterior gill arch with three short rakers on upper branch, one long raker in angle and lower branch with nine long and three short rakers, gill filaments on anterior arch rather short (max. 5% head length), ventral fins almost reaching anus.

Sagittal otolith (Fig. 37B) large and rather robust with an undivided sulcus placed centrally, an indistinct ostial channel and an elongate outer form with

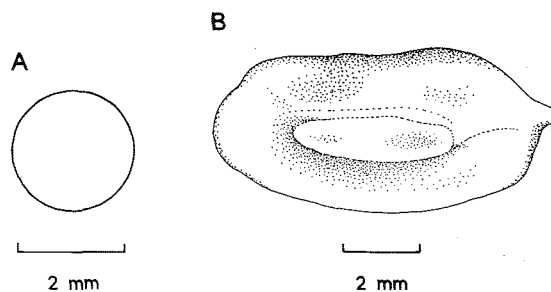


Fig. 37. *Bassozetus weneri*. Holotype. A, vomer; B, median view of left sagitta.

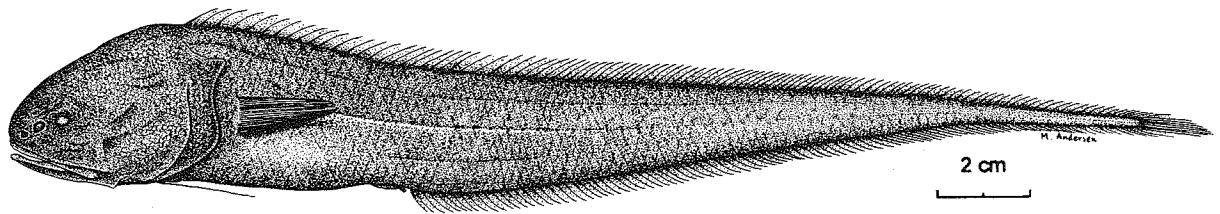


Fig. 38. *Bassozetus zenkevitchi*. USNM 149783, SL 263.

dorsal and ventral rims straight and anterior end with a distinct process; it is twice as long as high and 4-5 times as long as thick.

Axial skeleton (from radiographs): Tips of all neural and haemal spines pointed, the long 2nd spine is not much longer than the following ones, neural spines of vertebrae 4-12 with enlarged basal part, parapophyses developed on posterior eight precaudal vertebrae, pleural ribs on vertebrae 3-14 and epipleural ribs indistinct.

Coloration: Both head and body dark brown.

Biology: Only known from the semi-ripe, female holotype caught at continental slope depth. The stomach and intestine contained remains of the following crustaceans: 7 amphipods (10 - 40 mm in length) and 1 isopod ca. 10 mm in length indicating that *B. weneri* feeds on or close to the bottom.

Distribution: *B. weneri* is known from one locality on the Norfolk Ridge (Fig. 13) where it was caught in a bottom trawl at a depth of about 1850 m (Table 1).

Etymology: This species is named for Werner Schwarzhans, Hamburg, in recognition of his contributions to the understanding of ophidiiform otoliths.

***Bassozetus zenkevitchi* Rass, 1955**

Figs. 13, 38, 39

Bassozetus zenkevitchi Rass, 1955: 333, fig. 5 (type locality Iturup I., Kurile Is.).

Bassozetus zenkevitchi: Machida & Tachibana 1986: 437, figs 1-2.

Material examined (14 specimens, SL 57-275): Holotype: SL 245*, off Iturup I., Kurile Is., 45°N, 148°E, R/V VITYAZ st. ?, IKMT, pelagic between 2250-0 m, sounding 5125 m, 1949. (Holotype missing).

Non-types: ♀, SL 263, off Japan, 34°00'N, 137°49.7'E, R/V ALBATROSS st. 5084, Agassiz trawl, pelagically between 1680 m and surface, 20 Oct. 1906, USNM 149783. - ♂, SL 242, western North Pacific, 42°28'N, 150°19'E, R/V VITYAZ cr. 14 st. 2074, conical net fishing vertically from 2250-0 m, sounding 3973 m, 8 May 1953, ZM MGU P20510. - ♂, SL 95, western North Pacific, 41°18'N, 168°21.1'E, R/V S.F.BAIRD, 10' mid-water trawl, 5490-0 m, 10 Sep. 1953, SIOH53-340-61A. - ♀, SL 203, western North Pacific, 32°45'N, 150°13'E, R/V VITYAZ cr. 20 st. 3233, conical net fishing vertically with 6000 m wire to the surface, sounding c. 5900 m, 6-7 May 1955, ZM MGU P-20511. - ♂, SL 159, western North Pacific, 38°23.6'N, 144°3.2'E, R/V VITYAZ cr. 24 st. 3576, conical net fishing vertically from 6930-0 m, sounding 7327 m, 9-10 May 1957, ZM MGU P20512. - 1, SL 57, Central North Pacific, 28°47.1'N, 177°44'W, R/V ALEXANDER AGASSIZ st. 59, IKMT, depth ?, 23 Sep. 1968, SIO68-495. - 1♀ and 5♂, SL 150-275, Okhotsk Sea, 47°30'N, 151°41'E, R/V SHANTAR and MILOGRADOVA, tr. 1, paired trawling - otter trawl, 3400 m, 4 June 1975, ZISP 44510. - 1♀, SL 240, Okhotsk Sea, 48°2.3'N, 147°19.4'E, R/V NOVOULIANOVSK, tr. 55D, 1960-2000 m, 29 Sep. 1984, ZISP 47773. - 1♀, SL 245, Okhotsk Sea, 48°22'N, 152°30.3'E, R/V NOVODRUTZK, tr. 421, midwater trawl, sounding 3200 m, 28 Oct. 1987, ZISP 49074.

* These specimens have not been examined by us, but were reported from Rass (1955) and Machida & Tachibana (1986) and are included here.

Additional material (3, SL 184-263)* all from off Central Honshu:

SL 184, 30°51.5'N, 140°45.5'E, R/V SOYO-MARU, trawl, 2470 m, 5 Dec. 1964, BSKU 19548.

- SL 263, 30°37'N, 141°40.5'E, R/V SOYO-MARU, trawl, 2140 m, 12 July 1969, BSKU 19941. - SL 224, 34°32.3'N, 138°34.2'E, R/V HAKUHO-MARU, trawl, 2590-2620 m, 21 July 1974, BSKU 22532.

Condition of material: All 14 specimens examined are in fine condition, which may be due to the fact that at least seven of the nine catches were made in pelagic gear. This method is more gentle on the catch than bottom fishing gear.

Diagnosis: Body long, slender and compressed, head small with rounded snout, scales on head small on body somewhat larger with 25-30 oblique rows, basibranchial tooth patches absent, sagittal otolith (Fig. 39B) small, ventral fins weak and short (5.7-8.8% SL), pectoral finrays 23-25, long gill rakers 15-18, coloration almost black.

Similarity: *B. zenkevitchi* is similar to *B. multi-spinis* in possessing very short ventral fin rays.

Description: The principal meristic and morphometric characters are given in Tables 4 and 15. The original description (Rass 1955) was published in Russian and without the use of radiographs. Unfortunately, the holotype is apparently lost, as it is not present in any of the following collections: ZISP, ZM MGU and Institute of Oceanology, Moscow.

Head small with rounded snout, body low, slender and compressed, 25-30 oblique scale rows, numerous small scales on head, upper jaw ends well behind eye, posterior nostril enlarged, diameter of eye much smaller than snout, teeth in small specimens in one row on vomer and in 2-3 rows on palatines considerably larger than teeth on dentary and premaxillary, form of dentigerous vomer changes with growth (Fig. 39A), basibranchial tooth patches absent, anterior gill arches with four short rakers on upper branch, one long raker in the angle and lower branch with 14-17 long and 2-5 short rakers, ventral fins short, far from reaching anus, dorsal fin origin well in front of basis of pectorals.

Sagittal otolith (Fig. 39) small and robust with

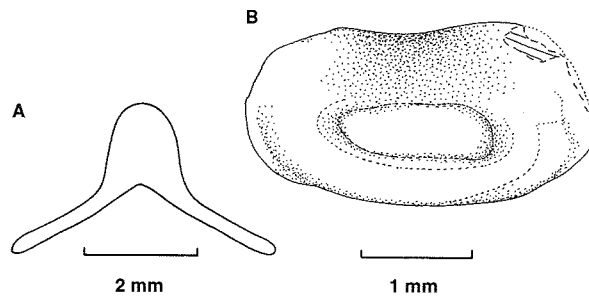


Fig. 39. *Bassozetus zenkevitchi*. ZM MGU P-20511, SL 203. A, vomer; B, median view of left sagitta.

an undivided sulcus placed closer to the ventral than to the dorsal rim, no ostial channel and outer form elongate with an even rim; it is twice as long as high and 3 times as long as thick.

Axial skeleton (from radiographs): Tips of neural spines of vertebrae 2-6 blunt, remaining neural and all haemal spines pointed, long 2nd neural spine distinctly longer than the following ten spines, neural spines of vertebrae 2-10 with enlarged basal part, parapophyses on vertebrae 4-13, pleural ribs on vertebrae 2-12, epipleural ribs indistinct.

Coloration: Both head and body are dark brown to black.

Biology: The known material (18 specimens) was caught on 13 stations. On eight stations non-closing, pelagic fishing gear was used, between the surface and a depth of 6930 m. Catches from the remaining five stations were made in non-closing bottom trawls so pelagic captures cannot be excluded. The fine condition of all specimens indicates a rather short period in the net so it seems reasonable to assume that *B. zenkevitchi* does occur pelagically. The material represents eight males, five females and one unsexed specimen. Two of the females had 0.5 mm eggs. No identifiable stomach contents were found.

Distribution: Fig. 13 shows that *B. zenkevitchi* is restricted to the North Pacific with most records off Japan and a single record northwest of Hawaii. As it may well occur pelagically, but has not been caught in closing gear, it can only be stated that it is taken between the surface and a depth of 6930 m.

Table 15. Meristic and morphometric characters of *B. zenkevitchi* and *wernerii*.

	HT	<i>zenkevitchi</i>			<i>wernerii</i>	
		HT and 17 specimens	57-275		Holotype 375	
Standard length	245					
MERISTIC CHARACTERS						
		Min	Mean	Max	No	
Dorsal finrays	116	113	116.7	119	15	131
Caudal finrays		7	8.0	9	15	8
Anal finrays	93	92	95.6	101	16	108
Pectoral finrays	24	23	23.8	25	17	29
Precaudal vertebrae		13	13.2	14	17	13
Total vertebrae		63	64.8	66	16	71
Developed rakers on						
ant. gill arch	16	15	16.0	18	18	10
Short rakers on						
ant. gill arch	4	6	7.6	9	17	6
Ant. dorsal ray						
above vertebra no.		3	3.5	4	12	5
Ant. anal ray below						
dorsal ray no.		23	24.4	26	11	24
Ant. anal ray below						
vertebra no.		14	15.5	17	11	17
MORPHOMETRIC CHARACTERS						
in % of standard length						
Head length	16.5	16.5	18.5	22.0	17	22.0
Depth at 1st anal ray		8.1	9.2	11.0	14	16.5
Upper jaw		8.1	9.1	11.5	14	10.5
Preanal	31.0	29.5	32.6	35.5	12	36.5
Predorsal	16.0	14.5	17.4	20.5	13	21.5
Base of ventral						
fin to anal fin		14.5	18.0	20.0	13	21.5
Ventral fin-length	6.1	5.7	6.9	8.8	9	17.5

APPENDIX

Some specimens examined for this revision are in such poor condition that specific identification is not possible. This has mainly been due to the dissolution of the otoliths and to the lack of scales causing difficulties in the separation of *B. compressus*, *normalis*, *robustus* and *taenia*.

The following is a list of problematic specimens with indication of relevant museum and catalogue numbers (when nothing is indicated the catalogue number includes only 1 specimen):

Bassozetus spp. from:

AMS I 31151-003

BMNH 1887.12.7.50 (former syntype of *B. compressus*) - 1939.5.24.1452 - 1990.8.21.97-98. - 1991.7.9.41 - 1991.7.9.827-835 - 1994.5.9.6 - 1994.5.9.9-10

ISH 1813/68 (3 specimens)

NHMG Pi. 1736 - 1737

USNM 39416 - 206926 - 206930 - 206935 - 206939

USU 01503

VIMS 3381 - 6853 - 6854 - 6855 - 6856 - 6885 - 6888 (3 specimens) - 6890 - 6891 (3 specimens) - 7053 - 7058 (2 specimens) - 7059 (2 specimens) - 7060 (6 specimens) - 7073

ZMH 9163

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Mogens Andersen, Robert Nielsen and Birgitte

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