

HETEROSOMATA (PISCES)

By JØRGEN NIELSEN

Zoological Museum, Copenhagen

INTRODUCTION

The Galathea Report only treats animals from depths exceeding 400 m. Therefore, only very few species of the order mostly of littoral occurrence, the Heterosomates, are represented in this paper. The species from the upper layers will be dealt with elsewhere, e. g. all the *Galathea* Heterosomates from 0-400 m of depths taken off West Africa are treated in the Atlante Report vol. 6 (in press).

All measurements are in accordance with the method described by NORMAN (1934, p. 50).

The present material comprises 45 specimens belonging to 6 species. Two of these, *Chascanopsetta galathea* and *Azygopus pinnifasciatus flemingi* form a species and a subspecies, respectively, new to science.

The material is in a good condition, preserved in formalin, transferred to alcohol, and is kept in the Zoological Museum, Copenhagen.

Abbreviations used in the systematic part:

- Std.l. – Standard length in mm
- L.l. – Lateral line
- D – Dorsal fin
- C – Caudal fin
- A – Anal fin
- V – Ventral fin
- P – Pectoral fin

(In the tables the numbers in the brackets indicate the average value of the character in question.)

Gear:

- HOT – Herring otter trawl
- SOT – Shrimp otter trawl
- ST 100 – Sledge trawl, 100 cm broad
- ST 300 – Sledge trawl, 300 cm broad

For further details see BRUUN (1959).

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rected the English manuscript. Mr. POUL H. WINTHER prepared the drawings and Mr. H.V. CHRISTENSEN took the photographs.

BOTHIDAE

BOTHINAE

Bothus pantherinus (Rüppell, 1828)

(Fig. ALCOCK 1890, p. 438)

Psettyllis pellucida Alcock, 1890

Material (1 specimen):

St. 203, (25°36'S, 35°21'E). 1 specimen

Std.l. 38. Depth 660-720 m. Gear: HOT.

Table 1 shows the characters for the type specimen of *Psettyllis pellucida*, the *Galathea* specimen and *Bothus pantherinus* from NORMAN's description (1934, p. 234):

Table 1.

	<i>P. pellucida</i>	<i>Galathea</i> specimen	<i>B. pantherinus</i> (64 specimens)
Std.l.	38	38	33-210
D	85	91	85-95
A	65	67	67-71
C	17	17	17
V	6	6	6
P	5	9-10	9-11
Head in % of std.l.	21	21	25-30
Depth in % of std.l.	96	90	50-60

There is no doubt that the *Galathea* specimen and the type of *P. pellucida* are identical. The most diverging character is the number of rays in P, but this may be due to a miscounting made by ALCOCK as the rays are very slightly developed at a std.l. of 38 mm. Moreover, in the literature I have never found a description of a species of the Bothinae with

so few P-rays, apart from a few species in which the P are absent.

In the same paper ALCOCK (1890) described a new species, *Psettyllis ocellata*, which was later found to be synonymous with *Bothus ovalis* (Regan, 1908). These two *Psettyllis*-species can be distinguished from each other among other things by the greater depth of body and the nearly complete lack of pigmentation in *P. pellucida*, characters refound in the *Galathea* specimen.

In his monograph NORMAN (1934, p. 240) mentioned *P. pellucida* under the treatment of the genus *Bothus*, but it has not been referred to any particular species of *Bothus*. – However, on going through the subfamily Bothinae in the monograph, only very few species show the combination of rays in D, A and P found in the present specimen. When using all the characters from table 1, the only possible species is *Bothus pantherinus*. – Columns 2 and 3 in the Table show a comparison between this species and the *Galathea* specimen. Only the "depth and head in relation to std.l." do not agree, but this may be due to a greater variation during growth in *B. pantherinus*.

Distribution. From East Africa to the Hawaiian Is.

The depth at the station (off Natal) at which the specimen was caught is 660-720 m. The gear used was a herring otter trawl (HOT), and judging from the species of fishes taken together with the present individual, the gear was fishing from the surface to the bottom. It is impossible to tell at what depth this specimen was caught, but it is a surprising catch whether it was taken in the surface layers or at the bottom. If it was caught pelagically, it is one of the few records of a pelagically occurring metamorphosed *Bothus*, and this is in good agreement with the wide distribution of the present species. If the

specimen was caught at the bottom, this is the greatest depth hitherto recorded for a species of *Bothus*. According to ALCOCK (1890), *P. pellucida* was taken at a depth of 15-35 m and after NORMAN (1934) the deepest record should be 50 m.

***Chascanopsetta galathea* n. sp.**

(Fig. 1 and plate XIV)

Material (14 specimens):

St. 196, (29°55'S, 31°20'E), 425 m. 1 specimen. Std.l. 240. Bottom: sandy mud with stones. Gear: ST100.

St. 202, (25°20'S, 35°17'E), 575-595 m. 13 specimens. Std.l. 122-285. Bottom: sand. Gear: ST300.

Holotype: P853104 of the Zoological Museum, Copenhagen. Type locality: *Galathea* St. No. 202 (off Natal).

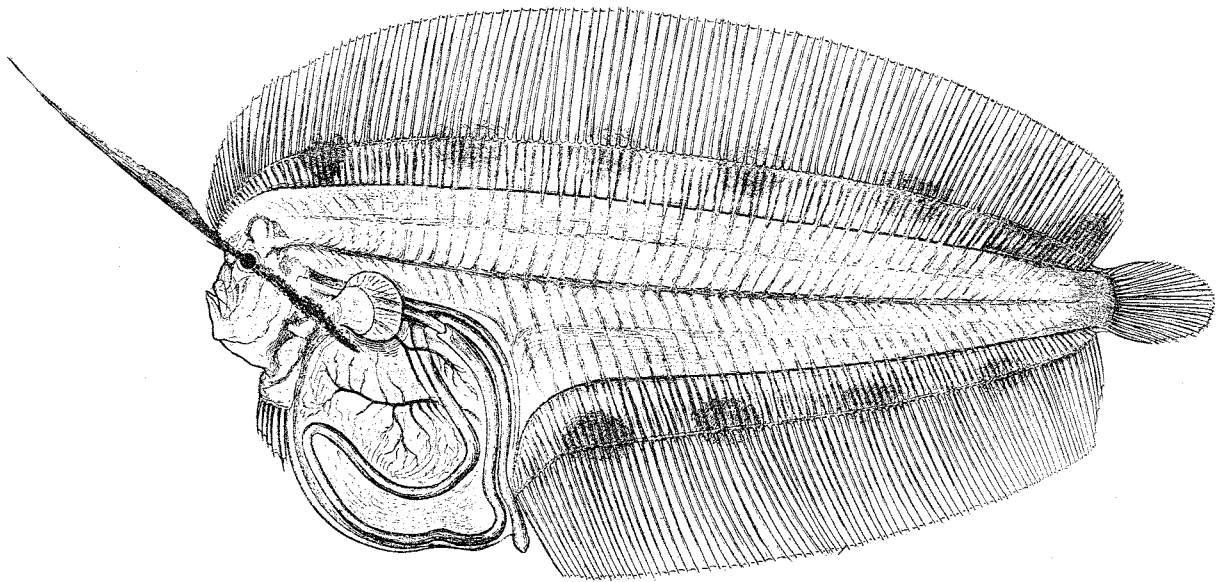
Paratypes: P853091 (St. No. 196) and P853092-P853103 (St. No. 202) all in the Zoological Museum, Copenhagen.

This new species fully agrees with the description of the genus *Chascanopsetta* Alcock, 1894, of which hitherto four species have been described. Two of these, *C. prorigera* Gilbert, 1905 from the Hawaiian Is., and *C. lugubris* Alcock, 1894 (Fig. 2) distributed from Japan westward to the West Indies, are fairly closely related to *C. galathea*. Still the three species differ from each other in certain respects as shown in Table 2.

In Table 2 the characters of *C. lugubris* originate from examinations of 137 specimens, i. e. 122 from West Africa (POLL (1959) with 115 specimens and NIELSEN (1961) with 7 specimens) and 15 specimens from the Indian Ocean (NORMAN 1934). Of *C. prorigera* only the holotype is known.

Table 2.

	Holotype of <i>C. galathea</i>	<i>C. lugubris</i>			<i>C. prorigera</i> 1 specimen
		NORMAN 1934	NIELSEN 1961	POLL 1959	
Std.l.	144	—	118-146	—	225
D	126	114-122	115-122	116-121	125
A	89	77-85	81-85	77-84	89
L.l.	181	—	181-195	—	—
Head in % of std.l.	19	19-25	20-22	20-23	24
Depth in % of std.l.	26	25-30	26-33	—	33
Eye in % of head	25	25-27	25-30	26-30	25
Max. in % of head	65	71-77	77-81	67-77	60
Dentary in % of head	82	—	—	—	—



5 cm.

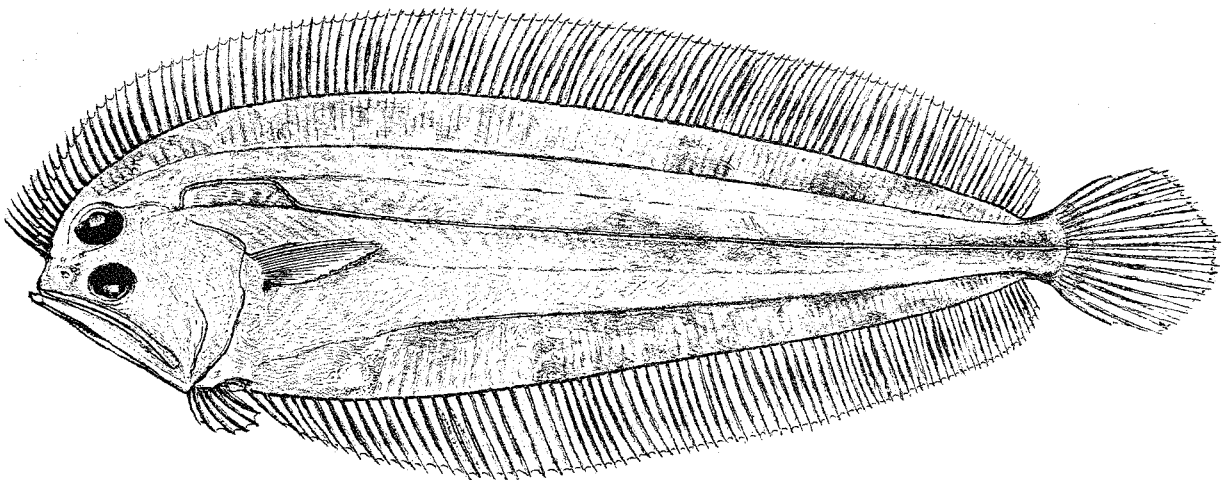
Fig. 1. *Chascanopsetta ?galathea*, std.l. 78 mm. Dana St. No. 3959 III. Caught off South Madagascar. (From BRUUN 1937).

Description:

Holotype. All the meristic and relative characters are shown in Table 2 in comparison with the two species mentioned above.

D commencing just in front of posterior nostril on blind side. The anterior 5-6 rays are a little longer and stouter than the next following. Neither D nor A are coalesced with C. P of blind side only two-thirds of the length of P from the ocular side; both with 14 rays. 17 rays in C. V with 6 rays.

L.1. developed on both sides of body with a low curve over P. The straight part of L.1. about 7 times as long as the curved part. The relation between these two parts of L.1. has been used by NORMAN (1934, p. 250) in separating two species of *Chascanopsetta*. However, this character is so variable that it actually is of no value. For instance NORMAN states that in *C. lugubris* this character is 5 to 5,75 while in *C. prorigera* it is 6; but according to POLL (1959) the character varies from 5,5-6,75 in *C. lugu-*



5 cm.

Fig. 2. *Chascanopsetta lugubris*, std.l. 128 mm. Dana St. No. 4003. Caught off Sierra Leone. (D 115, A 81). (From BRUUN 1937.)

bris and is thus useless as a character of distinction.

Very small cycloid scales, which cover the greater part of the head too. No scales on the bases of D and A.

Table 2 shows that the proportions of the body of the new species differ much from *C. prorigera*.

The pointed recurvate teeth uniserial in both jaws. Two sizes of teeth placed among each other with relative long interspaces. A large tongue.

No traces of gill rakers on the anterior gill arch.

The colour of the ocular side is light brown and that of the blind side yellowish. The rays of D, C, A and V with black pigment. The peritoneum can be seen through the skin as a dark blue area.

Key to the species of *Chascanopsetta*:

- I Length of maxillary never exceeding 80 % of length of head.
 - A. Depth of body 40 % of std.l. Number of rays in D 110 ... *C. megastoma*¹ Kamohara, 1936
 - B. Depth of body from 25 %-33 % of std.l. At least 114 rays in D.
 - a. Rays in D 114-122. Number of rays in A never more than 85.....
..... *C. lugubris* Alcock, 1894
 - b. Rays in D always more than 122 and more than 84 in A.
 - 1. Head about 25 % of std.l. Depth 33 % of std.l.
..... *C. prorigera*¹ Gilbert, 1905
 - 2. Head about 20 % of std.l. Depth in adolescent individuals 25 %-28 % of std.l.
..... *C. galathea* n. sp.
- II Maxillary and head of the same length
..... *C. prognathus*¹ Norman, 1939
 - 1. Only the holotype is known.

Variation:

Table 3 shows the variation of the meristic and relative characters of *C. galathea*. In column A all the 14 specimens are represented, while column B indicates the features of the smallest individual (std.l. 122 mm). Column C and D contain the remaining *Galathea* specimens. Of these all specimens in which the "depth in % of std.l." is larger than 30 are placed in C and the rest in D.

When comparing Table 3 with the figures of *C. lugubris* from Table 2 it appears that the relative characters of the 8 specimens from column D are most in accordance with NORMAN's figures, whereas the individual from B is very different from *C. lugubris* in all characters. Column C holds an intermediate position. In plate XIV an example of each of the three "stages" are figured.

The specimen from B (plate XIV, Fig. a) evidently has a relatively small head, maxillary and eye, a large depth of body and nearly a complete lack of pigmentation. In his monograph NORMAN (1934, p. 33) mentions that typical of young metamorphosed Heterosomates are characters which, apart from the one of the pigmentation, are quite opposite to those found in the present specimen. Still, this specimen could be considered as filling a gap between the unmetamorphosed stage and the fully grown form. This supposition is further supported by the fact that a very large (std.l. 78 mm), still symmetrical larva (Fig. 1) has been reported (BRUUN 1937). It has 126 rays in D and 88 in A, a number which is in accordance with that found in *C. galathea*. Moreover, the larva was caught off the southwest coast of Madagascar, a position not far from the localities of the present species. This might indicate that the larva belongs to the species *C. galathea*, and not to *C. lugubris*. - Among the *C. lu-*

Table 3

	<i>Chascanopsetta galathea</i>			
	A 14 specimens	B 1 specimen	C 5 specimens	D 8 specimens
Std.l.	122-285	122	136-148	143-285
D	122-(125)-127	125	122-123	123-(126)-127
A	84-(87)-89	87	84-(85)-87	86-(88)-89
L.l.	167-(186)-204	179	167-(186)-201	174-(187)-204
Head in % of std.l.	15-(18)-21	15	16-(18)-20	18-(19)-21
Depth in % of std.l.	25-(29)-34	34	30-(31)-32	25-(27)-28
Eye in % of head	17-(24)-28	17	22-(23)-24	24-(26)-28
Max. in % of head	50-(68)-77	50	63-(66)-69	65-(73)-77
Dentary in % of head	67-(85)-93	67	75-(81)-86	85-(90)-93

bris treated in the Atlantide Report (NIELSEN 1961) a specimen is found with a std.l. of 122 mm or exactly of the same length as the individual in column B, Table 3. However, as regards the relative characters, the *Atlantide* specimen agrees best with column D in Table 3, i.e. with the grown up form. To explain this disagreement it may be supposed that the length of the fish is not increasing, but perhaps even decreasing during the metamorphosis of the larva into the adolescent stage, a phenomenon observed within other fish groups. For example when the leptocephalus develops into the elver this involves a reduction of the length.

The remaining 13 specimens are sorted out in the columns C and D in Table 3, showing that the differences are not due to different std.l., even if the three largest specimens (with std.l. from 240-285 mm) all belong to column D. It is rather a question of degree of development. Plate XIV, Figs. b and c show the differences between the two "stages", and it appears that the specimens from column C have many of the characters typical of the individual from column B.

These considerations indicate that the 8 specimens from column D are the only grown up representatives of the species *C. galathea*, while the rest are adolescent individuals of more or less advanced stages.

Distribution:

This new species has been found at two localities off Natal at depths between 425 and 595 m. If the

Dana specimen (BRUUN 1937) belongs to this species, also the south end of Madagascar can be included in the area of distribution.

PLEURONECTIDAE RHOMBOSOLEINAE

Azygopus pinnifasciatus flemingi n. subsp. (Fig. 3)

Material:

St. 626, (42°10'S, 170°10'E), 610 m. 3 specimens.

Std.l. 86-101. Bottom: glob.ooze. Gear: ST300.

Holotype: P853105 of the Zoological Museum, Copenhagen.

Paratypes: P853106 and P853107 of the Zoological Museum, Copenhagen.

This new subspecies shows all the characters of the genus *Azygopus* Norman, 1926. It is very like the species *Azygopus pinnifasciatus*¹ Norman, 1926, the only described species of this genus. Still, it differs in several characters such as the diameter of the eyes, the number of gill rakers, L.l. scales, etc. (see Table 4), so it seems most correct to describe it as a new subspecies.

1. By the courtesy of Dr. H. O. FLETCHER, the Australian Museum, it has been possible to make comparisons between one of the paratypes of *A. pinnifasciatus* from the collections of the Australian Museum and the specimens of *A. p. flemingi*.

Table 4

	<i>A. p. pinnifasciatus</i> 10 specimens	<i>A. p. flemingi</i>		
		Holotype P853105	Paratype P853106	Paratype P853107
Std.l.	85-198	94	101	86
L.l.	88-95	110	107	103
Scales between L.l. and highest point of dorsal profile	27-32	36	38	35
D	104-115	103	104	97
A	84-92	86	86	81
P (dextral)	10-11	11	11	12
C	18-19	18	18	18
V (dextral)	10-11	9	9	10
Depth in % of std.l.	39-44	38	41	38
Head in % of std.l.	21-23	24	27	24
Eye in % of std.l.	-	9,6	11	9,2
Eye in % of head	25-30	39	40	40
Max. in % of std.l.	-	5,9	6,5	5,8
Max. in % of head	30-33	25	24	25
Gill rakers	11-12	9	10	9

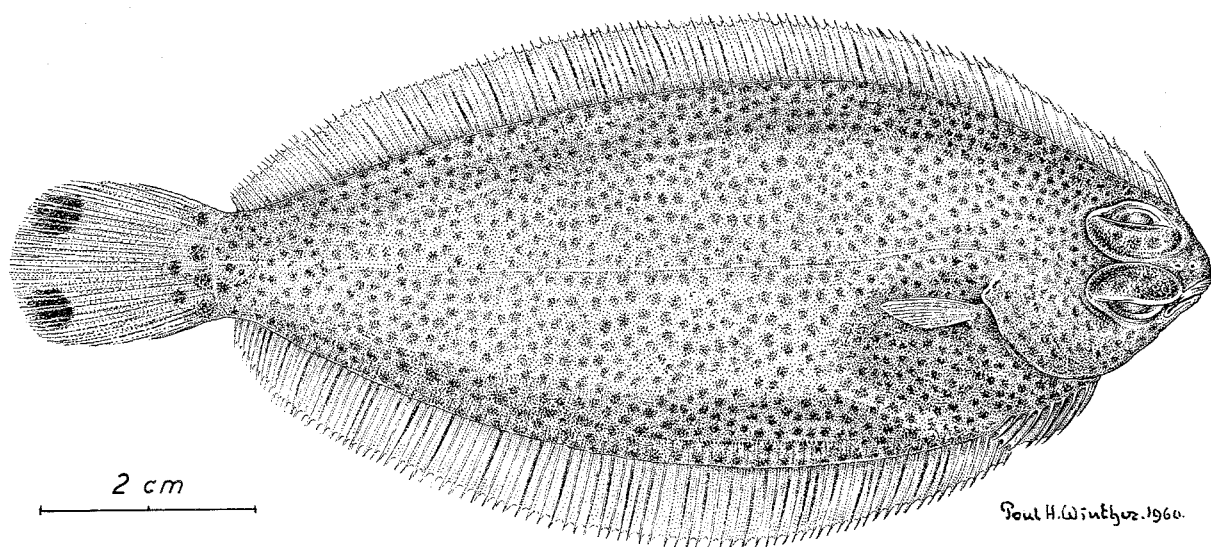


Fig. 3. Holotype of *Azygopus pinnifasciatus flemingi*, std.l. 94 mm. St. No. 626.

Description:

Holotype. All the meristic characters are shown in Table 4 and are compared with *A.p.pinnifasciatus*. In the following description *Azygopus p.pinnifasciatus* is abbreviated to *A.p.pinn.*

D beginning above the posterior nostril of the blind side, the first ray longer than the following, and D with fewer rays than found in *A.p.pinn.* A and D both free of C and both have the basal part covered with scales. Dextral V free of A and situated nearly on the ventral edge, number of rays lower than in *A.p.pinn.* Sinistral V only with 5 rays. P of eyed side about twice as long as P of blind side.

L.I. developed on both sides and forming a slight curve anteriorly. Scales rather small; number of L.I. scales larger than in *A.p.pinn.* More rows of scales between L.I. and highest point of dorsal profile than found in *A.p.pinn.* Head and even eyeballs covered with scales. Ctenoid scales on both sides of body.

Maxillary of eyed side smaller than in *A.p.pinn.*

The small and acute teeth are almost entirely confined to the blind side where they are placed in 3-4 rows.

On the lower part of the anterior gill arch 9 rather short, conical gill rakers are found, 2-3 rakers fewer than in *A.p.pinn.*

Eye diameter much larger than in *A.p.pinn.* The eye balls are quite contiguous. Snout one-third of horizontal eye diameter.

The colour of the eyed side is yellowish with innumerable brownish, irregular spots. The eyeballs are grey-blue, and the posterior part of C has two large, black, circular spots, which can be seen on the

blind side, too. Nearly all rays of D and A are brown or have traces of brown colouration. This is also different from *A.p.pinn.* in which the coloured rays of D and A are distributed as 7-8 groups of black rays in each fin. Each group consists of 3-5 rays, and between the groups there are about 10 colourless rays. The blind side is uniformly yellowish in both subspecies.

Variation:

The variation in the meristic characters is shown in Table 4. Furthermore, some small variations in the colouration are found. In one of the paratypes (P853107) the spots on the eyed side are darker and even more densely placed than in the holotype.

Distribution:

This new subspecies has only been found at the type locality in the Tasman Sea off the South Island of New Zealand at a depth of 610 m. The related subspecies *A.p.pinnifasciatus* has been recorded from depths of 200 to 800 m south of Australia. – The localities off New Zealand and South East Australia are separated by the Tasman Sea, a distance of about 2000 km. Most of the distance has depths exceeding 5000 m, so it is a problem how the species *Azygopus pinnifasciatus* has been able to cover this long stretch. One explanation is that unknown sea-mountains in the area have been used as stepping stones. Another explanation may be that the larvae have a long pelagic life, but no larvae of this genus have ever been described. An examination of the vertical distribution of other genera of He-

terosomes shows that very few occur at depths lower than 400 m. Furthermore, the larval stage is only known for some of these genera, but in some cases the larvae do have a prolonged pelagic life, e.g. *Poecilopsetta* and *Chascanopsetta* (BRUUN 1937), and some species of *Arnoglossus* and *Symphurus* (KYLE 1913). *Azygopus* may perhaps be another example.

This subspecies was named in honour of Dr. C.A. FLEMING, Wellington, who was a member of the Expedition in the Tasman Sea.

***Symphurus ocellatus* von Bonde, 1922**

(Fig. VON BONDE 1922, pl. I)

Material (14 specimens):

- St. 196, (29°55'S, 31°20'E), 430 m. 3 specimens. Std.l. 90-99. Bottom: sandy mud. Gear: ST300.
- St. 197, (29°57'S, 31°26'E), 495 m. 1 specimen. Std.l. 100. Gear: SOT.
- St. 202, (25°20'S, 35°17'E), 575-595 m. 10 specimens. Std.l. 87-113. Bottom: sand. Gear: ST300.

These 14 specimens all agree – as shown in Table 5 – with the description of *S. ocellatus* (VON BONDE 1922 and SMITH 1953).

Table 5.

	<i>S. ocellatus</i>	<i>Galathea</i> specimens
D	95-100	97-(99)-102
A	80-90	84-(87)-89
L.l.	about 85	about 90
Head in % of std.l.	18	18-(19)-20
Depth in % of std.l.	26-30	25-(27)-28

This species is remarkable for the black spot on D and A. The spot covers D from the 80th to the 90th ray and A from 65th to the 75th ray.

Distribution:

S. ocellatus is known to occur off the coast of Natal (about 25°S.lat. – about 33°S.lat.) at depths between 430 m and 640 m, so all the present specimens were taken within the area known.

***Symphurus holothuriae* Chabanaud, 1948**

(Plate XIV, Fig. d)

Material (2 specimens):

- St. 423, (10°27'N, 124°18'E), 750 m. 1 specimen. Std.l. 48. Bottom: mud. Gear: ST300.
- St. 436, (10°12'N, 124°14'E), 710 m. 1 specimen. Std.l. 45. Bottom: mud. Gear: ST300.

It is with some hesitation that these two specimens are referred to this species. Besides *S. holothuriae* also the description of *S. trifasciatus* (Alcock, 1894) agrees with the present material. Table 6 gives the meristic characters.

This shows that the two species are very much alike. CHABANAUD (1948) states in his description of *S. holothuriae* that this species is closely related to *S. trifasciatus*, but differs in certain respects: The dorsal lobe of the operculum is more developed than the ventral one in *S. holothuriae*, and the ocular side is provided with three broad black cross-bars in *S. trifasciatus*. The latter difference is perhaps due to the fact that the specimen upon which CHABANAUD described the new species was caught in 1882. The long time of preservation (56 years) may have bleached the cross-bars originally present. It may be that even a shorter stay in formalin and alcohol is sufficient to delete the cross-bars. The *Galathea* specimens have been kept in formalin for about 10 years and one of the specimens has some very diffuse colour marks on the eyed-side (see Plate XIV), which possibly can be interpreted as faded bars.

CHABANAUD also states as a reason for consider-

Table 6

	<i>S. holothuriae</i>	<i>Galathea</i> specimens	<i>S. trifasciatus</i>
D	84	86-88	85-91
A	70	74-76	71-78
L.l.	about 80	about 80	80-82
Head in % of std.l.	24	27-28	about 25
Depth in % of std.l.	26	27-28	about 25
Eye in % of head	12	11-12	-
Snout in % of head	25	23-25	-

ing the specimen forming a new species that the type locality of *S. holothuriae* northwest of Australia is very far from that of *S. trifasciatus* in the Gulf of Bengal. However, the seas between have large areas with depths less than 500 m. Thus it should be very easy for a species, under these conditions, to spread over this long distance. Several species within the Cynoglossidae are distributed over even larger areas.

These considerations indicate that *S. holothuriae* is probably a synonym for *S. trifasciatus*, but until more and especially fresh material of *S. holothuriae* has been procured, nothing definite can be stated.

Distribution:

The only hitherto known specimen, the holotype, was taken on the Holothurian Bank northwest of Australia, and the two *Galathea* specimens originate from the Philippines off Cebu.

Cynoglossus (Trulla) zanzibarensis Norman, 1939 (Fig. NORMAN 1939, p. 105)

Material (11 specimens):

- St. 196, (29°55'S, 31°20'E), 430 m. 1 specimen.
Std.l. 148. Bottom: sandy mud. Gear: ST300.
St. 197, (29°57'S, 31°26'E), 595 m. 10 specimens.
Std.l. 118-173. Gear: SOT.

These specimens do not agree with any of the Heterosomates from South Africa mentioned by SMITH (1953), but as shown in Table 7 they are identical with the more northerly species, *Cynoglossus zanzibarensis*. Furthermore, the following characters agree with the description of *C. zanzibarensis*: The ocular side with a single tubular nostril in front

Table 7

	<i>C. zanzibarensis</i> 6 specimens	<i>Galathea</i> specimens 11 specimens
D	116-122	120-(122)-124
A	94-100	98-(99)-103
Scales in middle L.I.	about 75	80-85
Number of L.I.	3 + 0	3 + 0
Scales between middle and upper L.I.	13-14	12-(13)-14
Head in % of std.l.	21-22	20-21
Depth in % of std.l.	25-26	22-(23)-24
Eye in % of head	13-14	11-(12)-15
Snout in % of head	about 30	29-(30)-35

of the lower eye (typical of the subgenus *Trulla* Kaup, 1858). Three L.I. on the ocular side and none or one very indistinct L.I. on the blind side.

The difference in the number of scales in the middle L.I. may be due to the difficulty in making an exact counting since none of the specimens had all the scales preserved.

Distribution:

Earlier only known from two localities in the Zanzibar area, at depths of 183-293 m. This new record, nearly 3000 km south of the type locality, can easily be explained by the currents off East Africa. When the South Equatorial Current reaches the African continent, part of it turns southward and continues along the coast to the Cape Province as the warm Agulhas Current.

REFERENCES

- ALCOCK, A., 1890: On some undescribed Shore-Fishes from the Bay of Bengal. - Ann. Mag. Nat. Hist., ser. 6, 6: 437.
- 1894: On a recent Collection of Bathybial Fishes. - Journ. Asiat. Soc. Bengal, Part 2, 63: 128.
VON BONDE, C., 1922: Heterosomata (Flat Fishes). - Rep. Fish. Mar. Biol. Surv. S. Afr., 2, Special Rep. II: 3-29.
BRUUN, A. F., 1937: *Chascanopsetta* in the Atlantic, a bathypelagic Occurrence of a Flatfish. - Vidensk. Medd. Dansk naturh. Foren. Kbhvn., 101: 125-135.
- 1959: General Introduction. - Galathea Rep., 1: 7-48.
CHABANAUD, P., 1948: Description de quatre espèces inédites du genre *Symphurus*. - Bull. Mus. Nat. Hist. Nat., Sér. 2, 20: 508-511.
DIETRICH, G., 1957: Allgemeine Meereskunde. - Berlin.
KAUP, J., 1858: Übersicht der Plagusinae der fünften Subfamilie der Pleuronectidae. - Arch. f. Naturgesch., 24: 105.
KYLE, H. M., 1913: Flat-fishes. - Rep. Danish Oceanogr. Exp. "Thor" 1908-10, 2, A.1: 1-146.
NIELSEN, J., 1961: Psettoidoidea and Pleuronectoidea. - Atlantide Rep., 6. (In press).
NORMAN, J. R., 1926: Flatfishes. - Biol. Res. "Endeavour", 5: 219-308.
- 1934: A systematic monograph of the Flatfishes. - London.
- 1939: Fishes. - John Murray Exp. 1933-34, 7: 1-116.
POLL, M., 1939: Poissons V. Téléostéens Acanthoptérygiens (2^e partie) - Exp. Océanogr. Belge Eaux Côt. Afr. Atl. sud. (1948-1949), 4, 3B: 290-331.
REGAN, C. T., 1908: Report on the marine Fishes collected by Mr. J. S. Gardiner in the Indian Ocean. - Trans. Linn. Soc. London, Zool., 12: 217-253.
RÜPPELL, E., 1828: Zoologischer Atlas zu Rüppells Reisen. Fische p. 121. - Senckenb. Nat. Ges. Frankfurt a. M.
SMITH, J. L. B., 1953: The Sea-Fishes of Southern Africa. - South Africa.