THE CEPHALOPODA IN THE INDIAN MUSEUM, CALCUTTA.

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(Plates I and II.)

In the first report on the collection of Cephalopods in the Indian Museum published by Goodrich (1896) 18 species of Decapods and 10 of Octopods were described. Unfortunately the eleven new species only were described in detail, while for the already known species generally the name and locality of the species only were recorded.

In 1916 Miss Massy described the material which had been accumulated in the Indian Museum since Goodrich's report. This paper, in which 43 species were described, contains excellent detailed descriptions and tables of measurements of most species. Only one species of *Sepia* was described as new.

The greater part of the material treated in the present report has already been studied by Goodrich or by Massy, but several changes of nomenclature or identification have necessitated redescriptions or complementary information.

I have to thank Mr. G. C. Robson for giving me the opportunity to study this interesting collection, which he had received for his own research. Mr Robson described some of the Octopods in his excellent monograph (1929-32).

I am also indebted to Dr. B. Prashad, Director, Zoological Survey of India, Indian Museum, Calcutta, for kindly allowing me to study this interesting collection.

To obtain an idea of the collection of Cephalopods in the Indian Museum described up to date I give below a table showing the species described by Goodrich, Massy, Robson and myself, with remarks on changes in the systematic position of some of the species. The result of the four studies gives a total of 23 genera and 53 species[1] (and some unidentified species); of these one genus (*Berrya*) and one species (*Octopus prashadi*) are described as new in this paper.

The method of taking measurements and of calculating indices followed by me in this report is that of Robson (1929, p. 24).

Cephalopoda of the Indian Museum described in literature.

No.	Species.	Goodrich, 1896.	Massy, 1916.	Robson, 1929-32.	Present paper.
	DECAPODA.				
1	*Sepia singaporensis* Pfeffer ..	p. 3 ..	p. 225 ..	—	—
2	*Sepia aculeata* Orbigny	p. 3 ..	p. 223 ..	—	p. 64
3	*Sepia singalensis* Goodrich ..	p. 3, pl. i, figs. 4-8.	p. 227 ..	—	—

[1] In 1936 Winckworth described *Sepia prashadi* of which the type has since been presented to the Indian Museum. Thus the total of the species in the Indian Museum is 54.

Cephalopoda of the Indian Museum described in literature—contd.

No.	Species.	Goodrich, 1896.	Massy, 1916.	Robson, 1929-32.	Present paper.
4	*Sepia esculenta* Hoyle	—	p. 225 ..	—	—
5	*Sepia elliptica* Hoyle	—	p. 226 ..	—	—
6	*Sepia arabica* Massy	—	p. 228 ..	—	—
7	*Sepia andreanoides* Hoyle ..	—	p. 229 ..	—	—
8	*Sepia kobiensis* Hoyle	—	p. 230 ..	—	—
9	*Sepia* sp. Massy	—	p. 231 ..	—	—
10	"Sepiidae" ? Massy	—	p. 237 ..	—	—
11	*Sepiella inermis* (Orbigny) ..	p. 5 ..	p. 231, pl. xxiii, fig. 6; pl. xxiv, figs. 1-9.	—	p. 65
12	*Sepiella* sp. Massy	—	p. 237 ..	—	—
13	*Sepiadarium kochii* Steenstrup ..	p. 3 ..	—	—	—
14	*Euprymna morsei* (Verrill) ..	*Inioteuthis morsei*, p. 3	p. 216 ..	—	—
15	"Sepiolidae" ? Massy	—	p. 217 ..	—	—
16	*Inioteuthis japonica* Verrill ..	—	p. 215 ..	—	—
17	*Inioteuthis maculosa* Goodrich ..	p. 2, pl. i, figs. 1-3.	p. 216 ..	—	—
18	*Loliolus investigatoris* Goodrich ..	p. 8, pl. ii, figs. 29-37.	p. 222 ..	—	p. 66
19	*Loligo duvaucelii* Orbigny ..	*Loligo indica* Pfr., p. 7, pl. ii, figs. 20-28.	*Loligo indica* Pfr., p. 218, pl. xxiii, fig. 9; pl. xxiv, fig. 11.	—	p. 67
20	*Loligo* sp.	—	p. 222 ..	—	—
21	*Sepioteuthis arctipinnis* Gould ..	—	p. 237 ..	—	—
22	*Sepioteuthis indica* Goodrich ..	p. 5, pl. i, figs. 9-19.	—	—	—
23	*Doryteuthis singhalensis* (Ortmann) ..	—	? *Loligo spectrum*, p. 221.	—	p. 70
24	*Abralia andamanica* Goodrich ..	p. 9, pl. ii, figs. 38-45.	p. 239 ..	—	—
25	*Abralia lineata* Goodrich	p. 10, pl. iii, figs. 46-50.	—	—	—
26	*Onychoteuthis banksii* Leach ..	p. 11 ..	—	—	—
27	*Stigmatoteuthis hoylei* (Goodrich) ..	*Histiopsis hoylei*, p. 15, pl. iv, figs. 62-71.	—	—	—
28	*Stigmatoteuthis japonica* Pfeffer ..	—	p. 242 ..	—	—
29	? *Calliteuthis reversa* Verrill ..	p. 16 ..	—	—	—
30	*Bathyteuthis abyssicola* Hoyle ..	—	p. 241 ..	—	—
31	*Chiroteuthis macrosoma* Goodrich ..	p. 12, pl. iii, figs. 51-57.	—	—	—
32	*Chiroteuthis pellucida* Goodrich ..	p. 14, pl. iv, figs. 58-61.	—	—	—
33	*Chiroteuthis imperator* Chun ..	—	p. 243 ..	—	—
34	*Megalocranchia abyssicola* (Goodrich)	*Taonius abyssicola*, p. 17, pl. v, figs. 72-80.	—	—	—
35	*Henseniotheuthis joubini* (Pfeffer) ..	—	p. 245 ..	—	—

Cephalopoda of the Indian Museum described in literature—contd.

No.	Species.	Goodrich, 1896.	Massy, 1916.	Robson, 1929-32.	Present paper.
	OCTOPODA.				
36	? *Hymenoteuthis macrope* (Berry) ..	—	*Cirroteuthis macrope*, p. 187.	II, p. 110	—
37	? *Grimpoteuthis pacifica* (Hoyle) ..	*Cirroteuthis pacifica*, p. 19.	—	II, p. 142	—
38	? *Grimpoteuthis grimaldii* (Joubin) ..	—	*Cirroteuthis grimaldii*, p. 186.	II, p. 148	—
39	*Argonauta böttgeri* Maltzan ..	—	p. 188 ..	II, p. 195	—
40	*Octopus* (*Octopus*) *rugosus* (Bosc) ..	*O. granulatus* (pars), p. 19.	*Polypus rugosus*, p. 189. *Polypus* sp., p. 212.	I, p. 63	p. 71
41	*Octopus* (*Octopus*) *tonganus* Hoyle ..	—	*P. tonganus*, p. 200.	I, p. 77	p. 74
42	*Octopus* (*Octopus*) *microphthalmus* Goodrich	p. 20, pl. v, figs, 83, 84.	*P. microphthalmus*, p. 205.	I, p. 89	—
43	*Octopus* (*Octopus*) *globosus* Appellöf ..	*O. globosus*, p. 19. *O. granulatus* (pars), p. 19.	*P. globosus*, p. 202.	I, p. 93	p. 75
44	*Octopus* (*Octopus*) *cyaneus* Gray ..	*O. vulgaris* p. 19.	? *P. cyanea*, p. 195. *P. herdmani*, p. 206.	I, p. 94 I, p. 86.	p. 79
45	*Octopus* (*Octopus*) *macropus* Risso. ..	? p. 20 ..	*P. macropus*, p. 192.	I, p. 101	p. 81
46	*Octopus* (*Octopus*) *areolatus* Orbigny ..	—	*P. areolatus*, p. 193.	I, p. 122	p. 83
47	*Octopus* (*Octopus*) *fusiformis* Brock ..	—	*P. fusiformis*, p. 203.	I, p. 132	p. 86
48	*Octopus* (*Octopus*) *defilippi* Vérany ..	—	*P. defilippi*, p. 196.	I, p. 135	p. 87
49	*Octopus* (*Octopus*) *niveus* Lesson ..	*O. aculeatus*, p. 20. *O. macropus* (pars), p. 20.	*P. aculeatus*, p. 191.	I, p. 141	p. 88
50	*Octopus arborescens* (Hoyle). ..	—	*P. arborescens* p. 207.	I, p. 151	p. 96
51	*Octopus prashadi*, sp. nov. ..	—	*P. levis*, p. 198.	? *Benthoctopus levis* p. 227.	p. 103
52	*Octopus* sp.	—	*Polypus* sp., p. 210.	—	—
53	*Octopus* sp.	—	*Polypus* sp., p. 211.	—	—
54	*Octopus* sp.	—	*P. hongkongensis* (pars), p. 197.	—	p. 106
55	*Octopus* sp.	—	—	—	p. 108
56	*Octopus* (*Macrotritopus*) *bandensis* (Hoyle).	—	*P. bandensis*, p. 201.	I, p. 170	—
57	*Paroctopus hongkongensis* (Hoyle) ..	—	*P. hongkongensis* (pars), p. 197.	I, p. 199.	p. 97
58	*Hapalochluena fasciata* (Hoyle) ..	*O. pictus* var. *fasciata*, p. 82.	—	*Hapalochlaena maculosa*, I, p. 211.	p, 98
59	*Berrya hoylei* (Berry)	—	*P. hoylei*, p. 207.	*O. hoylei* var. *annae*, I, p. 219.	p. 101
60	*Benthoctopus profundorum* Robson ..	—	*P. januarii* (pars), p. 199.	II, p. 238	—
61	*Teretoctopus indicus* Robson ..	—	*P. pricei*, p. 209, pl. xxiii, figs. 7, 8.	II, p. 249	—
62	*Teretoctopus alcocki* Robson ..	*O. januarii*, p. 19.	*P. januarii* (pars), p. 199.	II, p. 251	p. 105

Cephalopoda of the Indian Museum described in literature—concld.

No.	Species.	Goodrich, 1896.	Massy, 1916.	Robson, 1929-32.	Present paper.
63	*Japetella diaphana* (Hoyle) ..	—	*Eledonella diaphana*, p. 213.	II, p. 332	—
64	*Japetella* sp.	—	*Eledonella* sp., p. 214.	—	—

Order DECAPODA.

Family SEPIIDAE.

Sepia aculeata Orbigny, 1835-48.

1835-48. *Sepia aculeata* (van Hasselt MS.), Férussac et d'Orbigny, *Hist. Nat. gén. et part. des Céphal. acét.*, p. 287, pls. v bis, xxv.
1835-48. *Sepia indica*, Férussac et d'Orbigny, *ibidem*, p. 288, pl. xxi [*S. Blainvillei* Fér. et d'Orb. (*non* Deshayes)].
1884. *Acanthosepion Hasselti*, Rochebrune, *Bull. Soc. Philom, Paris*, (7) VIII, p. 101.
1885. *Sepia smithi*, Hoyle, *Ann. Mag. Nat. Hist.*, (5) XVI, p. 190.
1891. *Sepia microcotyledon*, Ortmann, *Zool. Jahrb.* III, p. 673, pl. xlvi, fig. 1.
1896. *Sepia aculeata*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 3.
1916. *Sepia aculeata*, Massy, *Rec. Ind. Mus.* XII, p. 223.

Specimens examined.—Sandheads, River Hooghly (P. V. Lady Fraser) 6. i. 1926 : 2♂, 3 ♀.

Measurements (in millimetres).

Sex	♂	♂	♀	♀	♀
Dorsal mantle-length	122	103	136	114	103
Ventral mantle-length	111	91·5	120	103	94
Largest mantle-breadth	52	45	62·5	52·5	48
Breadth of mantle-opening ..	44	34	50	38	37
Largest mantle-breadth including fins	78	60	—	76	62
Largest mantle-thickness ..	34	30	—	31	30
Length of head	25	26	30	26	23
Breadth of head	44	36	54	38	35
Thickness of head	26·5	26	—	25	25
Length of fin	112	94	—	102	92
Breadth of fin	15	10·5	—	16	12
1st right arm	43	35	40	39	32
1st left arm	43	30	40	39	29
2nd right arm ..	40+	34	40	35	31
2nd left arm	43	40	40	38	32
3rd right arm	49	40	44	42	34
3rd left arm	47	40	45	42	35
4th right arm	43+	38+	50	44	37
4th left arm	48+	41	45+	44	37
Right tentacular arm	115	95	81	135	160
Left tentacular arm	140	120	130	—	150
Right tentacular club	29	24	33	28	26
Left tentacular club	30	25	28	—	26
Length of shell	122	102	135	112·5	—
Breadth of shell ..	39	32·5	47·5	40	—
Thickness of shell	11·5	9	11	10·2	—
Length of last loculus	21	19	23	32	—
Length of spine	5	3	..	3	—
Diameter of largest arm-sucker	1·5	—	1·5	—	—
Diameter of largest tentacular sucker	0·5	—	0·8	—	—

Description.—These 5 specimens closely agree with Massy's detailed description. The breadth of the mantle and shell is, as in many other species of Cephalopods, larger in the females than in the males.

The dentition of the arm suckers is very irregular and varies a great deal. In large specimens the denticules are often more or less fused, especially in the proximal suckers. The tentacular suckers are armed with about 20 (sometimes more) acute teeth, which are largest on the distal side of the ring.

The hectocotylus agrees exactly with Massy's description.

Remarks.—A discussion of the synonymy of this species shall be given in another publication, in which certain groups of Cephalopods from the Indian Ocean shall be revised. The list of synonyms included in the synonymy of *Sepia aculeata* above is the result of a detailed study of this species.

Sepiella inermis (d'Orbigny, 1840).

1840. *Sepia inermis* (van Hasselt MS.), Férussac et d'Orbigny, *Hist. Nat. gén. et part. des Céphal. acét.*, p. 226, pls. vi bis, xx, figs. 1-9.
1849. *Sepia* (*Sepiella*) *microcheirus*, Gray, *Cat. Moll. Coll. Brit. Mus.* I, p. 107.
?1852. *Sepia tourannensis*, Eydoux et Souleyet, *Voyage Bonite* II, p. 33, pl. iii, figs. 6-12.
1884. *Sepiella curta*, Pfeffer, *Abh. Naturw. Ver. Hamburg* VIII, p. 13, figs. 16, 16*a*.
1884. *Diphtherosepion Martini*, Rochebrune, *Bull. Soc. Philom. Paris* (7) VIII, p. 81.
?1884. *Rhombosepion Touranense*, Rochebrune, *ibidem*, p. 84 (=*Sepia affinis* Eydoux et Souleyet).
1884. *Sepiella inermis*, Rochebrune, *ibidem*, p. 88.
1896. *Sepiella inermis*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 5.
1916. *Sepiella inermis*, Massy, *Rec. Ind. Mus.* XII, p. 231, pl. xxiii, fig. 6 : pl. xxiv, figs. 1-9.

Specimens examined.—*a*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel, February-March, 1925 : 1 ♂ ; *b*. Sandheads, River Hooghly (P. V. Lady Fraser), 6. i. 1926 ; 1 ♀, 4 ♂.

Measurements (in millimetres).

	a	b¹	*b*²	*b*³	*b*⁴	*b*⁵
Sex	♂	♀	♂	♂	♂	♂
Dorsal mantle-length ..	40	62	52	52	47	45
Ventral mantle-length ..	33·5	54·5	43·5	43	40	37·5
Largest mantle-breadth ..	23	40	30	27	27	29
Breadth of mantle-opening ..	20	26	29	29	24	25
Largest mantle-breadth including fins	31	48	48	40	35	36
Largest mantle-thickness ..	16·5	21	23	21	18	20
Length of head	11·5	19	18	14	10	14·5
Breadth of head ..	20·5	29	29	28	25	23
Thickness of head ..	12	18	18	17	12·5	15
Length of fins	42	65	55	53	47	45
Breadth of fin	6·5	9	11·5	9	7	7
1st right arm	15	20	17	—	14	14
1st left arm	16	20	17	18	14	14
2nd right arm	16	21	20	18	15	14
2nd left arm	16	20	20	18·5	14	14
3rd right arm	18	23	..	22	20	18
3rd left arm	18	23	25	23·5	20	18
4th right arm ..	20	27	20+	24	20	18
4th left arm ..	20	27	27	23·5	20	18
Right tentacular arm	—	90	—	—	—	—
Left tentacular arm ..	—	95	—	—	—	—
Right tentacular club	—	21	—	—	—	—
Left tentacular club ..	—	20	—	—	—	—
Length of shell . ..	—	—	50	49	—	—
Breadth of shell.. ..	—	—	20	19	—	—
Thickness of shell ..	—	—	7·5	7·5	—	—
Length of last loculus ..	—	—	15	16	—	—

Description.—As the specimens before me correspond with Massy's excellent description of this species, it is not necessary to describe the present material in detail.

Remarks.—Having examined a great number of both male and female specimens Massy concluded " that both *S. curta* and *S. ocellata* Pfeffer are the same species as *S. inermis*, and although *S. ornata* (Rang) has only been recorded from the West African region, I think it may eventually prove to be also this species, in which case Rang's name would have the priority."

I fully agree about the identity of *S. curta* and *S. inermis*, but as a result of the examination of a large number of Indian Ocean specimens of *Sepiella* (belonging to the Zoological Museum of Amsterdam) I have come to the conclusion that *S. ocellata* is without doubt a distinct species. Similarly *S. ornata*, which had been believed to be synonymous with *S. inermis*, is certainly a distinct species. My reasons for these views will be discussed in detail in a later publication.

Family LOLIGINIDAE.

Loliolus investigatoris Goodrich, 1896.

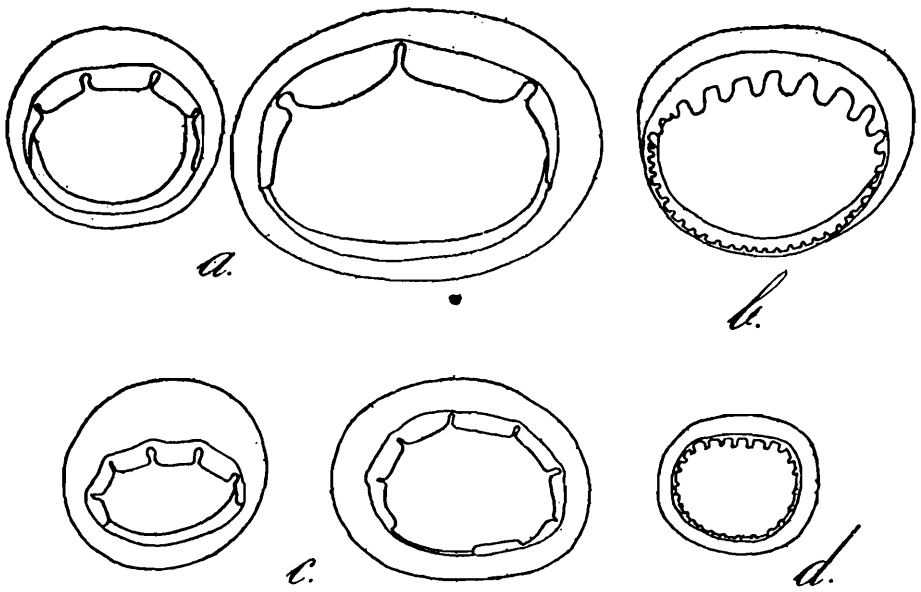
1896. *Loliolus investigatoris*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 8, pl. ii, figs. 29-37.
1916. *Loliolus investigatoris*, Massy, *Rec. Ind. Mus.* XII, p. 222.

Specimens examined.—*a.* Sandheads, River Hooghly (P. V. Lady Fraser) 6. i. 1926 : 1 ♀, 2♂ ; *b.* Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel, February-March, 1925 : 1 juv.

Measurements (in millimetres).

	a^1	a^2	a^3
Sex	♀	♂	♂
Dorsal mantle-length	42	32	30
Ventral mantle-length	38	31	23·5
Largest mantle-breadth	15	12	16
Breadth of mantle-opening	16	13	16
Largest mantle-breadth including fins	38	25	30
Largest mantle-thickness	13	10	12
Length of head	12·5	10	11
Breadth of head	14·5	11	13
Thickness of head	10	7·5	7·5
Length of fin	28	24	19
Breadth of fin	13	8	12
Distance between fin-base and mantle-margin	16	11	10
1st right arm	12	8	8
1st left arm	10	8	8
2nd right arm	19	17	17
2nd left arm	20	17	18
3rd right arm	29	23	23
3rd left arm	30	22	24
4th right arm	25	18	20
4th left arm	24	18	19
Right tentacular arm	55	—	—
Left tentacular arm	55	40	42
Right tentacular club	12	—	—
Left tentacular club	12	7	7
Length of shell	42	—	—
Breadth of shell	19	—	—

Description.—These specimens agree with Goodrich's original description. The hectocotylized left ventral arm has the same length as its partner. It is noteworthy that the largest male specimen has one basal sucker on its hectocotylized arm [according to Grimpe (1932, p. 484) the *Loliolus*-hectocotylus is characterized by the complete absence of suckers], and 30-40 pairs of modified suckers, of which the ventral ones form a wide membraneous expansion. The seven lobes of the buccal membrane each bear two small suckers.



TEXT-FIG. 1.—*Loliolus investigatoris* Goodrich.

a. Rings of arm-suckers of ♀: ×20; *b*. Ring of tentacular sucker of ♀: ×20; *c*. Rings of arm-suckers of ♂: ×20; *d*. Ring of tentacular sucker of ♂: ×20.

The arm suckers (text-fig. 1, *a-c*) are provided with 4-8 very large blunt teeth (according to Goodrich the arm suckers have only 3 teeth). There seems to be no difference between males and females in this respect. The tentacular suckers (text-fig. 1, *b*, *d*) are provided with about 25-40 more or less acute teeth of which the distal ones are the largest.

Loligo duvaucelii d'Orbigny, 1835-48.

1835-48. *Loligo duvaucelii*, Férussac et d'Orbigny, *Hist. Nat. gén. et part. des Céphal. acét.*, p. 318, pls. xiv, xx, figs. 6-16.

1884. *Loligo indica*, Pfeffer, *Abh. Naturw. Ver. Hamburg* VIII, p. 4, figs. 3, 3*a*.

1896. *Loligo indica*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 7, pl. ii, figs. 20-28.

1916. *Loligo indica*, Massy, *Rec. Ind. Mus.* XII, p. 218, pl. xxiii, fig. 9, pl. xxiv, fig. 11.

1934. *Loligo duvaucelii*, Adam, *Mém. Mus. Roy. Hist. Nat. Belgique* (H. S.) II, fasc. 16, p. 6, figs. 1-3.

Specimens examined.—*a*. Sandheads, River Hooghly (P. V. Lady Fraser), 6. i. 1926: 2♂, 2 ♀; *b*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel, February-March, 1925: 1♀, 1 juv. (?).

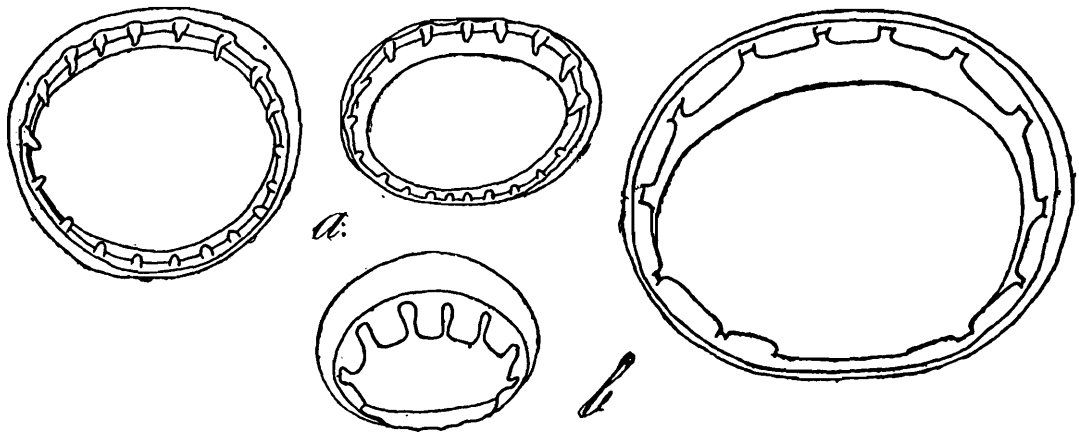
Measurements (in millimetres).

	a^1	a^2	a^3	a^4	b^1	b^2
Sex	♀	♀	♂	♂	♀	juv.
Dorsal mantle-length ..	105	101	85	89	115	32·5
Ventral mantle-length ..	98	90	90	83	112	31
Largest mantle-breadth ..	25	26	—	25	36	10
Breadth of mantle-opening	22·5	23	—	24	31	9·5
Largest mantle-breadth including fins	55	56	50	50	57	20
Largest mantle-thickness ..	20	18	—	12	33	7·5
Length of head	18	15	20	17	23	10
Breadth of head ..	21	21	18	20	23	10
Thickness of head ..	16	15	15	11	15	6
Length of fin	57	53	54	45	68	18
Breadth of fin	21	22	21	18	25	7
Distance between fin-base and mantle-margin ..	45	45	45	42	41	14
1st right arm	28	27	33	35	30	7
1st left arm	28	26	33	32	30	7
2nd right arm	34	32	35	38	37	11
2nd left arm	34	32	34	35	37	11
3rd right arm	37	36	37	33	44	15
3rd left arm	37	34	37	36	44	15
4th right arm	35	31	30+	34	35	14
4th left arm	35	32	33	39	34	14
Right tentacular arm ..	65	75	75	55+	100	35
Left tentacular arm ..	60	80	80	80	—	—
Right tentacular club ..	26	22	21	—	27	9
Left tentacular club ..	26	25	25	22	—	—
Diameter of largest arm-sucker	1·7	—	—	—	2·3	—
Diameter of largest tentacular sucker	2	—	—	—	2	—

Description.—These specimens correspond with the descriptions of *Loligo duvaucelii* by d'Orbigny (1839) and the author (1934), and with those of *Loligo indica* by Pfeffer (1884), Goodrich (1896) and Massy (1916). Hoyle's description of *Loligo indica* (1886) differs a great deal from the other descriptions of the species, and I am not quite certain that his material really belonged to that species.

The lobes of the buccal membrane are each provided with 3-4 suckers. The arm suckers have large blunt teeth on the distal side of the ring.

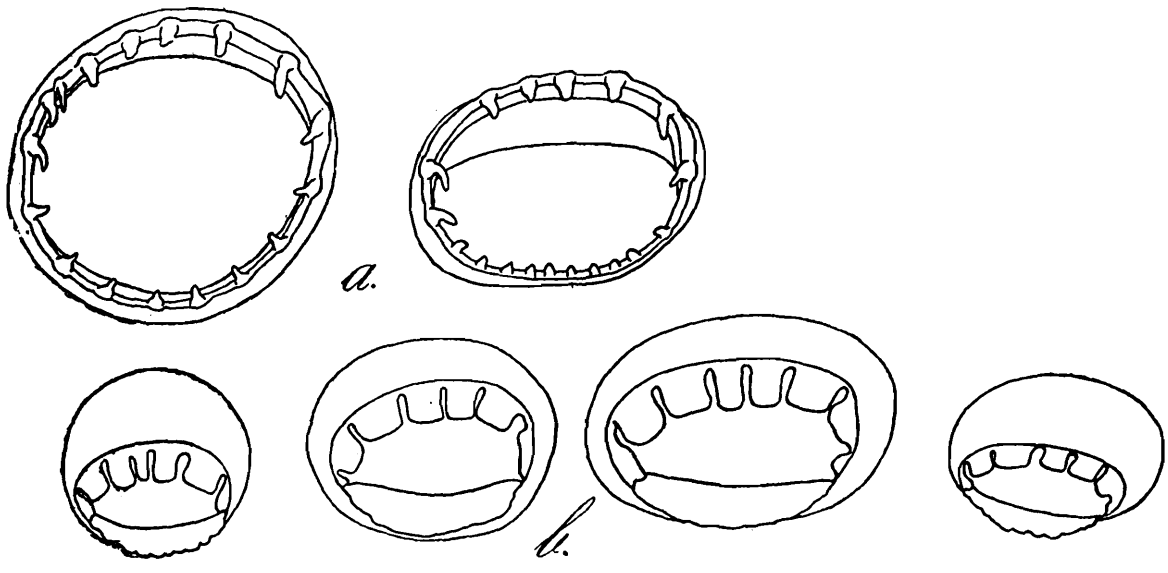
In the largest suckers of the males there are up to 13 teeth (text-fig. 2*b*), but in the smaller suckers there are only 6-8 teeth (text-fig. 2*b*). In



TEXT-FIG. 2.—*Loligo duvaucelii* d'Orbigny.

a. Rings of tentacular suckers of ♂ (a^3) : ×20 ; *b*. Rings of arm suckers of ♂ (a^3) : ×20

the females the arm suckers are relatively smaller and possess only 6-8 teeth in the largest suckers. The proximal side of the chitinous ring is not always smooth, but may show an irregular denticulation (text-fig. 3*b*). In both males and females the tentacular suckers are armed with 17-20 acute distant teeth (text-figs. 2*a*, 3*a*).



TEXT-FIG. 3.—*Loligo duvaucelii* d'Orbigny.

a. Rings of tentacular suckers of ♀ (a^1) : ×20. *b*. Rings of arm suckers of ♀ (a^1) : ×20·

The hectocotylized arm has 10-11 pairs of ordinary suckers at the base and about 35 pairs of modified suckers.

Remarks.—In 1934 I discussed the identity of *Loligo duvaucelii* and *Loligo indica*. The study of the present material has confirmed my view that *Loligo indica* is a synonym of *Loligo duvaucelii*.

Doryteuthis singhalensis (Ortmann, 1890).

1890. *Loligo singhalensis*, Ortmann, *Zool. Jahrb. Syst.* V, p. 676, pl. xlvi, fig. 3.
1912. *Doryteuthis singhalensis*, Naef, *Zool. Anz.* XXXIX, p. 742.
?1916. *Loligo spectrum*, Massy (*non* Pfeffer), *Rec. Ind. Mus.* XII, p. 221.
1928. *Loligo singhalensis* var. *beryllae*, Robson, *Serv. Océan. Pêches Indochine*, 10e Note, p. 15, figs. 4-10.

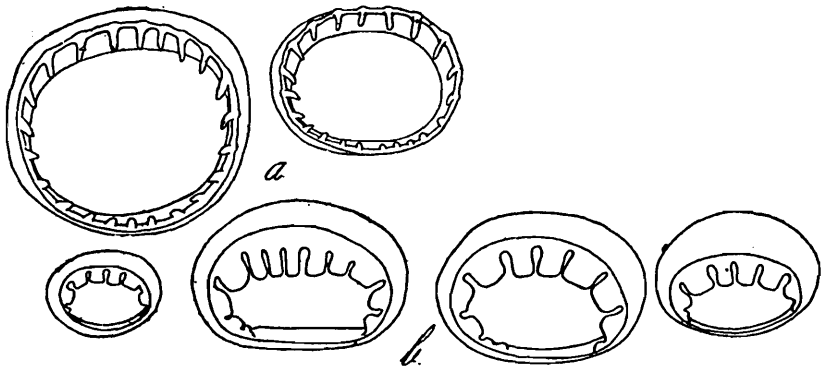
Specimens examined.—*a*. Sandheads, River Hooghly (P. V. Lady Fraser) 6.i.1926 : 1♂ ; *b*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel, February-March, 1925 : 1♂, 1 Juv.(?).

Measurements (in millimetres).

	a	b^1	b^2
Sex	♂	♂	juv.
Dorsal mantle-length	150	178	28
Ventral mantle-length	142	169	25
Largest mantle-breadth	22	28	9
Breadth of mantle-opening	23	28	8·5
Largest mantle-breadth including fins	60	68	11·5
Largest mantle-thickness	20	20	6
Length of head	16	18	6·5
Breadth of head	22	23	7·5
Thickness of head	16	15	5
Length of fin	85	100	12
Breadth of fin	29	22	3·5
Distance between fin-base and mantle-margin ..	60	67	15
1st right arm	26	30	—
1st left arm	26	30	—
2nd right arm	28	35	—
2nd left arm	30	35	—
3rd right arm	33	39	—
3rd left arm	33	39	—
4th right arm	29	34	—
4th left arm	28	38	—
Right tentacular arm	57+	85	—
Left tentacular arm	70	85	—
Right tentacular club	—	25	—
Left tentacular club	24	25	—
Length of shell	152	—	—
Breadth of shell..	19	—	—
Diameter of largest arm sucker	—	1·8	—
Diameter of largest tentacular sucker	—	2	—

Description.—Our material corresponds fairly well with Ortmann's original description. The only difference is in the number of suckers on the lobes of the buccal membrane which is smaller in our specimens. I do not, however, attach any great importance to this character as the buccal suckers are often lost.

The small suckers of the sessile arms have about 6 large blunt teeth on the distal margin of their rings. In larger suckers there are about



TEXT-FIG. 4.—*Doryteuthis singhalensis* Ortmann.

a. Rings of tentacular suckers of ♂ (*a*); ×13. *b*. Rings of arm suckers of ♂ (*a*): ×13.

9 large teeth and sometimes some smaller ones (text-fig. 4*b*). The tentacular suckers are provided with about 20 sharp distant teeth which are very long on the distal margin of the ring.

The hectocotylized arm has about 12 pairs of normal suckers and 35 pairs of modified suckers, forming papillae.

Remarks.—Probably the specimen which Massy identified as *Loligo spectrum* belongs to *Doryteuthis singhalensis*, but her description is not sufficiently detailed to allow of a definite decision on this point.

Order OCTOPODA.

Family OCTOPODIDAE.

Octopus (Octopus) rugosus (Bosc, 1792).

1792. *Sepia rugosa*, Bosc, *Actes Soc. Hist. Nat. Paris* I, p. 24, pl. v, figs. 1, 2.
1896. *Octopus granulatus*, Goodrich (pars), *Trans. Linn. Soc. London, Zool.* VII, p. 19.
1916. *Polypus rugosus*, Massy, *Rec. Ind. Mus.* XII, p. 189.
1916. *Polypus* sp., Massy, *ibidem*, p. 212.
1929. *Octopus* (*Octopus*) *rugosus*, Robson, *Monograph* I, p. 63.
1929. *Polypus granulatus*, Sasaki, *Journ. Coll. Agri. Hokkaido Imp. Univ.* XX Suppl., p. 40, pl. iii, fig. 18; pl. ix, figs. 11-13; pl. xxix, figs. 2, 3.
1934. *Octopus* (*Octopus*) *rugosus*, Adam, *Mém. Mus. Roy. Hist. Nat. Belgique*, (H. Ser.) II, fasc. 16, p. 16, fig. 8.
1937. *Octopus* (*Octopus*) *rugosus*, Adam, *Mém. Mus. Roy. Hist. Nat. Belgique*, (2 Ser.), fasc. 9, p. 72, fig. 27.
1937. *Octopus* (*Octopus*) *rugosus*, Adam, *Capita Zoologica* VIII, fasc. 3, p. 23, fig. 9.

Specimens examined.—*a*. Andamans: 1 ♀ (No. M 376/1); *b*. Great Cocos Island: 1 ♀ (No. M 378/1); *c*. Muscat: 1 ♀ (No. M379/1); *d*. Malacca Straits: 1 ♂ (No. M 12090/2); *e*. Andamans: 5 ♀ (No. M 12091-5/2); *f*. Malacca Straits: 1 ♀ (No. M12096/2); *g*. Sandheads, River Hooghly (P. V. Lady Fraser), 6.i.1926: 1 ♂.

Measurements (in millimetres).

	a	*b*	*c*	*d*	*e*[1]
Sex	♀	♀	♀	♂	♀
End of body to eye	31	17	19	29	10
End of body to mantle-margin	25	12·5	14	22	7·5
Eye to dorsal web	20	12	11	12	6
Breadth of body	24	14	13	20	8
Breadth of head	17	12·5	10	14	8
1st right arm	73	56	—	—	±15
1st left arm	73	47+	—	65	±15
2nd right arm	69+	60	—	75	±15
2nd left arm	87	—	—	72	±15
3rd right arm	92	60	—	65	±15
3rd left arm	75+	60	—	78	±15
4th right arm	90	60	—	75	±15
4th left arm	90	60	—	72	±15
Hectocotylus	—	—	—	3	—
Web between 1st arms	14	11	8	12	—
Web between 1st and 2nd arms, right	22	12·5	10	14	—
Web between 1st and 2nd arms, left	22	—	10	15	—
Web between 2nd and 3rd arms, right	22	14·5	11	20	—
Web between 2nd and 3rd arms, left	23	—	12	20	—
Web between 3rd and 4th arms, right	24	12	12	17	—
Web between 3rd and 4th arms, left	24	—	12	17	—
Web between 4th arms	20	12	10	16	—
Length of funnel	13	—	—	13	—
Funnel-organ	—	—	—	—	—
Diameter of largest sucker	3	2·5	—	4	—
Number of gill-filaments in each demibranch	9	—	—	8·9	—
Length of penis	—	—	—	17	—
Arm-formula	3.4.2.1	2=3=4.1	—	3.4.2.1	1=2=3=4
Web-formula	D.C.B.E.A	C.B.D=E.A	C=D.B=E.A	C.D.E.B.A	—
Indices:—					
Width-index	77·5	82	68·5	69	80
Interocular index	55	73·5	52·5	48·5	80
Web-index	26	24	—	25·5	—
Sucker-index	9·7	14·7	—	13·8	—
Hectocotylus-index	—	—	—	4·6	—

	e^2	e^3	e^4	e^5	f	g
Sex	♀	♀	♀	♀	♀	♂
End of body to eye	32	39	33	14	11·5	38
End of body to mantle-margin	23	34	26	11	10	30
Eye to dorsal web	12	19	13	8	6·5	—
Breadth of body	23	29	21	12	9·5	33
Breadth of head	15	20	16	10	8·5	24
1st right arm	70	80	86	±28	—	85
1st left arm	—	80	65+	±28	—	85
2nd right arm	83	86	70+	±28	—	95
2nd left arm	75	86	92	±28	—	95
3rd right arm	88	92	75+	±28	—	82
3rd left arm	95	92	100	±28	—	110
4th right arm	86	—	95	±28	—	—
4th left arm	98	92	100	±28	—	105
Hectocotylus	—	—	—	—	—	3
Web between 1st arms	12	17	13	—	—	17
Web between 1st and 2nd arms, right	18	21	23	—	—	—
Web between 1st and 2nd arms, left	18	23	23	—	—	26
Web between 2nd and 3rd arms, right	23	23	25	—	—	—
Web between 2nd and 3rd arms, left	21	23	29	—	—	26
Web between 3rd and 4th arms, right	23	22	30	—	—	—
Web between 3rd and 4th arms, left	24	24	31	—	—	26
Web between 4th arms	21	20	25	—	—	22
Length of funnel	18	21	19	—	—	—
Funnel-organ	—	W	—	—	—	—
Diameter of largest sucker	3·5	4	4·2	—	—	5
Number of gill-filaments in each demibranch	—	8	—	—	—	—
Length of penis	—	—	—	—	—	—
Arm-formula	4.3.2.1	4=3.2.1	4=3.2.1	1=2=3=4	—	3.4.2.1
Web-formula	D.C=E.B.A	D.B=C.E.A	D.C.E.B.A	—	—	B=C=D.E.A
Indices :—						
Width-index	72	74·5	63·5	86	82·5	87
Interocular index	47	51	48·5	71·5	74	65
Web-index	24·5	26	31	—	—	23·5
Sucker-index	11	10·2	12·7	—	—	13·2
Hectocotylus-index	—	—	—	—	—	3·7

Description.—I have examined the material studied by Miss Massy (1916, p. 189), but as I agree with her excellent descriptions I do not discuss this material here. The present specimens of this common species do not need a detailed description. They show the characteristic granular skin, dark grey or slate-coloured on the dorsal side with a faint dark reticulation.

Especially in the young specimens the web is well developed along the arms, forming wide membranes on their ventral side. Generally the body of young specimens is more globular than that of older ones and shows a median ventral furrow. In most specimens a big ocular cirrhus is present above and somewhat behind each eye. The funnel is free for about half its length.

Remarks.—The specimens enumerated under *a-f* in the list above are probably those identified by Goodrich as *Octopus granulatus*. Among these specimens, labelled "*Polypus granulatus*" there was one (No. M 377/1) which does not belong to this species, but to *Octopus globosus* (see pp. 75, 78).

Octopus (Octopus) tonganus Hoyle, 1885.

1885. *Octopus tonganus*, Hoyle, *Ann. Mag. Nat. Hist.* (5) XV, p. 225.
1886. *Octopus tonganus*, Hoyle, *Challenger Report* XVI, p. 83, pl. viii, figs. 1, 2.
1916. *Polypus tonganus*, Massy, *Rec. Ind. Mus.* XII, p. 200.
1929. *Octopus* (*Octopus*) *tonganus*, Robson, *Monograph* I, p. 77, text-figs. 11, 12.

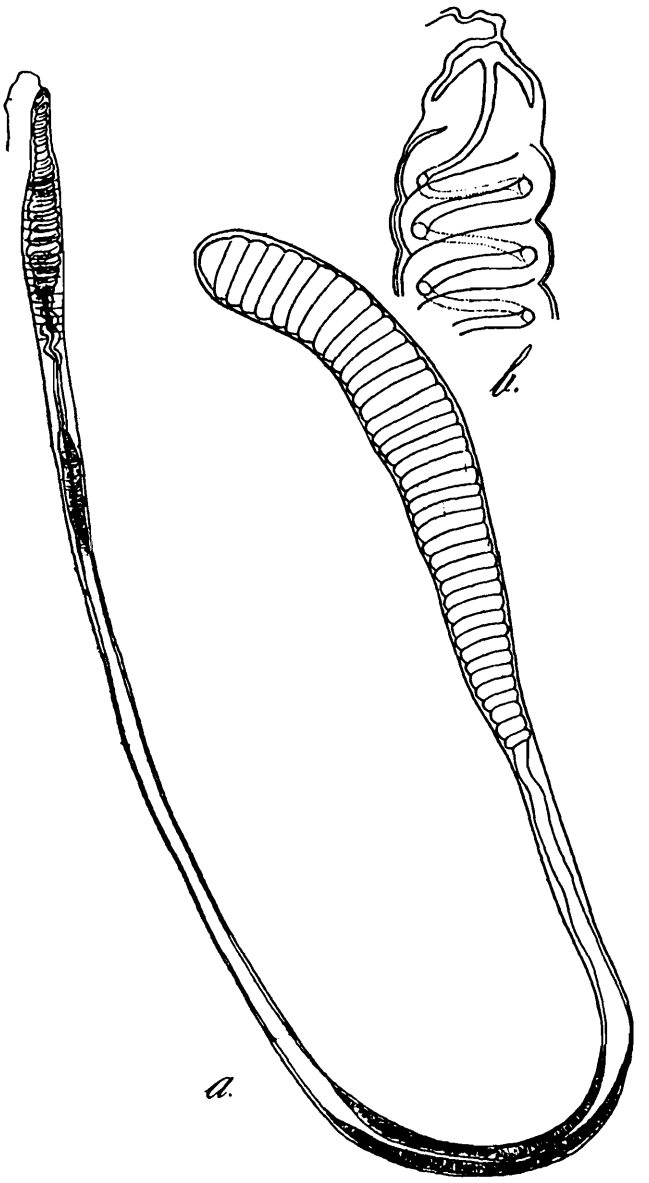
Specimen examined.—"Investigator" station 242, 2.x.1898, Arabian Sea, 17° 27′N., 71° 41′E., 56-58 fathoms: 1♂ (No. M 796/1).

Description.—This specimen has already been described by Miss Massy, but I find it necessary to add the following notes to supplement her description:

The short web has the formula C. B. A. D.=E, its highest section measuring only 10·5 per cent of the length of the longest arm. The gill has 11 filaments in each demibranch. The funnel-organ is W-shaped with long and slender limbs. The ink-sac is very small, only 3 mm. in length. The penis measures 8 mm. The spermatophore (text-fig. 5) is characterized by its swollen anterior end.

Remarks.—According to Robson (1929, p. 78) this species has affinities with *O. rugosus*, "and may turn out to be a variety of that form." However, it is distinguished by the very short ligula, long arms, shallow web, small ink-sac and by its spermatophore which differs from that of *O. rugosus* by its swollen anterior end.

Until more material will be known it is difficult to establish the relationship of *O. tonganus* to other species, but the characters mentioned above are sufficient to permit its separation from *O. rugosus*.



TEXT-FIG. 5.—*Octopus tonganus* Hoyle.
a. Spermatophore, (No. M 796/1): ×16. *b.* Its anterior end: ×136.

Octopus (Octopus) globosus Appellöf, 1886.

1886. *Octopus globosus*, Appellöf, *K. Svensk. Vetensk. Akad. Handl.* XXI, p. 7, pl. i, figs. 4-5.
1896. *Octopus globosus*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 19, pl. v, fig. 81.
1896. *Octopus granulatus*, Goodrich (*pars*), *ibidem*, p. 19.
1916. *Polypus globosus*, Massy, *Rec. Ind. Mus.* XII, p. 202.
1929. *Polypus globosus*, Sasaki, *Journ. Coll. Agri. Hokkaido Imp. Univ.* XX Suppl., p. 97, pl. xii, figs. 21, 22, text-figs. 50-53.
1929. *Octopus* (*Octopus*) *globosus*, Robson, *Monograph* I, p. 93, text-fig. 20.
1934. *Octopus* (*Octopus*) *globosus*, Adam, *Mém. Mus. Roy. Hist. Nat. Belgique* (H. Ser.) II, fasc. 16, p. 20, fig. 10.
1938. *Octopus* (*Octopus*) *globosus*, Adam, *Bull. Mus. Roy. Hist. Nat. Belgique* XIV, No. 7, p. 3, fig. 5A.

Specimens examined.—*a.* Malacca Straits : 1 ♀ (No. M 375/1) ; *b.* Malacca Straits : 1 ♀ (No. M 377/1) ; *c.* Bombay : 1 ♂ (No. M 382/1); *d.* Bandra, near Bombay : 1 ♂ (No. M 5450/1) ; *e.* Kabusa Island, Mergui : 1 ♀ (No. M 7927/1) ; *f.* Off Gopalpore, 25-28 fathoms, Orissa Coast, September, 1909 : 1 ♂ (No. M 8278/1) ; *g.* Malacca Straits : 2 ♂, 2 ♀ (No. M 12097-12100/2) ; *h.* Port Blair, Andamans (R. P. Mullins), June 1918 : 1 ♂.

Measurements (in millimetres).

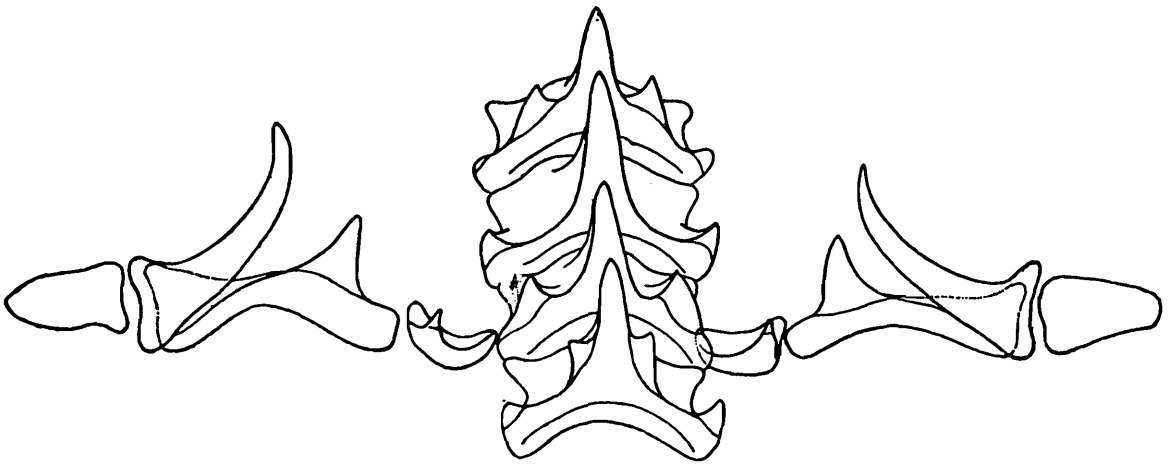
	a	*b*	*c*	*d*	*e*
Sex	♀	♀	♂	♂	♀
End of body to eye	22	15	17	15	10
End of body to mantle-margin	16	11	12	13	7
Eye to dorsal web	19	16	—	—	6
Breadth of body	16·5	12	14	14	8
Breadth of head	15	13	12	12	7·5
1st right arm	52	45	64	43	27
1st left arm	55	45	60	44	27
2nd right arm	44+	50	72	50	31
2nd left arm	62	50	71	53	28
3rd right arm	40+	48+	59	44	34
3rd left arm	60	50	68	51	32
4th right arm	58	48	69	48	27
4th left arm	58	48	62	44	28
Hectocotylus	—	—	4	3	—
Web between 1st arms	14·5	12·5	12	11	7
Web between 1st and 2nd arms, right	15	13	12	12	8
Web between 1st and 2nd arms, left	15·5	13	12	11·5	8
Web between 2nd and 3rd arms, right	16	14	12	11·5	9
Web between 2nd and 3rd arms, left	16	13	12	13	9
Web between 3rd and 4th arms, right	14	13	11	10	8
Web between 3rd and 4th arms, left	15	14	14	12	7
Web between 4th arms	13	11·5	11	12·5	7
Length of funnel	10	—	5	5	—
Diameter of largest sucker	3	2	3	2	1·5
Number of gill-filaments in each demibranch	5	—	7	—	—
Length of penis	—	—	5	—	—
Arm-formula	2.3.4.1	2=3.4.1	4.3.2.1	2.3.4.1	3.2.4.1
Web-formula	C.B.D.A.E	D.B=C.A.E	D.A=B=C.E	C.E.D.B.A	C.B.D=E=A
Indices:—					
Width-index	75	80	82	93	80
Interocular-index	68	86·5	70·5	80	75
Web-index	26	28	20	24·5	26·5
Sucker-index	13·6	13·3	17·6	13·4	15
Hectocotylus-index	—	—	6·8	6·8	—

	f	g^1	g^2	g^3	g^4	*h*
Sex	♂	♂	♀	♀	♂	♂
End of body to eye	9	8	11	6	12·5	10
End of body to mantle-margin	6	14	8·5	5	10	7
Eye to dorsal web	—	14	10	4·5	11·5	7
Breadth of body	7	12	9	5·5	12·5	8·5
Breadth of head	8	—	10	6	9·5	8
1st right arm	19+	45	28	13	—	25+
1st left arm	20	—	—	13	—	37
2nd right arm	24	—	28	—	—	40
2nd left arm	22+	—	—	12+	—	42
3rd right arm	20	52	32	15	—	30
3rd left arm	22	—	—	18	—	40
4th right arm	22	—	32	16·5	—	41
4th left arm	22	—	32	16·5	—	39
Hectocotylus	0·25	2·3	—	—	—	0·8
Web between 1st arms	±5·5	—	6·5	±4	11	7
Web between 1st and 2nd arms, right	±5·5	—	8	±4	11	7
Web between 1st and 2nd arms, left	±5·5	—	—	±4	10·5	7
Web between 2nd and 3rd arms, right	±5·5	—	9	±4	12	9
Web between 2nd and 3rd arms, left	±5·5	—	—	±4	13	11
Web between 3rd and 4th arms, right	±5·5	—	9	±4	10·5	7·5
Web between 3rd and 4th arms, left	±5·5	—	—	±4	12	11
Web between 4th arms	±5·5	—	7·5	±4	10·5	7·5
Length of funnel	2·5	—	—	—	6	—
Diameter of largest sucker	1	3	1·5	1	2·5	2
Number of gill-filaments in each demibranch	—	5	—	—	—	5·6
Length of penis	—	2·5	—	—	—	—
Arm-formula	2.3=4.1	—	3=4.1=2	—	—	2.4.3.1
Web-formula	A=B=C=D=E	—	C=D.B.E.A	—	—	C=D.E.B=A
Indices :—						
Width-index	78	66·5	82	92	100	85
Interocular-index	89	—	91	100	76	80
Web-index	23	—	28	22	—	26
Sucker-index	11·1	16·6	13·6	16·6	20	20
Hectocotylus-index	2·8	4·8	—	—	—	2·7

Description.—Some of these specimens have already been described by Miss Massy (1916, p. 202, Nos. M 382/1, M 8278/1 and M 5450/1). The others, except the last one, are probably the specimens mentioned, but not described, by Goodrich (p. 19). No. M 377/1, which was labelled "*Polypus granulatus*", is certainly *O. globosus*.

The description of this species by Massy is very detailed, and it would be sufficient to add here only a few supplementary remarks. In well preserved specimens the eyes are surrounded by numerous small and some larger papillae. Small papillae are also present on the dorsal surface of the web, head and the anterior part of the mantle. The number of gill-filaments is very low. The hectocotylus of No. M 12097/2 is very well preserved and fully agrees with Goodrich's figure (pl. v, fig. 81)—it might even be the same specimen. The ligula has a deep central furrow, without transverse grooves.

The radula (text-fig. 6) of some of these specimens corresponds fairly closely with that figured by me in an earlier paper (1934, fig. 10). The



TEXT-FIG. 6.—*Octopus globosus* Appellöf. Radula, (No. M 382/1): ×170.

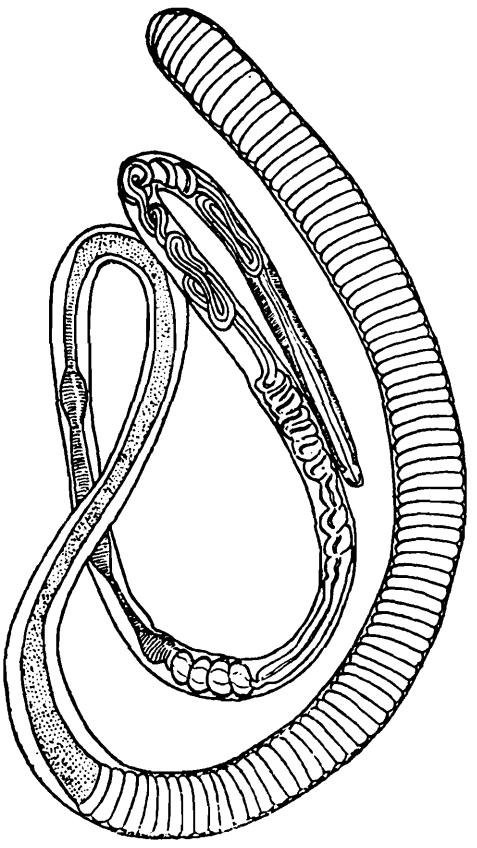
rhachidian teeth have a symmetrical seriation ($A_{2\text{-}3}$). The first laterals have an arched base and a prominent outer cusp; the second laterals have a deeply indentated base line and lack an endocone, but a long internal heel is present; the third laterals are strong and moderately curved; the marginal plates are short.

The spermatophore (text-fig. 7), which had not been figured before, is illustrated in text-figure 7. It is strongly coiled and seems to be rather characteristic.

Remarks.—The material described above corresponds very well with the specimens described by me in 1934 and 1938.

Sasaki (1929, p. 97) has described this species from Japan, but I am not quite sure whether his specimens are conspecific with the above described material. The granulation of the skin of the Japanese material seems to be quite different and the gill-filaments are more numerous. On the other hand, these specimens as well as the type-specimen, which also originated from Japan, are larger than the Indian Ocean material. Without having examined the type-specimen I am not in a position to decide whether the Indian Ocean specimens really belong to *Octopus globosus*. In any case it is closely related to this species and until the contrary can be proved I regard this material as *O. globosus*.

Probably *O. duplex* Hoyle is the same species, but its description is not detailed enough to allow of a definite conclusion on this point.



TEXT-FIG. 7.—*Octopus globosus* Appellöf. Spermatophore, (No. M 382/1): ×19.

According to Ortmann (1891) *Octopus globosus* is the same as *O. rugosus*. but I agree with Appellöf (1898) that the latter species differs from *O. globosus* by its deeply incised dorsal web. In any case the material before me can easily be distinguished from *O. rugosus* by its smaller size, more globular body, its arms which are often bent back over the head, its web, its lower number of gill-filaments and its quite different skin-granulation.

Octopus (Octopus) cyaneus Gray, 1849.

1849. *Octopus cyanea*, Gray, *Catal. Moll. Brit. Mus.* I, p. 15.
1896. *Octopus vulgaris*, Goodrich (*non* Lamarck), *Trans. Linn. Soc. London, Zool.* VII, p. 19.
?1916. *Polypus cyanea*, Massy, *Rec. Ind. Mus.* XII, p. 195.
1916. *Polypus herdmani*, Massy (*non* Hoyle), *ibidem*, p. 206.
1929. *Polypus marmoratus*, Sasaki, *Journ. Coll. Agri. Hokkaido Imp. Univ.* XX, Suppl. p. 47, pl. i, fig. 10; pl. v, fig. 4; pl. ix, figs. 19-24; text-fig. 17.
1929. *Octopus* (*Octopus*) *cyanea*, Robson, *Monograph* I, p. 94.
1937. *Octopus cyanea*, Adam, *Mém. Mus. Roy. Hist. Nat. Belgique*, (2 Ser.), fasc. 9, p. 74, fig. 28.
1938. *Octopus* (*Octopus*) *cyaneus*, Adam, *Bull. Mus. Roy. Hist. Nat. Belgique* XIV, No. 7, p. 5, fig. 2.

Specimens examined.—*a.* Andamans: 1 ♀ (No. M 325/1) (=*O. vulgaris* Goodrich); *b.* Point Galle, Ceylon: 1 ♀ (No. M 326/1) (=*O. vulgaris* Goodrich); *c.* Pearl Banks, Ceylon: 1 ♀ (No. M 8235/1) (=*Polypus herdmani* Massy); *d.*? Akyab, Burma: 1 ♀ (No. M 8253/1) (=*Polypus cyanea* Massy); *e.* Port Blair, Andamans: 1 ♂ 1 ♀ (R. P. Mullins), June 1918.

Measurements (in millimetres).

	a	*b*	*d*	*d'?*	e^1	e^2
Sex	♀	♀	♀	♀	♂	♀
End of body to eye	75	110	12	125	72	80
End of body to mantle-margin	—	—	8	108	—	—
Eye to dorsal web	60	71	8·5	100	54	58
Breadth of body	55	57	8	78	49	50
Breadth of head	41	45	9	46	44	40
1st right arm	310	320+	25	342	280	340
1st left arm	250	410	26	—	170+	300
2nd right arm	350	400	—	455	280	250+
2nd left arm	360	320+	28	—	170+	370
3rd right arm	330	460	31	427	235	450
3rd left arm	430	460	32	—	430	270+
4th right arm	380	480	28	422	430	260+
4th left arm	390	470	—	—	340+	440
Hect cotylus	—	—	—	—	2·5	—
Web between 1st arms	35	55	—	98	38	42
Web between 1st and 2nd arms, right	45	70	—	—	50	45
Web between 1st and 2nd arms, left	46	80	—	128	42	42
Web between 2nd and 3rd arms, right	55	90	—	—	55	54
Web between 2nd and 3rd arms, left	53	90	—	—	56	62
Web between 3rd and 4th arms, right	41	85	—	—	55	54
Web between 3rd and 4th arms, left	50	110	—	—	56	65
Web between 4th arms	45	80	—	73	50	52
Length of funnel	35	38	3·5	32	30	—
Funnel-organ	W	—	—	—	W	—
Diameter of largest sucker	8	10	1	10	9	6
Number of gill-filaments in each demibranch	±10	—	—	—	10—11	—
Largest diameter of ocellus, right	11·5	14	2	—	10	11
Largest diameter of ocellus, left	9·5	12	—	—	13	—
Length of penis	—	—	—	—	12	—
Arm-formula	3.4.2.1	4.3.1.2	3.4=2.1	2.3.4.1	4=3.2=1	3.4.2.1
Web-formula	C.D.B.E.A	D.C.B=E.A	—	—	C=D.E.B.A	D.C.E.B=A
Indices :—						
Width-index	73	52	66·5	62·5	68	62·5
Interocular-index	55	41	75	37	61	50
Web-index	12·8	23	—	28	13	14·4
Sucker-index	10·7	9·1	8·3	8	12·5	7·5
Hectocotylus-index	—	—	—	—	1·06	—
Ocellus-index	15·4	12·7	16·6	—	18	13·8

Description.—I propose to consider specimens *a-e* separately below:

a and *b*. These two females were labelled "*Polypus vulgaris*" and are probably those mentioned by Goodrich (Goodrich states that the large female is from the Andamans and the smaller male from Point Galle, but the smaller one, which is also a female, is from the Andamans, the large one from Point Galle).

There is no doubt whatever that these specimens belong to *O. cyaneus*. The dorsal side of head and body has a dark grey colour, maculated with slate-coloured patches. The arms are provided with two series of intercotyledonary irregular dark dashes, quite visible on the ventral side, but obscured by the general pigmentation on the dorsal side. The skin is almost entirely smooth, but bears on its dorsal surface some longitudinally extended tubercles. On the head is a triangle of the same tubercles and on the dorsal arm surfaces two longitudinal series of them. Above each eye is a large supraocular cirrhus.

The ocellar spots are well developed and consist of a dark central spot surrounded by a paler zone, and an irregular outer ring (the measurements given in the table are those of the central spot).

c. This specimen has been described by Massy (p. 206) as *Polypus herdmani*, but Robson (p. 86) already suggested that it might belong to *O. cyaneus*. Massy described the ocellar spots as "consisting of a dark oval patch surrounded by a narrow lighter coloured ring", but on a closer examination the ocellus is slightly different. The dark oval patch has a very small light center. The dark patch is surrounded by a narrow lighter coloured (but non-iridescent) ring and in the right ocellus this ring is again surrounded by a dark ring. The left ocellus is less well defined and lacks the outer dark ring. The outer surface of the web is faintly marmorated. According to Massy, there are "numerous elongated warts and tubercles placed chiefly round the eyes and on dorsal surface of head and umbrella." But I do not agree with this interpretation. The skin is strongly wrinkled, which gives the impression of numerous tubercles; in reality there are only a few tubercles on the dorsal surface of mantle, head and web, as in *O. cyaneus*. The arms lack the characteristic series of dark spots, but this may be due to the young age of the animal. I am almost certain that this specimen belongs to *O. cyaneus*, but I cannot venture to give an opinion on the other specimens described as *Octopus herdmani* without having examined them.

d. It is very doubtful if this specimen which was identified by Massy as *Polypus cyanea* belongs to this species. The animal is in a poor state of preservation and neither the ocellar spots nor the arm spots are present. It is impossible to give a definite opinion on the status of this specimen, but I think it most probably to be *O. macropus* or perhaps *O. vulgaris*.

e. These two specimens fully correspond with the specimens *a* and *b* and certainly belong to *Octopus cyaneus*.

Octopus (Octopus) macropus Risso, 1826.

1826. *Octopus macropus*, Risso, *Histoire Naturelle. .. .Europe Méridionale* IV, p. 3.
? 1896. *Octopus macropus*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 20.
1916. *Polypus macropus*, Massy, *Rec. Ind. Mus.* XII, p. 192.
1929. *Octopus* (*Octopus*) *macropus*, Robson, *Monograph* I, p. 101.
1932. *Octopus* ? *macropus* var., Robson, *Bull. Raffles Mus.* VII, p. 26.

Specimens examined.—*a*. Indian Seas: 1 ♂ (No. M 603/1); *b*. Persian Gulf: 1 ♂ (No. M 8220/1); *c*. Singgora, Talé Sap, Gulf of Siam, 1.ii.1916: 1 ♀ (No. M 10308/1); *d*. Sandheads, River Hooghly (P. V. Lady Fraser), May 1928: 2 ♂, 1 ♀.

Measurements (in millimetres). 12

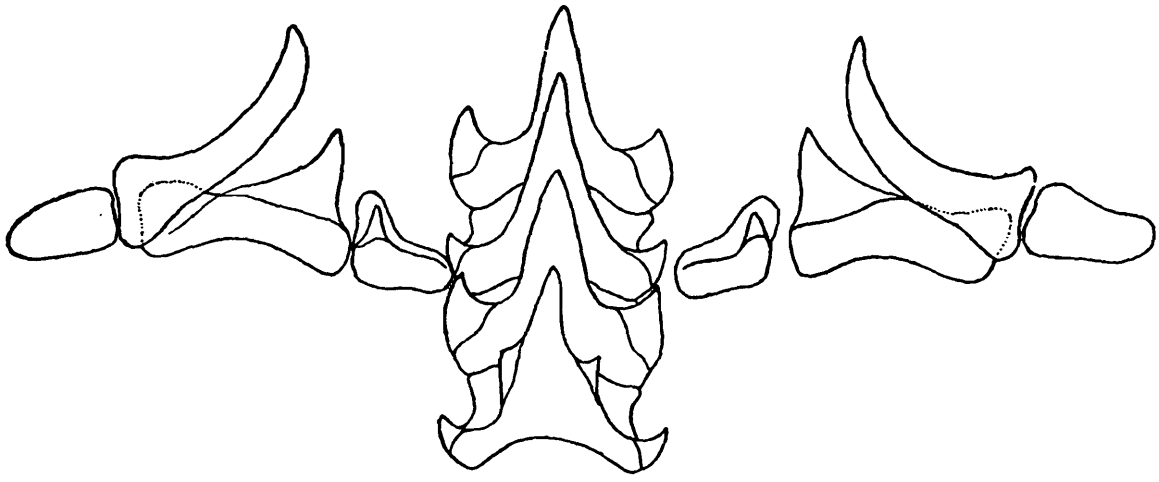
	a	*b*	*c*	d^1	d^2	d^3
Sex	♂	♂	♀	♂	♂	♀
End of body to eye	28	43	45	46	55	32
End of body to mantle-margin	19	32	40	41	45	28
Eye to dorsal web	27	27	50	57	40	32
Breadth of body	26	23	35	42	48	28
Breadth of head	21	20	24	33	45	24
1st right arm	137	—	—	175+	395	225
1st left arm	145	196	250	270	360	185
2nd right arm	133	170	240	245	325+	205
2nd left arm	128	146+	—	260	—	175
3rd right arm	62	83	220	170+	235	190
3rd left arm	105	153	220	200	300	160
4th right arm	90	137	210	225	215+	170
4th left arm	87	148	—	200	—	170
Hectocotylus	3	—	—	—	—	—
Web between 1st arms	—	—	34	50	38	40
Web between 1st and 2nd arms, right	—	—	30	50	55	37
Web between 1st and 2nd arms, left	—	—	30	50	47	35
Web between 2nd and 3rd arms, right	—	—	27	32	60	40
Web between 2nd and 3rd arms, left	—	—	25	37	47	35
Web between 3rd and 4th arms, right	—	—	30	37	30	36
Web between 3rd and 4th arms, left	—	—	20+	32	45	30
Web between 4th arms	—	—	20	35	37	28
Length of funnel	17	15	28	25	—	25
Diameter of largest sucker	3	5	6	9	13	4
Number of gill-filaments on each demibranch ..	—	—	—	9	—	9
Length of penis	—	—	—	9	—	—
Arm-formula	1.2.4.3 1.2.3.4	1.2.3.4	1.2.3.4	1.2.3=4	1.2.3.4	1.2.3.4 1.2.4.3
Web-formula	—	—	A.B=D.C.E.	A=B.C.E.D	B=C.D.A.E	A.B=C.D.E
Indices :—						
Width-index	93	53·5	78	91	87	87·5
Interocular-index	75	46·5	53·5	72	82	75
Web-index	—	—	13·6	18·5	15·2	17·8
Sucker-index	10·7	11·6	13·3	19·6	23·5	12·5
Hectocotylus-index	4·8	—	—	—	—	—

Description.—The first two specimens have already been described by Massy, the third one has been mentioned but not described.

a. The body of this specimen is very much compressed and does not show the characteristic elongate shape of *O. macropus*; it is more saccular. The skin is finely granulated. The web, although rather shallow, is continued along the arm-sides, as well developed membranes. The hectocotylus is rather short. Owing to its contracted state the web could not be measured.

b. This animal has the characteristic shape, but is in a very poor condition.

c. The body of this female specimen is more saccular than the typical *O. macropus*, it is weakly rugose on its dorsal surface. The funnel is free for about half its length; the limbs of the funnel-organ are very slender. The web forms large membranes along the arm-sides. The



TEXT-FIG. 8.—*Octopus macropus* Risso. Radula, (No. M 10308/2): ×96.

radula of this specimen (text-fig. 8) is characterised by the absence of entocones in most of the rhachidian teeth, and only here and there the entocones are present.

d. These specimens correspond with specimen *c*, but their shape is more saccular. The skin-sculpture is very weak, consisting of numerous small, pointed granules covering the dorsal surface of mantle and head. The dorsal arms are very stout. In the males some of the suckers on the dorsal and dorso-lateral arms are abruptly enlarged. In both males the hectocotylus is mutilated. The rather shallow web is continued on the arm-sides as large membranes. The funnel of all three specimens is almost completely fused with the head, but the contracted state of the animals indicates that this may possibly be due to contraction. The funnel-organ is poorly preserved. The colour of the animals is more or less reddish-brown on the dorsal surface.

Octopus (Octopus) areolatus Orbigny, 1840.

1840. *Octopus areolatus*, Orbigny, in Férussac et d'Orbigny, *Hist. Nat. gén. et part. des Céphal acét.*, p. 65.

1916. *Polypus areolatus*, Massy, *Rec. Ind. Mus.* XII, p. 193.

1929. *Octopus* (*Octopus*) *areolatus*, Robson, *Monograph* I, p. 122, pl. vii, fig. 1, text-figs. 36, 37.

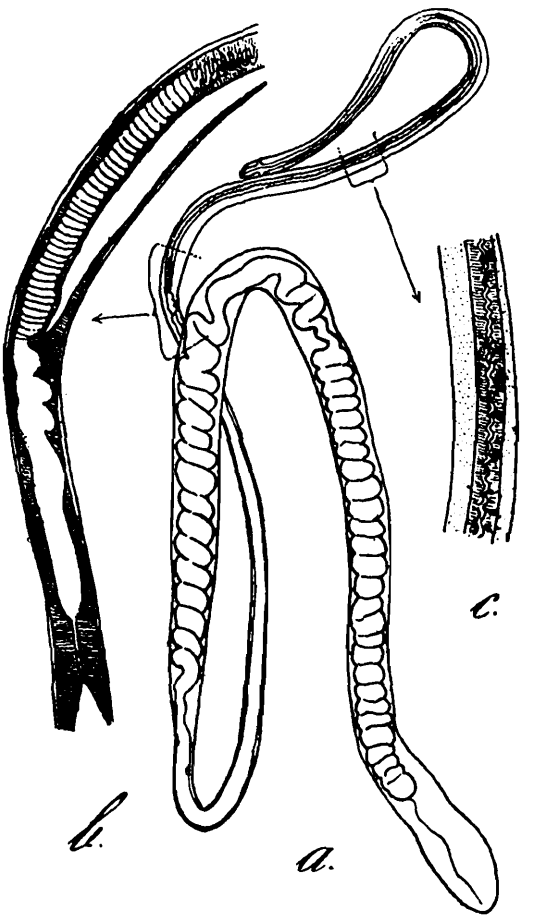
Specimens examined.—*a*. Gulf of Martaban, 14° 46′N.,95° 52′E., 61 fathoms, 7.iii.1904 : 1 ♂ (No. M 3272/1) (=Massy 1916 : No. M 8272/1); *b*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel (P. V. Lady Fraser), February-March 1928 : 1 ♂.

Measurements (*in millimetres*).

	a	*b*
Sex	♂	♂
End of body to eye	25	33
End of body to mantle-margin	20	—
Eye to dorsal web	11	25
Breadth of body	19	24
Breadth of head	13	15
1st right arm	44	60
1st left arm	39	60
2nd right arm	49	60+
2nd left arm	52	70
3rd right arm	45	65
3rd left arm	58	78
4th right arm	61	70
4th left arm	56	70
Hectocotylus	6	6
Web between 1st arms	10	13
Web between 1st and 2nd arms, right	12	15
Web between 1st and 2nd arms, left	12	14
Web between 2nd and 3rd arms, right	12·5	20
Web between 2nd and 3rd arms, left	12·5	20
Web between 3rd and 4th arms, right	12	—
Web between 3rd and 4th arms, left	12	—
Web between 4th arms	12	—
Length of funnel	8	11
Diameter of largest sucker	2	3·5
Diameter of ocellus, right	5	5·5
Diameter of ocellus, left	5	5
Distance between centre of ocellus and eye, right	9	14
Distance between centre of ocellus and eye, left	9	12
Distance between centre of ocellus and web, right	9	7
Distance between centre of ocellus and web, left	8·5	6
Length of penis	6·4	9·5
Number of gill-filaments in each demibranch	9	10
Arm-formula	4.2.3.1	3.4=2.1
Web-formula	C.B=D=E.A	—
Indices :		
Width-index	76	73
Interocular-index	52	45·5
Web-index	20·5	25·5
Sucker-index	8	10·6
Hectocotylus-index	13	9·2
Ocellus-index	20	16·6

Description.—

a. This specimen has been very well described by Massy (p. 194) and it is only necessary to add a few complementary remarks and give its measurements. The suckers are rather small. The limbs of the



TEXT-FIG. 9.—*Octopus areolatus* Orbigny. Spermatophore, (No. M 3272/1). *a.* ×18; *b.* and *c.* ×68.

W-shaped funnel-organ are slender. The spermatophore (text-fig. 9) is very slender, its fore-end is not well enough preserved to be figured in detail.

b. This animal corresponds fairly well with the first one. The dorsal surface of mantle, head and web are weakly granular. Above each eye is a big cirrhus. The ocelli are situated nearer to the web-margin. The suckers are strongly contracted. The penis is very long. The W-shaped funnel-organ has slender limbs. The hectocotylus corresponds with Massy's description, but the central furrow of the ligula is deeper and lacks transverse grooves.

Remarks.—Although *O. areolatus* and *O. ocellatus* are very closely related, the specimens before me certainly belong to the first species. The opinion of Tyron (1879, p. 272) that *O. areolatus* should be identical with *O. lunulatus* is probably based on d'Orbigny's statement that *O. areolatus* "pourrait bien être le même que l'*O. lunulatus* Quoy" But without any doubt these species have nothing to do with each other. I agree with Robson's opinion that *O. pulcher* is probably identical with *O. areolatus*. The differences which Ortmann (1888) enumerates between

his *O. brocki* and *O. areolatus* are insignificant and I agree with Robson (1929) that these species are identical.

I am not at all certain about the identity of *O. fang-siao* Sasaki and *O. areolatus*, but for the moment I am unable to offer any definite opinion.

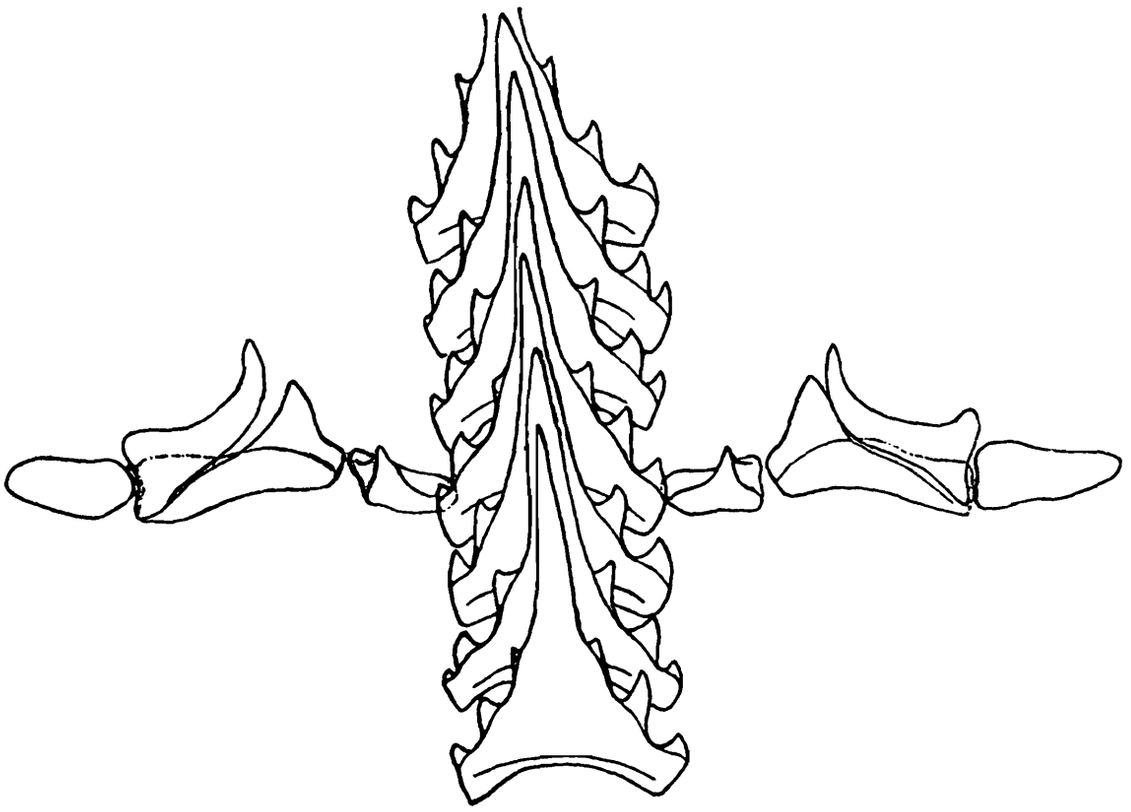
Octopus (Octopus) fusiformis Brock, 1887.

1887. *Octopus fusiformis*, Brock, *Zool. Jahrb.* II, p. 601, pl. xvi, figs. 1, 2.
1916. *Polypus fusiformis*, Massy, *Rec. Ind. Mus.* XII, p. 203.
1929. *Octopus (Octopus) fusiformis*, Robson, *Monograph* I, p. 132.

Specimens examined.—Palk Straits, south of India: 2 ♀ (No. M 8232-3/1)

Description.—These two female specimens are very well described by Massy so that I only need to give some complementary information.

The web is strongly contracted and cannot be properly measured. It is not continued on the arm-sides. The ventral surface of the animals does not show any trace of the reticulate pattern of the type reported by Brock. The gill has about 12 filaments in each demibranch. The funnel-organ is badly preserved but in the larger specimen it resembles that of *O. teuthoides* Robson (1929, fig. 42). The radula (text fig. 10. is very peculiar and represents a type very uncommon among Octopodinae *O. dofleini* Wülker seems to have the same rhachidian denticulation (*vide*



Text-fig. 10.—*Octopus fusiformis* Brock. Radula, (No. M 8232/1): ×47.

Sasaki, 1929, fig. 35). The rhachidian teeth are all multicuspid, each side bearing two endocones and one ectocone. These are arranged symmetrically and show a regular seriation. In every fourth tooth an inner endocone appears which in the following teeth moves laterally, in the fourth tooth

it becomes the outer endocone, in the seventh ectocone and in the tenth it disappears completely. I do not know any species of Octopodinae showing exactly the same type of rhachidian teeth. But having examined only one specimen I cannot state if this type is common for *O. fusiformis*.

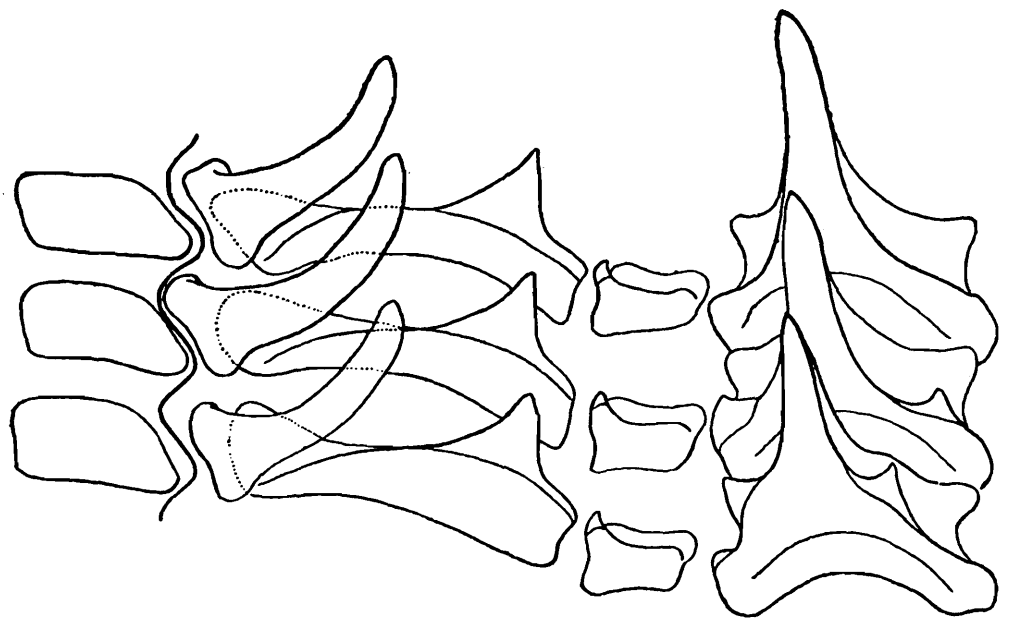
If a detailed study of the internal anatomy of this species reveals other distinguishing characters it will perhaps be necessary to change its generic position. *Octopus teuthoides*, which by its external shape appears closely related, has a completely different radula (*vide* Adam, 1934, fig. 11).

Octopus (Octopus) defilippi Vérany, 1851.

1851. *Octopus Defilippi*, Vérany, Moll. Méditerr. I, p. 30, pl. xi, figs. D, F.
1916. *Octopus defilippi*, Massy, *Rec. Ind. Mus.* XII, p. 196.
1929. *Octopus* (*Octopus*) *defilippi*, Robson, *Monograph* I, p. 135, text-figs. 45-49.

Specimens examined.—Mergui Archipelago, shore collecting, 25.i.1913 ("Investigator" station 503): 1 ♂ (No. M 8154/1).

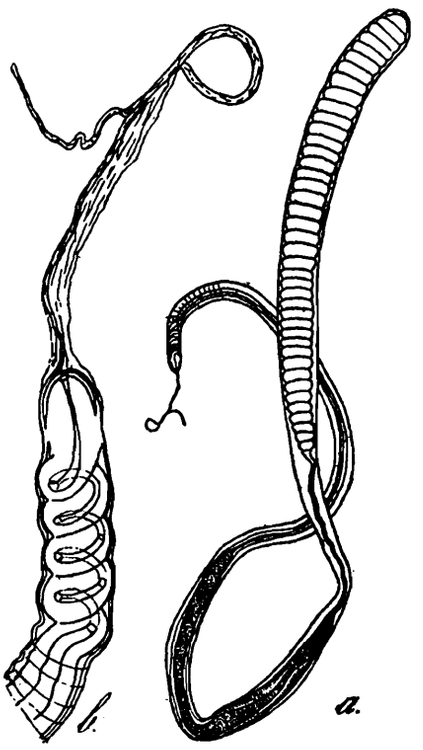
Description.—This specimen has been described in detail by Massy. However, it is desirable to give some complementary information. The web is very shallow, its deepest section measuring only 8·6 per cent. of the longest arm; the formula is D.C.A.=B.E. The penis is long (8 mm.) measuring 25 per cent. of the dorsal mantle length. The mantle is elongate ovoid, its shape resembling rather *O. defilippi* var. *dama*. The radula (text-fig. 11) differs from that of the type in having well



TEXT-FIG. 11.—*Octopus defilippi* Verany. Radula, (No. M 8154/1): ×225.

developed ectocones on the rhachidian teeth, with a symmetrical seriation (A3), and a well developed internal heel in the second lateral. In

this respect it resembles the radula of var. *dama* Robson (1929, p. 137, fig. 46*a*) The spermatophore is shown in text-figure 12.



TEXT-FIG. 12.—*Octopus defilippi* Verany. Spermatophore, (No. M 8154/1). *a.* ×12; *b.* ×73.

Remarks.—In several characters this specimen corresponds more with the var. *dama* than with the typical form. But until more specimens from the Indian Ocean are available, I prefer not to give a separate name to this elongate form.

Octopus (Octopus) niveus Lesson, 1830.

(Plate I, fig. 1).

1826. *Octopus niveus*, Orbigny (Tabl. Méthod. Class. Céphal.)—*Ann. Sci. Nat.* (1) VII, p. 144 (*nomen nudum*).

1830. *Octopus niveus*, Lesson, *Voy. Coquille, Zool.* II, p. 239, pl. i, i *bis*.

1840. *Octopus aculeatus*, Orbigny, *Hist. Nat. gén et part. Céphal. acét.*, p. 53, pls. vii, vii, xxiii.

1896. *Octopus aculeatus*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 20.

1896. *Octopus macropus*, Goodrich (*pars*), *ibidem*, p. 20.

1916. *Polypus aculeatus*, Massy, *Rec. Ind. Mus.* XII, p. 191.

1929. *Octopus* (*Octopus*) *niveus*, Robson, *Monograph* I, p. 141, text-figs. 50*a*, *b*.

1937. *Octopus niveus*, Adam, *Bull. Mus. Roy. Hist. Nat. Belgique* XIII, No. 45, p. 3, fig. 2.

1938. *Octopus* (*Octopus*) *niveus*, Adam, *ibidem*, XIV, No. 7, p. 9, fig. 6B.

Specimens examined.—*a*. Little Cocos Island : 1 ♂ (M363/1) ; Andamans : 5 ♂, 4 ♀ (M 364-9/1 ; 371-3/1) ; *c*. Malacca Straits : 1 juv. (M 374/1) ; *d*. Andamans : 1 juv. (M 380/1) (pl. I, fig. 1) ; *e*. Malacca Straits : 1 ♂ (M 381/1) ; *f*. Byikhwaaw Bay, Burma, 25.viii.1911 : 1 ♂ (M 8101/1) : *g*. ? Burma, from coral reef : 5 ♂ (M 8243-4/1) ; *h*. Andamans ; 3 ♂, 1 juv. (M 12101-4/2).

Measurements (in millimetres).

	a	*b*¹	*b*²	*b*³
Sex	♂	♂	♀	♂
End of body to eye	30	30	46	31
End of body to mantle-margin	20	25	36	34
Eye to dorsal web	15	15	27	17
Breadth of body	20	21	30	21
Breadth of head	15	20	21	20
1st right arm	100	135	175	150
1st left arm	90	120	—	—+
2nd right arm	115	143	—	160
2nd left arm	85	153+	—	—
3rd right arm	120	168	—	170
3rd left arm	85	—	—	—
4th right arm	135	190	245	150+
4th left arm	120	155	240	—
Hectocotylus	1·5	4	—	3
Web between 1st arms	12	15	—	12
Web between 1st and 2nd arms, right	18	17	—	21
Web between 1st and 2nd arms, left	16	18	—	—
Web between 2nd and 3rd arms, right	23	21	—	21
Web between 2nd and 3rd arms, left	16	—	—	—
Web between 3rd and 4th arms, right	21	18·5	—	18
Web between 3rd and 4th arms, left	19	—	—	—
Web between 4th arms	20	16	—	14
Length of funnel	—	15	24	13
Funnel-organ	W	W	W	W
Diameter of largest sucker	6	5	4·5	4·5
Number of gill-filaments in each demi-branch	6	6	6	6
Length of penis	—	7	—	8
Arm-formula	4.3.2.1	4.3.2.1	—	—
Web-formula	E.D.B=C.A	C.D.B.E.A	—	B=C.D.E.A
Indices:				
Arm-index (=longest arm : mantle-length)	4·5	6·3	5·3	5·5
Width-index	66·5	70	65	68
Interocular-index	50	66·5	45·5	64·5
Web-index	14·8	11	—	12·4
Sucker-index	20	16·7	9·8	14·5
Hectocotylus index	1·2	2·4	—	1·8

	*b*⁴	*b*⁵	*b*⁶	*b*⁷
Sex	♂	♂	♂	♀
End of body to eye	30	18·5	30	20
End of body to mantle-margin	21	13	21	16
Eye to dorsal web	18	10	16	9
Breadth of body	20	14	20	19
Breadth of head	18	11·5	17	13·5
1st right arm	135	60	80+	90
1st left arm	—	60	140	100
2nd right arm	—	80	80	100
2nd left arm	—	75	—	120
3rd right arm	150	—	155	—
3rd left arm	—	75	—	85
4th right arm	175	—	—	—
4th left arm	—	80	140	120
Hectocotylus	3	—	2·8	—
Web between 1st arms	13	10	—	10
Web between 1st and 2nd arms, right	15	—	—	16·5
Web between 1st and 2nd arms, left	—	13	—	15·5
Web between 2nd and 3rd arms, right	17·5	—	—	19
Web between 2nd and 3rd arms, left	—	15	—	17
Web between 3rd and 4th arms, right	15	—	—	21
Web between 3rd and 4th arms, left	—	15	—	18·5
Web between 4th arms	13	8		16·5
Length of funnel	—	—	—	—
Funnel-organ	—	—	—	—
Diameter of largest sucker	5·5	2	—	2·2
Number of gill-filaments in each demi-branch	—	—	—	—
Length of penis	—	—	—	—
Arm-formula	4.3.2.1?	4.3=2.1	—	2=4.1.3
Web-formula	C.B=D.A=E	C=D.B.A.E	—	D.C.E.B.A
Indices:				
Arm-index (=longest arm : mantle-length)	5·8	4·3	5·2	6
Width-index	66·5	75·5	66·5	95
Interocular-index	60	62	56·5	67·5
Web-index	10	20	—	17·5
Sucker-index	18·3	10·8	16·6	11
Hectocotylus index	2	—	—	—

Measurements (in millimetres).

	b[1]	*b*[2]	*c*	*d*
Sex	♀	♀	juv.	juv.
End of body to eye	18	18	9	11
End of body to mantle-margin	15	13·5	6·5	8
Eye to dorsal web	12	13	—	6
Breadth of body	16·5	14	6·5	9
Breadth of head	13	10	6	8
1st right arm	52	35+	18	35
1st left arm	65	65	—	—
2nd right arm	115	65	32	46
2nd left arm	95	85	20	48
3rd right arm	120	75	26	63
3rd left arm	—	80	30	62
4th right arm	112	75	29	58
4th left arm	115	75	—	58
Hectocotylus	—	—	—	—
Web between 1st arms	12·5	10	—	7
Web between 1st and 2nd arms, right	16	—	—	8
Web between 1st and 2nd arms, left	15	13	—	8
Web between 2nd and 3rd arms, right	20	—	—	11·5
Web between 2nd and 3rd arms, left	15	17	—	10·5
Web between 3rd and 4th arms, right	20	—	—	9
Web between 3rd and 4th arms, left	14	17	—	10·5
Web between 4th arms	17·5	12	—	9
Length of funnel	—	—	—	4
Funnel-organ	—	—	—	—
Diameter of largest sucker	2	2	—	1
Number of gill-filaments in each demi-branch	—	—	—	6
Length of penis	—	—	—	—
Arm-formula	3.2=4.1	2.3.4.1	2,3.4.1	3.4.2.1
Web-formula	C=D.E.B.A	C=D.B.E$_{2}$A	—	C$_{2}$D.E.B.A
Indices:				
Arm-index (=longest arm : mantle-length)	6·7	4·7	3·3	5·7
Width-index	92	78	72	82
Interocular-index	72	55·5	67	73
Web-index	16·7	20	—	16·6
Sucker-index	11·1	11·1	—	9·1
Hectocotylus index	—	—	—	—

	e	*f*	*g*[1]	*g*[2]
Sex	♂	♂	♂	♂
End of body to eye	23	18	31	32
End of body to mantle-margin	17	11	17	22
Eye to dorsal web	10	12	22	24
Breadth of body	16	14	21	24
Breadth of head	13	10	15	20
1st right arm	—	57	110+	157
1st left arm	100	63	130	156
2nd right arm	160	80+	141	184
2nd left arm	80	98	147	210
3rd right arm	55	80	127	156
3rd left arm	110	62+	168	223
4th right arm	—	—	137	172
4th left arm	—	82	163	182
Hectocotylus	1·3	1·25	2·5	2·25
Web between 1st arms	—	—	17	—
Web between 1st and 2nd arms, right	—	—	21	—
Web between 1st and 2nd arms, left	—	—	20	—
Web between 2nd and 3rd arms, right	—	—	19	—
Web between 2nd and 3rd arms, left	—	—	23	—
Web between 3rd and 4th arms, right	—	—	16	—
Web between 3rd and 4th arms, left	—	—	18	—
Web between 4th arms	—	—	18	—
Length of funnel	10	6	13	11
Funnel-organ	—	—	—	W
Diameter of largest sucker	2·2	1·5	4	5
Number of gill-filaments in each demi-branch	6	—	6·7	6
Length of penis	6	—	6	6
Arm-formula	—	—	3.4.2.1	3.2.4.1
Web-formula	—	—	C.B.D=E$_{2}$A	—
Indices:				
Arm-index (=longest arm : mantle-length)	4·8?	5·4	5·4	7
Width-index	69·5	78	68	75
Interocular-index	56·5	55·5	48·5	62·5
Web-index	—	—	13·7	—
Sucker-index	9·6	8·3	12·9	15·6
Hectocotylus index	2·4	1·6	2	1·4

Measurements (in millimetres).

	g^3	h^1	h^2	h^3	h^4
Sex	♂	♂	♂	♂	juv.
End of body to eye	27	22	21	26	7
End of body to mantle-margin	17	18	20	23	5
Eye to dorsal web	18	13	10	12	5
Breadth of body	18	14·5	12·5	11	5
Breadth of head	15	13	10	11·5	5·5
1st right arm	—	97	75	105	10
1st left arm	130	90	75	90	14
2nd right arm	175	155	100	120	19
2nd left arm	—	—	100	120+	21
3rd right arm	140	70	50	45	—
3rd left arm	170	125+	—	170	19
4th right arm	195	170	160+	140	23
4th left arm	110+	190	85+	155	23
Hectocotylus	3	2·2	1	1·5	—
Web between 1st arms	14	22	9	—	—
Web between 1st and 2nd arms, right	15	13	11·5	—	—
Web between 1st and 2nd arms, left	14	13	9·5	—	—
Web between 2nd and 3rd arms, right	18	14	17	—	—
Web between 2nd and 3rd arms, left	23	14	13	—	—
Web between 3rd and 4th arms, right	14	15	17	—	—
Web between 3rd and 4th arms, left	21	13·5	14·5	—	—
Web between 4th arms	11	13·5	18	—	—
Length of funnel	14	11	10	10	—
Funnel-organ	W	—	—	W	—
Diameter of largest sucker	4	2·2	3	2·5	—
Number of gill-filaments in each demibranch	—	7	—	6	—
Length of penis	—	4·4	—	9	—
Arm-formula	4.2.1.3	—	—	3.4.2.1	4.2.3.1
Web-formula	C.D.A.=B.E	C.D=E.B.A	E.D.C.B.A	—	—
Indices:					
Arm-index (=longest arm : mantle-length)	7·2	8·6	7·6?	6·5	3·3
Width-index	66·5	66	59·5	42·5	71
Interocular-index	55·5	59	47·5	44	78·5
Web-index	11·8	7·9	11·2	—	—
Sucker-index	14·8	10	14·3	9·6	—
Hectocotylus index	2·1	3·1	2	3·3	—

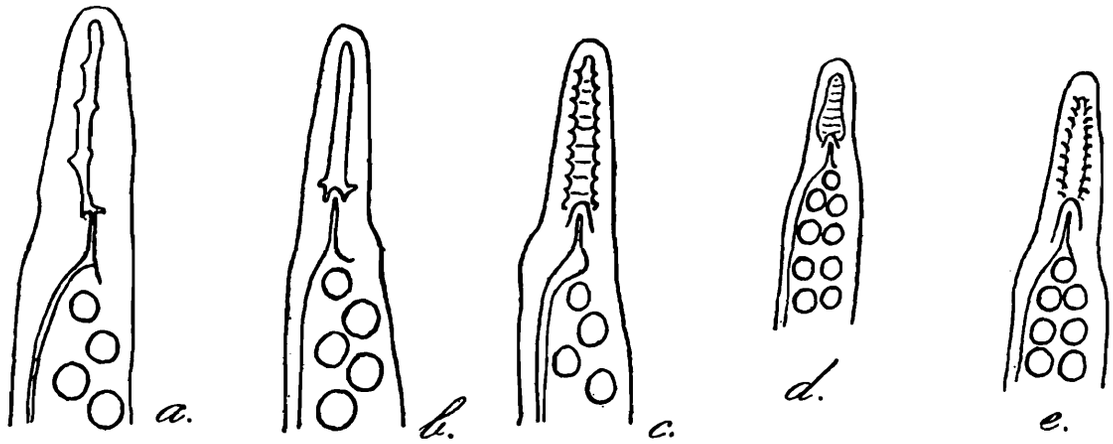
Description—

a. This male specimen, which is probably the one identified by Goodrich as *Octopus aculeatus*, is well preserved. The body is strongly rugose, of a greyish colour. On the dorsal surface of mantle, head, web and arms are big cirrhi which show about the same disposition as in *O. horridus*. The abruptly enlarged suckers of the right lateral arms are much larger than those of the left arms. Mantle-opening rather narrow. Funnel-organ W-shaped. Gill-filaments only 6 in each demibranch. Web very low, but forming large membranes along the arm-sides, especially on the ventral side. Hectocotylus very small.

b^1. A well preserved male specimen of dark-greyish colour more or less reticulated on mantle, web and arms. Skin granulation as in the foregoing specimen. Although the general appearance and colouration resemble *O. horridus* the animal differs from this species by its abruptly enlarged suckers on the lateral arms and the funnel-organ of the same slender shape as in *O. niveus*. The hectocotylus is shown in text-figure 13*a*.

b^2. A big female specimen with practically all the arms mutilated, but with the web continued on the arms as large membranes, especially, on their ventral side. Body slate-coloured with poorly developed cirrhi except on head, web and arms. Funnel free for more than half its length.

b[3]. A nearly black-coloured male specimen which agrees with the foregoing ones. Its suckers are not abruptly enlarged on the lateral arms. Mantle-opening rather narrow. Hectotylus very small (text-fig. 13*b*) with deep median furrow without transverse grooves. The very long and slender spermatophore is illustrated in text-figure 14.



TEXT-FIG. 13.—*Octopus niveus* Lesson. Hectocotyli: ×8.
a. No. M 364/1; *b*. M 366/1; *c*. M 367/1; *d*. M 381/1; *e*. M 12101/2.

b[4]. A dark grey male specimen corresponding with the foregoing one. The seminal channel of the third right arm strongly transversely striated. Suckers not abruptly enlarged in lateral arms. Hectocotylus (text-fig. 13*c*) with well developed central furrow and transverse ridges.

b[5]. A dark brown male specimen with poorly developed cirrhi and strongly rolled-up arms. Suckers not abruptly enlarged in lateral arms. Third right arm regenerated with an indication of a new ligula.

b[6]. Very dark-coloured male specimen with mutilated web and abruptly enlarged suckers on third right arm.

b[7]. This female specimen with bursiform body has the arms strongly rolled up. On the dorsal surface of mantle and arms a faint reticulation around the cirrhi (as in *O. horridus*). Arm membranes of web very large, up to 7 mm.

b[8]. Dark-coloured bursiform female specimen with strongly rugose head and rolled-up arms.

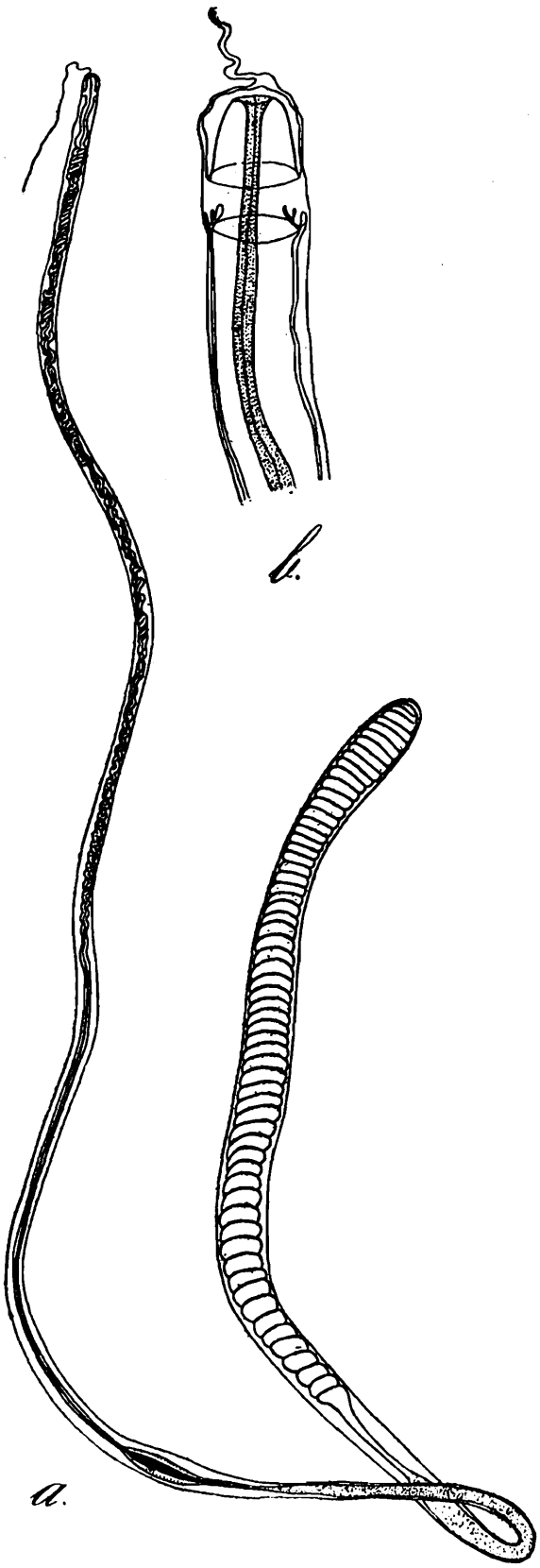
b[9]. Bursiform female with badly preserved skin, very large arm-membranes and strongly rolled-up arms.

All these Andaman-specimens are probably those mentioned by Goodrich (1896).

c. This very young specimen shows the same cirrhi-pattern on the dorsal mantle-surface as the foregoing ones and resembles in this respect *O. horridus*. On the ventral mantle surface are a number of big black chromatophores. The eyes are very prominent and the web-membranes well developed.

d. This young specimen (Pl. I, fig. 1) was labelled "*Polypus macropus*" and is perhaps one of the specimens which Goodrich (1896) referred "with considerable doubt" to this species. But it has nothing to do with *O. macropus* and agrees very well with *O. niveus*. The shape and sculpture of the body are best demonstrated by plate I, fig. 1. The arms are strongly rolled up and the web-membranes, although rather

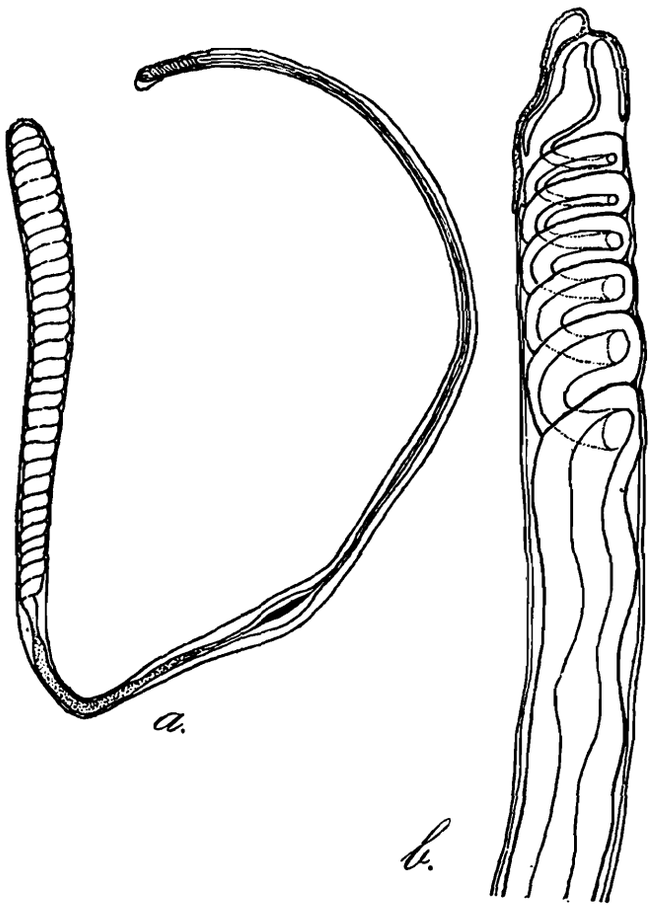
delicate, are well developed, especially along the ventral arm sides, up to the arm tips. The funnel is free for about $\frac{1}{3}$ of its length. The



TEXT-FIG. 14.—*Octopus niveus* Lesson. Spermatophore, (No. M 366/1). *a.* ×18; *b.* ×170.

funnel-organ has slender limbs. Ventrally the body is swollen with a median furrow. Mantle-opening narrow. The colour pattern which is characteristic for *O. horridus* is not visible but the cirrhi have about the same arrangement.

e. This male specimen also had been labelled "*Polypus macropus*" It is in a rather poor condition. Suckers not abruptly enlarged on lateral arms. Hectocotylus very small (text-fig. 13*d*) with the ligula distinctly transversely striated. The spermatophore (text-fig. 15) is not so long



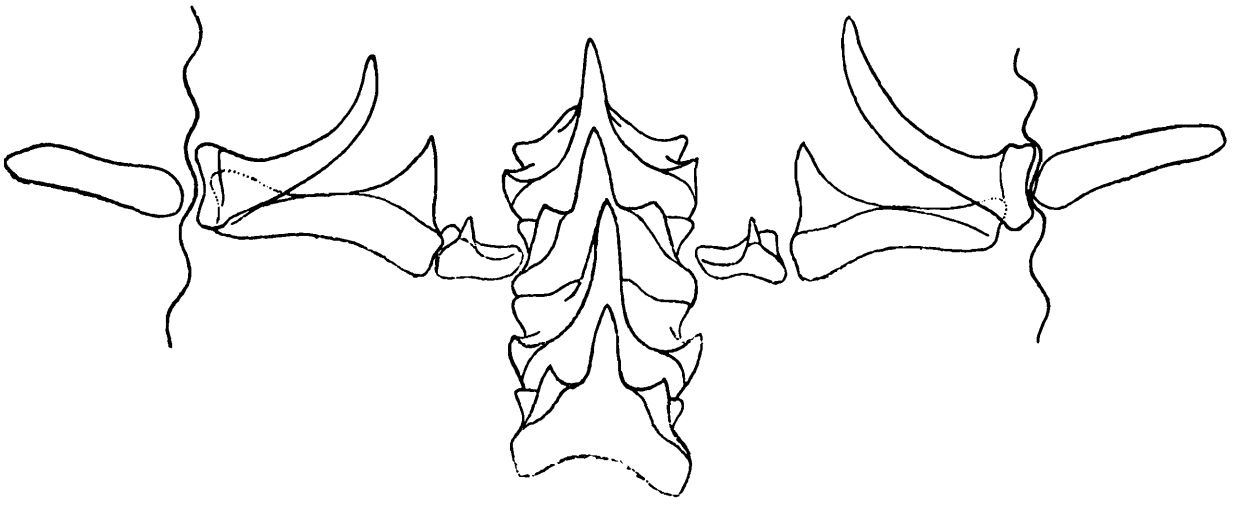
TEXT-FIG. 15.—*Octopus niveus* Lesson. Spermatophore, (No. M 381/1). *a.* ×20; *b.* ×90.

and slender as that of No. M 363/1 (text-fig. 14) and differs in some details, but this may be due to a difference in sexual development of the animals.

f. & *g.* These animals have been described in detail by Massy (1916). I have only given some complementary measurements. The funnel-organ is not definitely W-shaped, as Massy states, but is as in Robson's figure (fig. 50*a*). Massy compared these specimens with the type of *O. aculeatus* (=*O. niveus*) and stated the close resemblance of them. In 1937 I already published a note on the curious anomaly of specimen No. M 8244/1, *viz.*, the possession of two gills on the right side. The radula of No. M 8245/1 is figured in text-figure 16. The rhachidian teeth have a symmetrical (A_2) seriation with in all teeth only one pair of ectocones (never endo- and ectocones in the same tooth). This corresponds with the radula of *O. horridus* which I figured in 1934 (p. 19, fig. 9). In other details also the radula of *O. niveus* resembles that figure, but the marginal plates are larger.

h. These four animals had been labelled "*Polypus macropus*". They show a more or less *horridus*-pattern of colour and cirrhi, but do not differ in other respects from the foregoing specimens. All have the small number of gill-filaments, shallow web with large arm-membranes, small hectocotylus and very long arms (except in the young

specimen). Funnel-organ with slender limbs as in *O. niveus*. The hectocotylus of No. M 12101/2 is shown in text-figure 13*e*; it has a deep median furrow with crenulated borders. In No. M 12101/2 the ink-sac is well developed.



TEXT-FIG 16.—*Octopus niveus* Lesson. Radula, (No. M 8245/1): ×97.

Remarks.—In general all the above-described specimens agree in having a more or less bursiform body, narrow head, very long arms (except in young specimens) of which the dorsal ones usually are shortest, shallow web of which the dorsal sector generally is lowest. One of the lateral web-sectors is usually the deepest. The web continues especially on the ventral arm-sides, forming wide membranous expansions. Mantle-opening rather narrow. Funnel-organ W-shaped with slender limbs. Usually rather long hectocotylized arm with very small terminal organ which is more or less transversely striated or ridged. Rather small number of gill-filaments. In some male specimens the suckers of the lateral arms are abruptly enlarged and exceed those of the females in diameter. In well preserved specimens the dorsal surface shows a number of large cirrhi which are arranged similar to those of *O. horridus*.

In most of the above-mentioned characters these specimens very closely resemble *O. niveus*, but there is also a certain resemblance with *O. horridus* (globular body, long arms, shallow web, narrow mantle-opening, small number of gill-filaments, radula, small ligula) especially in the similar colour-pattern of some of the specimens.

Comparing Robson's descriptions of the two species (1929, pp. 91, 141) I find only very small differences:

i. The suckers of *O. horridus* are rather large, but not abruptly enlarged in the male. This character depends very much on the state of contraction in preserved specimens. In the present material I have found males with and without enlarged suckers on the lateral arms, or even with enlarged suckers on only one of the arms.

ii. The hectocotylized arm of *O. horridus* is rather shorter than its partner. As will be seen from my table of measurements, the third right arm of the males is nearly always more or less shorter than the left one; only in one case (*a*) it is longer.

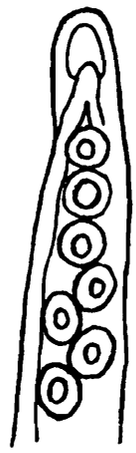
I have come to the conclusion that the principal difference between the two species is the characteristic colour-pattern of *O. horridus*. But, as Robson himself states that "This feature is sometimes obscured by a general darkening of the ground colour, which in these circumstances tends to pass into the patches. Very exceptionally the whole surface is uniformly dark brown," this character loses much of its specific value. In view of the above I am greatly inclined to consider these two species as specifically identical, but I do not want to take a final decision without examining the types.

Octopus (Octopus) arborescens (Hoyle, 1904).

1904. *Polypus arborescens*, Hoyle, *Rep. Pearl Fish. Gulf Manaar.* II, Suppl. Rep. XIV, p. 189, pl. ii, figs. 8, 9, 12; pl. iii.
1916. *Polypus arborescens*, Massy, *Rec. Ind. Mus.* XII, p. 207.
1929. *Octopus (Octopus) arborescens*, Robson, *Monograph* I, p. 151.
1938. *Octopus (Octopus) arborescens*, Adam, *Bull. Mus. Roy. Hist. Nat. Belgique* XIV, No. 7, p. 11, figs. 5 B-C, 4.

Specimens examined.—Pearl Banks, Ceylon: 1 ♂ (No. M 8234/1).

Remarks.—This animal has been well described by Massy (1916) and in 1938 I have already given some complementary information about it in comparison with a specimen from the Andamans (in the text of this publication is a typographical error: the ligula of the hectocotylus is not 26 per cent. of the third arm, but 3·8 per cent. as stated in the table of measurements). The hectocotylus of the Pearl Banks-specimen is shown in text-figure 17



TEXT-FIG. 17.—*Octopus arborescens* Hoyle. Hectocotylus, (No. M 8234/1): ×23.

Octopus (Macrotritopus) bandensis (Hoyle, 1885).

1885. *Octopus bandensis*, Hoyle, *Ann. Mag. Nat. Hist.* (5) XV, p. 227.
1886. *Octopus bandensis*, Hoyle, *Challenger Report* XVI, p. 96, pl. vii, figs. 9, 10.
1916. *Polypus bandensis*, Massy, *Rec. Ind. Mus.* XII, p. 201.
1929. *Octopus (Macrotritopus) bandensis*, Robson, *Monograph* I, p. 170.

Specimen examined.—"Investigator" station 152, 11½ miles S. 83°W. of Colombo Lt., 26½ fathoms, 12.xii. 1893: 1♀.

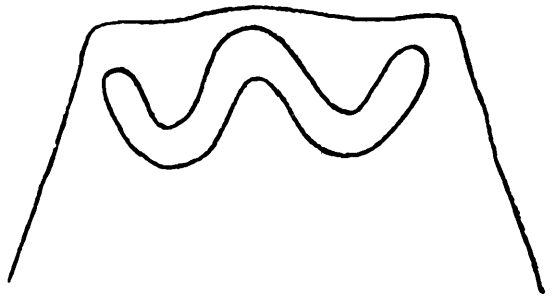
Description.—This specimen already well described by Massy is a female with strongly developed nidamental glands. The gill has about 10 filaments in each demibranch. The funnel-organ resembles that of *Octopus elegans* Brock figured by Robson (1929, fig. 62).

? **Paroctopus hongkongensis** (Hoyle, 1886).

1885. *Octopus hongkongensis*, Hoyle, *Ann. Mag. Nat. Hist.* (5) XV, p. 224.
1916. *Polypus hongkongensis*, Massy (*pars*), *Rec. Ind. Mus.* XII, p. 197.
1929. *Paroctopus hongkongensis*, Robson, *Monograph* I, p. 199.

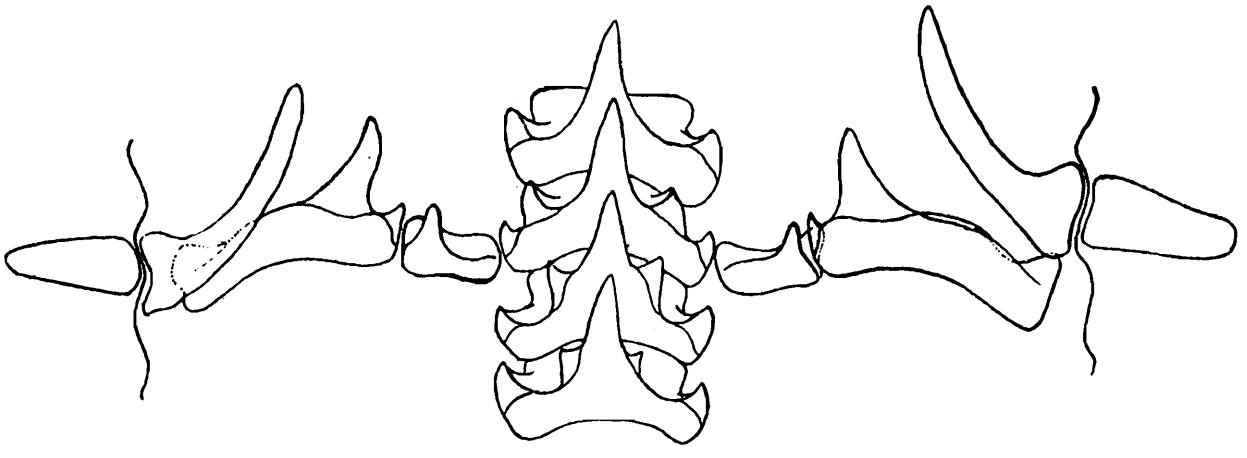
Specimen examined.—" Investigator " station 465, S. of Ceylon, 5°56′ N., 81°22′E., 109-132 fathoms, 22. iv. 1912 : 1♀ (No. M 8147/1).

Description.—Of the two specimens which Massy described as *Polypus hongkongensis* one (No. M 8112/1) certainly does not belong to this species (see p. 106). Massy's description is not very complete. The reddish brown body is strongly rugose on the dorsal surface of the mantle, head web and arms. Above each eye are two large ocular cirrhi. Along the sides of the mantle are numerous long warts exactly as in *Octopus apollyon* (Berry 1912, pl. xxxvi, fig. 1). The body is saccular, being nearly as broad as long (index 81 per cent.), the head is narrower (51 per cent.). The arms attain about 75 per cent. of the total length and are in the order 3·4=2·1 (right) or 3.2.1.4 ? (left). The suckers are relatively small (9.5 per cent.), but this may be due to the sex of the animal. The web has the formula C. D. E. B. A. and is very deep (28 per cent). The mantle-opening is rather wide. The funnel is free for a little less than half its length. The funnel-organ (text-fig. 18)



TEXT-FIG. 18.—*Paroctopus hongkongensis* (Hoyle). Funnel-organ, slightly enlarged.

is relatively small, its limbs measuring only 11 mm. (funnel length 25 mm.), and has about the same shape as that of *O. apollyon* (Berry 1913, p. 72, fig. 1), but with the limbs more slender. There are 10 filaments in each demibranch. The radula (text-fig. 19) has a symmetrical A3-4



TEXT-FIG. 19.—*Paroctopus hongkongensis* (Hoyle). Radula, (No. M 8147/1) : ×47.

seriation. It differs somewhat from that of the type figured by Robson (1929, fig. 80). The central tooth is less pointed, the basal plate of the first lateral not so long and thin, the second lateral with a well developed

entocone (in the type only a marked heel) and the marginal plates not so long and thin.

Remarks.—As pointed out by Robson (1929, p. 200), the position of this female specimen is not at all certain. Certain characters rather correspond with *Paroctopus apollyon* (length and order of arms, less globular body). On the other hand, the funnel-organ corresponds with that of *P. hongkongensis*. Unfortunately no male specimen is known from the Indian Ocean. Until more material from the Indian Ocean is available I prefer not to take a final decision as to the specific status of this specimen.

Sasaki (1929) has put together *Octopus punctatus* Gabb, *O. hongkongensis* of Berry and Sasaki (1920), *O. dōfleini* Wülker and *O. apollyon* Berry under name *Polypus dōfleini* Wülker, stating that Hoyle's *O. hongkongensis* from China is probably a different species. At present sufficient material is not available to justify this opinion, but I hope to be able to deal with this question at a later date.

Hapalochlaena fasciata (Hoyle, 1886).

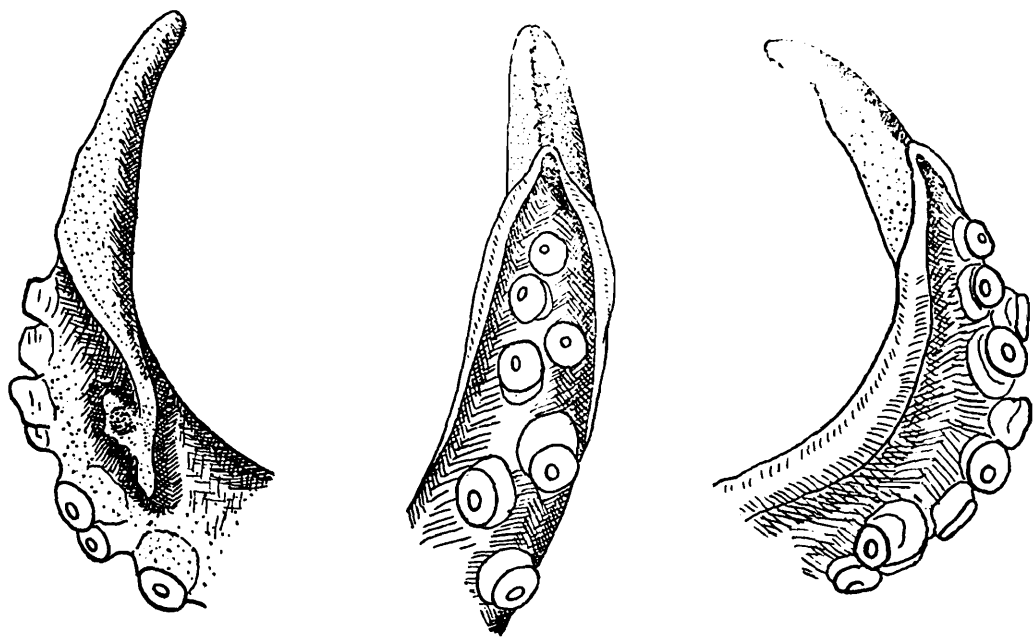
1886. *Octopus pictus* var. *fasciata*, Hoyle, *Challenger Report* XVI, p. 94, pl. viii, fig. 3.
1896. *Octopus pictus* var. *fasciata*, Goodrich, *Trans. Linn. Soc. London, Zool.* VII, p. 19, pl. v, fig. 82.
1929. *Hapalochlaena maculosa*, Robson (*pars*), *Monograph* I, p. 211.

Specimen examined.—Port Jackson : 1♂ (No. M 353/1).

Measurements (in millimetres).

Total length	±95
End of body to eye	29
Breadth of body	18
Eye to dorsal web	18
Breadth of head	14
1st right arm	37+
1st left arm	60
2nd right arm	65
2nd left arm	62
3rd right arm	48
3rd left arm	63+
4th right arm	68
4th left arm	49 (regenerated)
Hectocotylus	3·7
Web between 1st arms	11
Web between 1st and 2nd arms, right	13
Web between 1st and 2nd arms, left	13
Web between 2nd and 3rd arms, right	15·5
Web between 2nd and 3rd arms, left	15·5
Web between 3rd and 4th arms, right	15
Web between 3rd and 4th arms, left	17
Web between 4th arms	14
Length of funnel	12
Diameter of largest sucker	2
Number of gill-filaments in each demibranch	6
Length of penis	5
Arm-formula	4.2.3.1
Web-formula	D.C.E.B.A
Indices :	
Width-index	62
Interocular index	48
Arm-index ..	71
Web-index ..	25
Sucker-index	6·9
Hectocotylus-index	7·7

Description.—This specimen was recorded by Goodrich (1896). The colour-pattern corresponds with that of the type, but on the arms are found not only rings but also stripes, fused rings and other transformations of the characteristic ring-pattern. The skin is almost smooth. The streaks and rings are blackish with a pale bluish centre and placed on dark maculae. The funnel is free for about half its length, the funnel-organ W-shaped with very thick limbs. The head is narrower than the body with the eyes very little prominent. The longest arm bears 6 basal suckers placed in one longitudinal series and about 35 pairs of suckers ; the hectocotylized arm has only 5 basal and 18 pairs of suckers.



TEXT-FIG. 20.—*Hapalochlaena fasciata* (Hoyle). Hectocotylus : ×7.

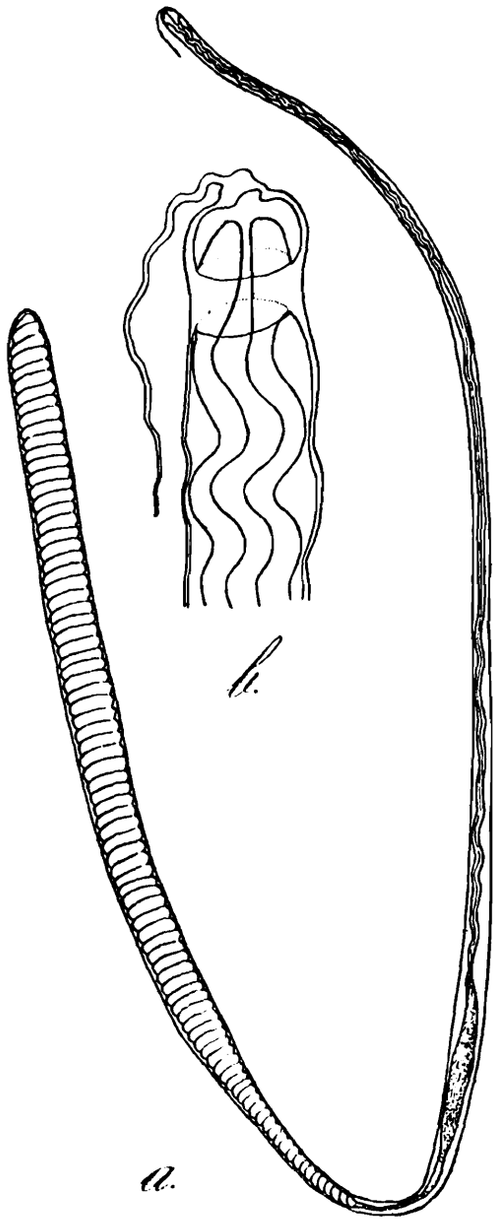
The hectocotylus (text-fig. 20) is rather small. The ligula is rounded and has only a very rudimentary median groove with some weak transverse grooves. The calamus is very well developed. On the ventral side it continues as the large seminal channel, on the dorsal side it forms also a well developed but short membrane.

The web is continued along the arms, forming wide membranes. The spermatophore is very long and slender (text-fig. 21).

Remarks.—Robson (1929, p. 211) has placed this characteristic form in the synonymy of *Hapalochlaena maculosa*, but Sasaki (1929, p. 58) is of the opinion that besides the characteristic colour-pattern *H. fasciata* differs from *Octopus pictus* (=*H. maculosa*) by " the elongated pentagonal profile of the body, long arms, different formula of their length and circum-orbital cirri." Moreover the hectocotylus is quite different. Compared with Robson's description of *H. maculosa* the differences enumerated by Sasaki seem to be rather insignificant. The body form is about the same ; the arms are short in both species, but their order is really different ; the web differs slightly in our specimen, sector A being the smallest instead of E.

The hectocotylus of our specimen differs a great deal from that figured by Robson (1929, fig. 87) for *H. maculosa*, but it differs also from the

hectocotylus of *H. fasciata* described by Sasaki (1929, p. 59) which has a rudimentary calamus.



Text-fig. 21.—*Hapalochlaena fasciata* (Hoyle). Spermatophore: *a.* ×18; *b.* ×170.

Until more material is available I prefer to keep this characteristic fasciate form separate from the typical *H. maculosa*. The small differences discussed above might, however, turn out later to be only varietal differences.

Berrya, gen. nov.

Type of the genus.—*Polypus hoylei* Berry, 1909.

Diagnosis.—Octopodines with soft body, large eyes, short stout arms, deep subequal web continued along the arms in membranous expansions, narrow mantle-opening. With funnel usually completely fused to the head, funnel-organ VV-shaped. With much reduced ink-sac, with a long and coiled duct. Hectocotylized arm short, with well developed hectocotylus of which the calamus is weakly developed, but the ligula very large with a distinct central groove, markedly inrolled

sides and wide cheeks. Spermatophore large. Inner demibranch of gill reduced.

Remarks.—This genus is only known from deep or moderately deep waters and exhibits several Bathypolypodine-characters: reduction (but not entire loss) of ink-sac, reduction of inner demibranch of the gills, deep web, double funnel-organ, large spermatophores. The Bathypolypodinae, however, are always devoid of an ink-sac, so that the new genus will have to be included in the Octopodinae. The condition of the material which I examined, did not allow of an examination of the digestive organs so that I cannot add any details about the structure of the crop.

Until now only one species of this genus is known. As in the case of *Robsonella* (=*Joubinia* Robson) this genus seems to be closely related to the Bathypolypodinae, but differs from the former genus in several important characters such as web, radula, penis, etc.

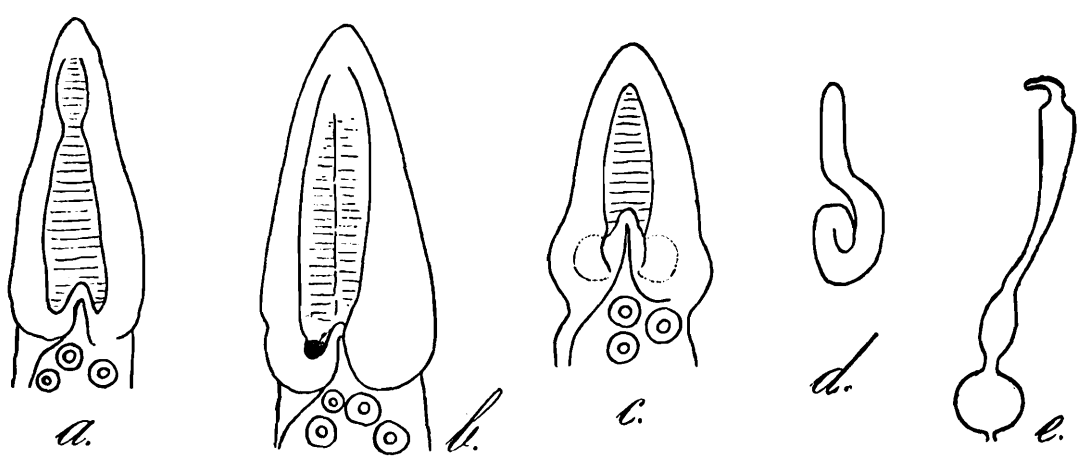
Berrya hoylei (Berry, 1909).

1909. *Polypus hoylei*, Berry, *Proc. U. S. Nat. Mus.* XXXVII, p. 407, fig. 1.
1914. *Polypus hoylei*, Berry, *Bull. U. S. Bur. Fish. Washington*, p. 296. pls. xlvii-xlviii, lv.
1916. *Polypus hoylei*, Massy, *Rec. Ind. Mus.* XII, p. 207.
1929. *Octopus hoylei* and var. *annae* Robson, *Monograph* I, p. 219, text-fig. 89.

Specimens examined.—*a.* "Investigator" station 379, Persian Gulf, 28°59′N—50°3′E, 25 fathoms, 8. x. 1905: 1♂ (No. M 8123/1); *b.* "Investigator" station 360, Arabian Sea, 13°36′N—47°32′E, 130 fathoms, 20 xii. 1905: 2♂ (No. M 8125-6/1); *c.* "Investigator" station 464, S. of Ceylon, 6°2′30″N—81°29′E, 52-68 fathoms, 22. iv. 1912. 1♀ (No. M 8144/1); ? *d.* Andaman Sea, 13°17′15″N—93°10′25″E,: 185 fathoms: 1♀ (No. 741/1).

Description.—This material (except *d*) has already been described by Massy (1916) and afterwards by Robson (1929) who created a new variety for it. There are, however, some complementary points worth mentioning:

a. The body of this very soft and gelatinous specimen (Plate I, figs. 1, 2) shows very distinctly the numerous extremely small chromatophores



TEXT-FIG. 22.—*Berrya hoylei* (Berry).

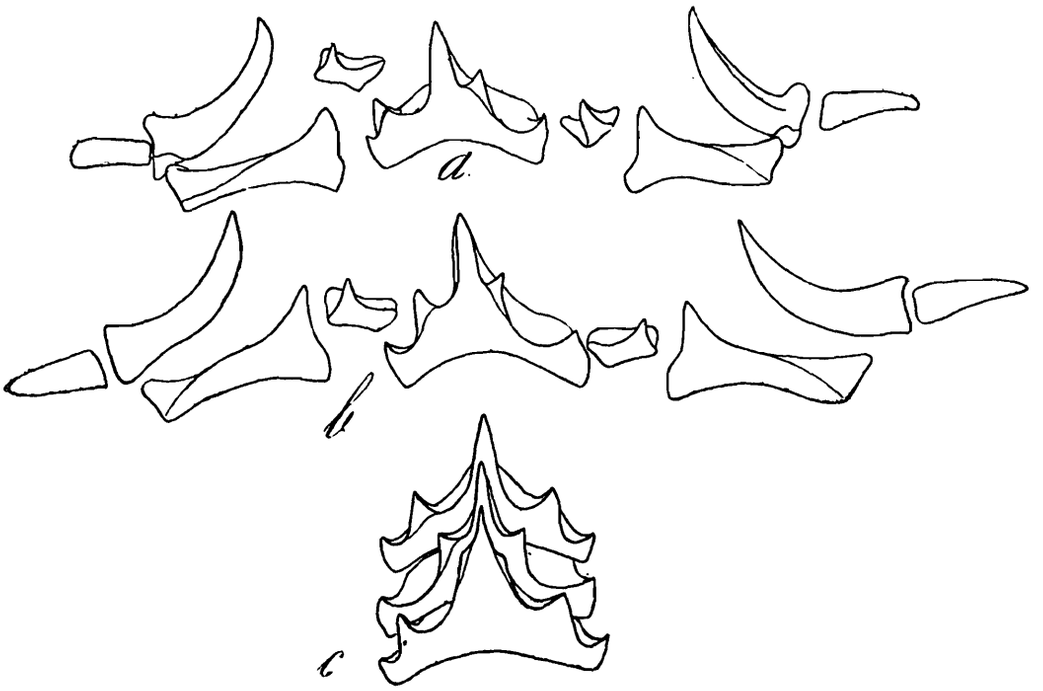
a. Hectocotylus of No. M 8123/1: ×5; *b.* Hectocotylus of No. M 8125/1: ×5; *c.* Hectocotylus of No. 8126/1: ×5; *d.* Penis of No. 8125/1: ×1·6; *e.* Oviducal gland and oviduct of No. M 8144/1: ×1·5.

surrounding the small tubercles. The mantle is saccular, its width being 70 per cent. of its dorsal length. The head is about as broad as

the body with big not very prominent eyes. The arms are short, the longest being only two times the length of the mantle. The web is subequal, very deep (32·5 per cent.) and continued along the arms. The funnel is completely fused with the head (Plate I, fig. 3), funnel-organ VV-shaped. Mantle-opening rather narrow (pl. I, fig. 3). Gill with 11 filaments in each demibranch. The ink-sac is small with a long and coiled duct. The hectocotylized arm is short and the terminal organ (12·8 per cent.) well developed (text-fig. 22*a*) with a large median groove, distinctly transversely grooved.

b[1]. No. 8125/1 is the type of Robson's variety *annae*. As Robson states, it resembles Berry's species in "the consistency of the tissues, the shape of the body, the general characters of sculpture and colour, the size of the anus and suckers and the character of the funnel and funnel-organ," but it differs from it by the much longer hectocotylus (11·7 per cent.). The arms are very short, about 1·7 times the mantle length. The web is well developed, attaining a depth of 35 per cent. of the longest arm. The gill has about 10 filaments in each demibranch, the inner side being much reduced. The funnel is free for only a very small part. The penis is very long (24·5 per cent., text-fig. 22*d*) and contains a large spermatophore. The hectocotylus (text-fig. 22*b*) differs slightly from Robson's figure 89. Although the calamus is small, it is not so strongly reduced as in Robson's figure. The base of the ligula is broader.

b[2]. The male No. M 8126/1 greatly resembles the foregoing one. Its funnel is free for about 42·5 per cent. of its length. The funnel-organ is VV-shaped. Gill with 9-10 filaments in each demibranch. Penis long (21 per cent.) with a well developed caecum. The hectocotylus (text-fig. 22*c*) is long (11·1 per cent.) and has well developed basal cheeks



Text-fig. 23.—*Berrya hoylei* (Berry). Radula of No. M 8126/1, ×58.
a. 36th row; *b*. 61st row; *c*. rhachidian teeth of the 74-76th rows.

containing each a deep cavity which is in connection with the median groove of the ligula. Ink-sac extremely small. The radula (text-fig. 23) differs slightly from Robson's description. It shows two seriation-

types. The first part up to the 61st row of teeth has a B_{2-3} seriation, but from the 62nd row to the end the seriation is A_{2-3}. The second lateral has a faint internal heel but no endocone. The third laterals are short and stout. Marginals weakly developed.

c. The female greatly resembles the male specimens. The arms attain twice the length of the mantle. The deep web is about subequal with its ventral section slightly smaller; it attains 37 per cent. of the length of the longest arm. The funnel is nearly completely fused with the head. Gill with 10-11 filaments in each demibranch. The oviduct is shown in text-figure 22*e*. Its proximal part is short, the oviducal gland measures 7·3 per cent. of the dorsal mantle-length, the distal part measures about 31 per cent. and has a basal swollen part and an enlarged distal end which is, however, constricted at its extremity.

d. This female specimen was labelled *Polypus januarii*, but Robson (1932, p. 240) already pointed out that owing to its small but distinct ink-sac it is not a *Benthoctopus* at all. The animal is in a very poor condition and a detailed description or even exact measurements cannot be given. The web is well developed. Funnel-organ VV-shaped. Gill with 7-8 filaments in each demibranch. The consistency of the skin is the same as in *Berrya hoylei*.

Remarks.—The material described above corresponds so closely to Berry's description that I am inclined to consider the only noteworthy difference; the smaller hectocotylus in Berry's specimen, as being probably due to preservation. The creation of a special name for this material (var. *annae* Robson) can hardly be accepted. However, I agree with Robson that Massy's material represents a distinct genus. Robson did not create a new genus, as in his opinion, more information as to the type would be necessary. In a postscript after *Octopus hoylei* var. *annae* Robson (p. 221) states that the ink-sac in the type of *O. hoylei* is reduced and that in the type and in var. *annae* the duct is long and coiled.

Although the internal anatomy of *O. hoylei* is still insufficiently known (owing to the poor condition of the material the internal anatomy could not be studied), it seems to me that the information available fully justifies the creation of a new genus, which I have called *Berrya* in honour to the author of the only known species.

Octopus prashadi, sp. nov.

(Plate II, figs. 1-3).

1916. *Polypus levis*, Massy (*non* Hoyle), *Rec. Ind. Mus.* XII, p. 198.

Holotype.—Indian Seas: 1♀ (No. M 4768/1: Indian Museum, Calcutta).

Specimens examined.—*a.* the Holotype; *b.* Port Blair, Andamans: 1♀ (No. M 361/1).

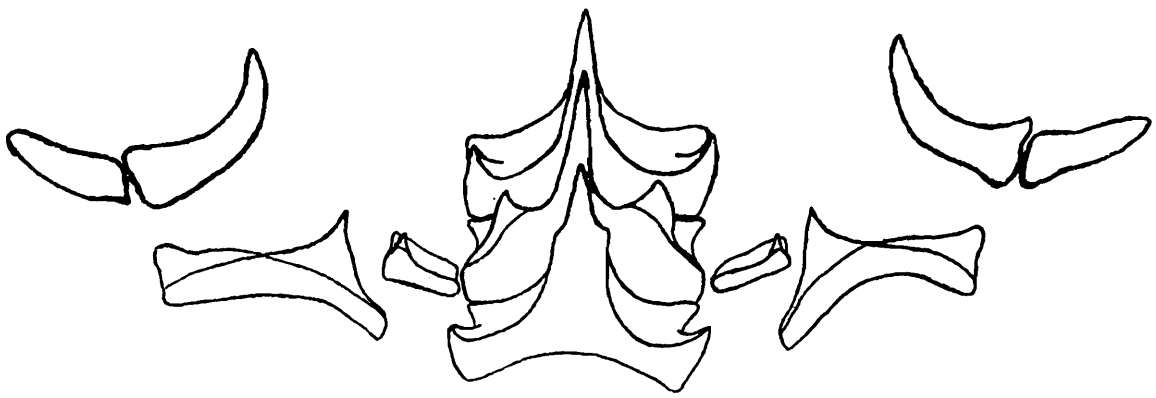
Measurements (in millimetres).

	a	*b*
Total length	±90	—
End of body to eye	30	27
End of body to mantle-opening	24	21·5
Eye to dorsal web	21	16·5
Breadth of body	20	23
Breadth of head	17	17
1st right arm	59	45
1st left arm	60	45
2nd right arm	60	53
2nd left arm	62	53
3rd right arm	57	—
3rd left arm	56	53
4th right arm	56	56
4th left arm	57	56
Web between 1st arms	18	15
Web between 1st and 2nd arms, right ..	19	16
Web between 1st and 2nd arms, left	19	17
Web between 2nd and 3rd arms, right	24	20
Web between 2nd and 3rd arms, left ..	24	20
Web between 3rd and 4th arms, right ..	23	21
Web between 3rd and 4th arms, left ..	23	20
Web between 4th arms	17	17
Length of funnel	12	12
Diameter of largest sucker ..	2	—
Length of ink-sac	6	6
Number of gill-filaments in each demibranch	8	—
Arm-formula	2.1.3.4 right ; 2.1. 4.3 left.	4.3=2.1
Web-formula	C.D.B.A.E	C=D.B= E.A.
Indices :		
Width-index	66·5	85
Interocular-index	56·5	63
Sucker-index	6·7	—
Web-index	38·5	37·5
Ink-sac-index	20	22

Description—

a. The female type-specimen (Plate II, fig. 1) is well preserved and has been described by Massy (1916, p. 198) as *Polypus levis* Hoyle. The head is separated from the mantle by a faint constriction. The eyes are relatively small and hardly prominent. The arms attain about two times the dorsal mantle-length. The web is rather deep and is not continued along the arm sides. The mantle-opening is narrow. The funnel is free for about $\frac{1}{3}$ of its length and has its anterior opening above the line of the eyes. Funnel-organ VV-shaped (and not W-shaped as stated by Massy). The gill has the inner demibranch rather reduced. Surface smooth. As Massy states, the colour is slate-blue above (it seems to cover a reddish-brown colour) with large chromatophores at sides, paler beneath. According to Robson (1932, p. 227), who examined the same specimen, there is no trace of an ink-sac, but this is not the case, as a well developed ink-sac is present and invested in the liver capsule (as in *O. vulgaris*).

b. The second specimen (Plate II, figs. 2,3) which was also labelled *Polypus levis* resembles very closely the type-specimen. Its body is more globular, but as may be seen (Plate II, fig. 2), this is due to the strong development of the ovary which nearly covers all the other internal organs. The web is continued on the ventral side of the arms as small membranes. As in the type, the ink-sac, although not very large, is well developed. The oviducts are rather long, their distal part (without the oviducal gland) measuring 44·5 per cent. of the dorsal



TEXT-FIG. 24.—*Octopus prashadi*, sp. nov. Radula, (No. M 361/1): ×100.

mantle-length. The radula (text-fig. 24) resembles somewhat that of *Octopus* sp. B (*vide* Adam, 1934, p. 25, fig. 14). The rhachidians have an A_3 seriation. The first laterals are long and slender with a relatively small cusp. The second laterals have a strongly arched basal plate and a long internal heel. The third laterals are short and stout. The marginal plates are rather long.

Remarks.—As Massy already pointed out, this species greatly resembles *Octopus levis* Hoyle. Robson placed *O. levis* in the genus *Benthoctopus*, probably owing to the supposed absence of an ink-sac, the narrow mantle-opening, the relatively small number of gill-filaments, etc. As already stated above, Robson mentioned the absence of an ink-sac in Massy's specimen, but a closer examination of the two specimens at my disposal revealed the presence of a well developed ink-sac, which was diffcult to be seen in the second specimen owing to the enormous development of the ovary. On the other hand, though Robson was not certain about the correctness of Massy's diagnosis, he preferred to leave her identifications unchallenged. The fact, however, that an ink-sac is present makes it necessary to separate this material from *Benthoctopus levis* (Hoyle). As there is no other species which corresponds to or resembles these two specimens it is necessary to create a new species for them, which I name *Octopus prashadi* in honour of Dr. B. Prashad, the Director of the Zoological Survey of India.

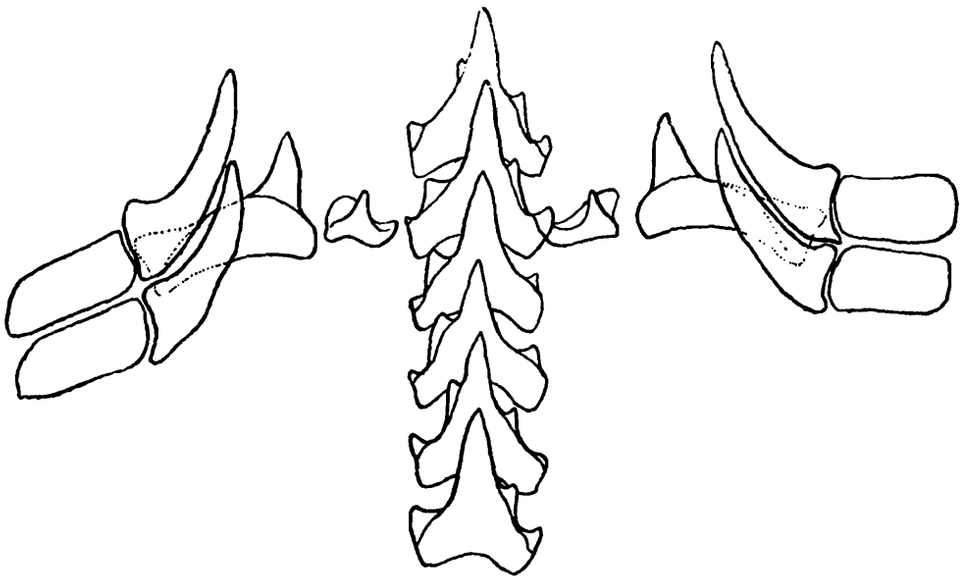
Octopus prashadi shows several abyssal characters, but as the male is not known it is not possible to discuss its exact generic or sub-generic position.

Teretoctopus alcocki Robson, 1932.

1932. *Teretoctopus alcocki*, Robson, *Monograph* II, p. 251.

Specimens examined.—I have examined the four specimens belonging to this species described by Robson.

As I fully agree with his description, it is not necessary to redescribe the material. But as Robson did not describe the radula I give here a figure of the radula of No. M 350/1 (text-fig. 25). The rhachidians have



TEXT-FIG. 25.—*Teretoctopus alcocki* Robson. Radula, (No. M 350/1): ×23.

a rather narrow base and show a B4 seriation. The other teeth are also rather short and stout.

Octopus sp.

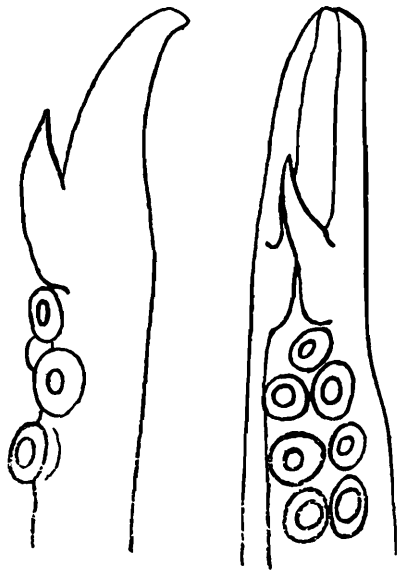
1916. *Octopus hongkongensis*, Massy (*non* Hoyle) (*pars*), *Rec. Ind. Mus.* XII, p. 197.

Specimen examined.—"Investigator" station 237, Andaman Sea 13°17′N., 93°7′E., 90 fathoms, 13. iv. 1898: 1♂ (No. M 8112/1).

Measurements (in millimetres).

End of body to eye	16
End of body to mantle-margin	14
Eye to dorsal web	15
Breadth of body	12
Breadth of head	9
1st right arm	70
1st left arm	70
2nd right arm	62+
2nd left arm	60+
3rd right arm	38
3rd left arm	79
4th right arm	—
4th left arm	67
Hectocotylus	3·2
Web between 1st arms	10·5
Web between 1st and 2nd arms, right	11
Web between 1st and 2nd arms, left	11
Web between 2nd and 3rd arms, right	11
Web between 2nd and 3rd arms, left	11
Web between 3rd and 4th arms, right	9·5
Web between 3rd and 4th arms, left	10
Web between 4th arms	9·5
Length of funnel	9
Length of penis	4
Diameter of largest sucker	1·3
Indices:	
Width-index	75
Interocular-index	56
Web-index	14
Sucker-index	8
Hectocotylus-index	8·4

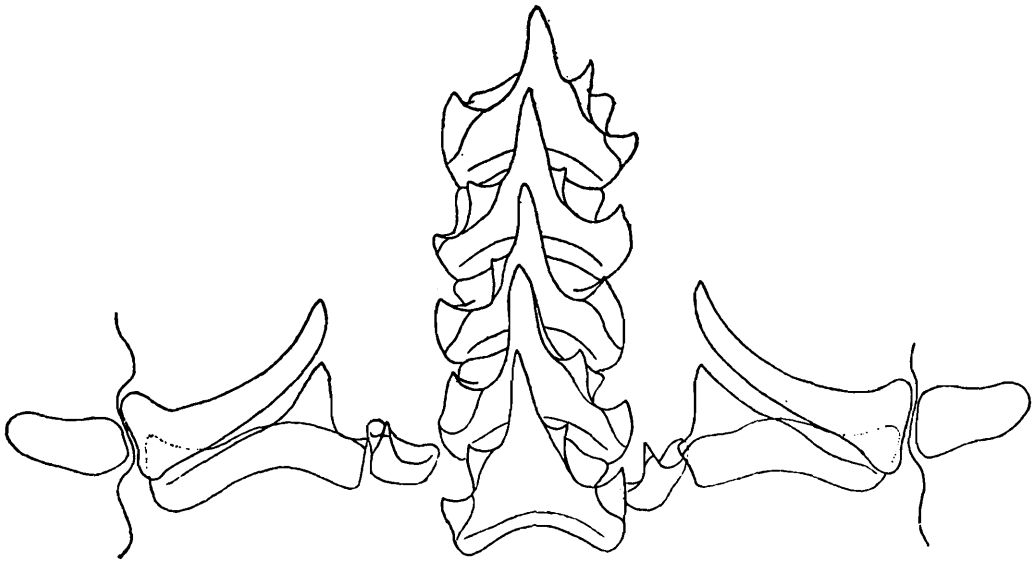
Description.—This male specimen was identified as *Polypus hongkongensis* by Massy, but it certainly does not belong to this species. The body is saccular. The head is much smaller than the mantle. The arms attain about five times the dorsal mantle-length. The hectocotylized arm is very short, about half the length of its partner. The hecto-



TEXT-FIG. 26.—*Octopus* sp. Hectocotylus, (No. 8112/1): ×10.

cotylus (text-fig. 26) is short and does not resemble at all that of *O. hongkongensis*. The ligula is provided with a well marked central groove without transverse ridges, the calamus is very long and stout and is more than half the length of the total hectocotylus.

The web is rather shallow, subequal (B=C.A.D.E.). Funnel free for about $\frac{1}{3}$ of its length. Funnel-organ badly preserved, it may have been W-shaped, but the lateral pads are not visible. There is a well developed ink-sac. The mantle-opening is very narrow. The radula



TEXT-FIG. 27.—*Octopus* sp. Radula, (No. M 8112/1): ×138.

(text-fig. 27) differs from that of *O. hongkongensis* (Robson, 1929, fig. 80). The rhachidians have a B_3 seriation. The basal plate of the first lateral is not long and thin, but about triangular. The second lateral has a small endocone. The marginal plates are not so long and slender.

The gill has 8-9 filaments in each demibranch. The penis is short with a relatively large caecum. The granulation of the skin resembles very closely that of *O. globosus*. There is a big cirrhus behind and above each eye.

From the foregoing description it will be clear that this specimen has nothing to do with *O. hongkongensis*, but owing to the badly preserved funnel-organ it is difficult to establish its exact position, and to prevent eventual confusion I propose to leave its specific position unsettled.

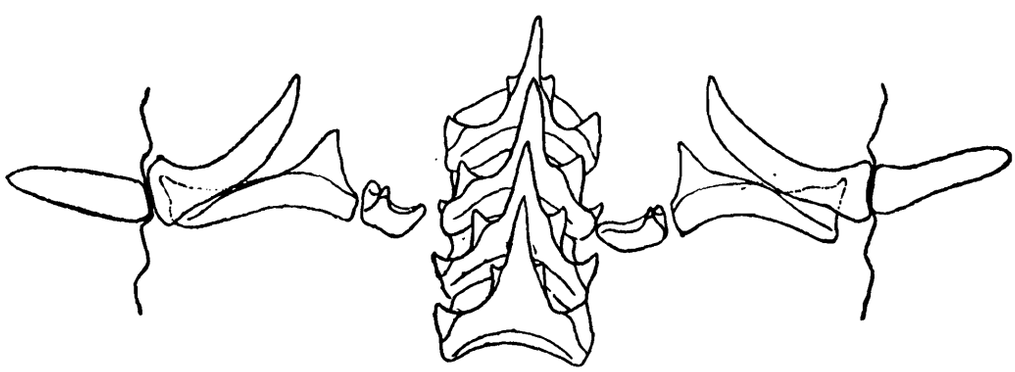
Octopus sp.

Specimen examined.—Andaman Sea, 13°17′15″N., 93°10′25″E., 185 fathoms : 1♀ (No. M 742/1).

Measurements (in millimetres).

End of body to eye	32
End of body to mantle-margin	26·5
Eye to dorsal web	28·5
Breadth of body	23·5
Breadth of head	16·5
1st right arm	80+
1st left arm	92
2nd right arm	100
2nd left arm	85+
3rd right arm	85+
3rd left arm	75+
4th right arm	100
4th left arm	75+
Web, subequal	20
Diameter of largest sucker	1·7

Description.—This animal, which had been labelled *Polypus januarii*, cannot be referred to *Benthoctopus* (*vide* Robson, 1932, p. 240), as it has a small but distinct ink-sac. The globular body very closely resembles *Octopus prashadi*, but the arms are much longer, the web shallower and the funnel-organ different, W-shaped. The gill has 9-10 filaments in each demibranch. The skin is faintly rugose and is tainted with brown



TEXT-FIG. 28.—*Octopus* sp. Radula, (No. 742/1) : ×73.

flecks on the dorsal surface. The radula is shown in text-figure 28; the rhachidians have an A_3 seriation.

Remarks.—For the moment I prefer not to define the exact specific status of this specimen.

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