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ETUDE DE REPRÉSENTANTS INDIENS DU SOUS-GENRE *TROPOCYCLOPS* (CRUSTACÉS COPEPODES CYCLOPOÏDES).

Par KNUT LINDBERG.

INTRODUCTION.

En 1935 j'ai décrit sous le nom de *Eucyclops (Tropocyclops) multicolor* une espèce répondant aux caractéristiques du sous-genre *Tropocyclops* Kiefer, du genre *Eucyclops* Claus, mais se séparant nettement du *E. (T.) prasinus* Fischer, qui, à ma connaissance, était alors la seule forme connue de ce sous-genre. Un travail critique de F. Kiefer, dont j'ignorais alors la publication, avait cependant paru en 1931, traitant de ce même sous-genre. Dans ce mémoire, Kiefer a montré que le *E. (T.) prasinus*, tel qu'il était connu jusque là, ne constitue pas une espèce définie, mais que le nom spécifique *prasinus* a apparemment servi à désigner des formes séparables, mais présentant les caractères généraux du sous-genre *Tropocyclops*. Kiefer a fait une étude détaillée de 89 spécimens provenant de 19 localités différentes, 6 européennes, 5 américaines, 3 africaines et 5 asiatiques (toutes des Indes néerlandaises) et, comme résultat de ce travail, Kiefer a dénombré l'espèce *prasinus* en 9 formes différentes.

Subséquentement à la description du *E. (T.) multicolor*, à laquelle n'avait servi que des échantillons récoltés à Kurduvadi et à Pandharpour (Deccan, Inde britannique), j'ai pu collectionner des *Tropocyclops* dans 22 localités différentes, représentant 7 ou 8 régions géographiques distinctes de la péninsule indienne, dont certaines très distantes les unes des autres, et situées, tant au niveau de la mer qu'à des altitudes allant jusqu'à 2000 m. Parmi les 121 spécimens examinés se trouvaient seulement 2 formes parfaitement séparables, l'une, de beaucoup la plus fréquente et la plus répandue, se conformant aux caractères du *E. (T.) multicolor* Lindberg; l'autre, moins commune, répondant à peu près à la description du *E. (T.) confinis* forma *frequens* Kiefer. Comme je n'ai pas pu examiner des échantillons de cette variété et comme Kiefer, n'a donné de renseignements que sur certaines de ses caractéristiques, il n'est évidemment pas possible d'identifier avec certitude absolue cette forme indienne avec les spécimens étudiés par Kiefer, qui provenaient des îles de Java et de Flores, de l'Afrique du Sud et de l'Afrique Orientale allemande. Cependant la conformité dans les caractères mentionnés par Kiefer est si grande que je crois très probable l'identité des spécimens indiens avec ceux décrits par Kiefer, sous le nom de *E. (T.) confinis* forma *frequens*. J'ai dressé un tableau comparatif entre les 14 spécimens de l'Afrique et des Indes néerlandaises et les 24 animaux indiens, tableau dans lequel je n'ai pu faire entrer naturellement que les caractères donnés par Kiefer dans son mémoire. (Tableau III).

Les particularités auxquelles Kiefer attache de l'importance diagnostique dans son étude du sous-genre *Tropocyclops* sont les suivantes : formule des épines, longueur totale, longueur des branches de la furca,

rapport entre la longueur de la soie apicale médiane interne de la furca et celle de la branche de la furca, rapport entre la longueur et la largeur de l'article terminal de l'endopodite de la quatrième paire de pattes, celui entre la longueur de l'épine apicale interne et celle de l'épine apicale externe de cet article et entre la longueur de l'épine apicale interne et celle de l'article qui la porte.

Chez les animaux de l'Inde j'ai examiné ces mêmes caractéristiques, et en plus, j'ai trouvé que quelques autres particularités offraient de la valeur diagnostique. Ces dernières, qui n'avaient pas été mentionnées par Kiefer sont :—

- (1) la position des branches de la furca ;
- (2) la longueur de la soie dorsale de la furca ;
- (3) le rapport de longueur entre la soie apicale interne de la furca et celle de la soie apicale externe ;
- (4) la structure et la longueur de l'épine interne de la cinquième patte.

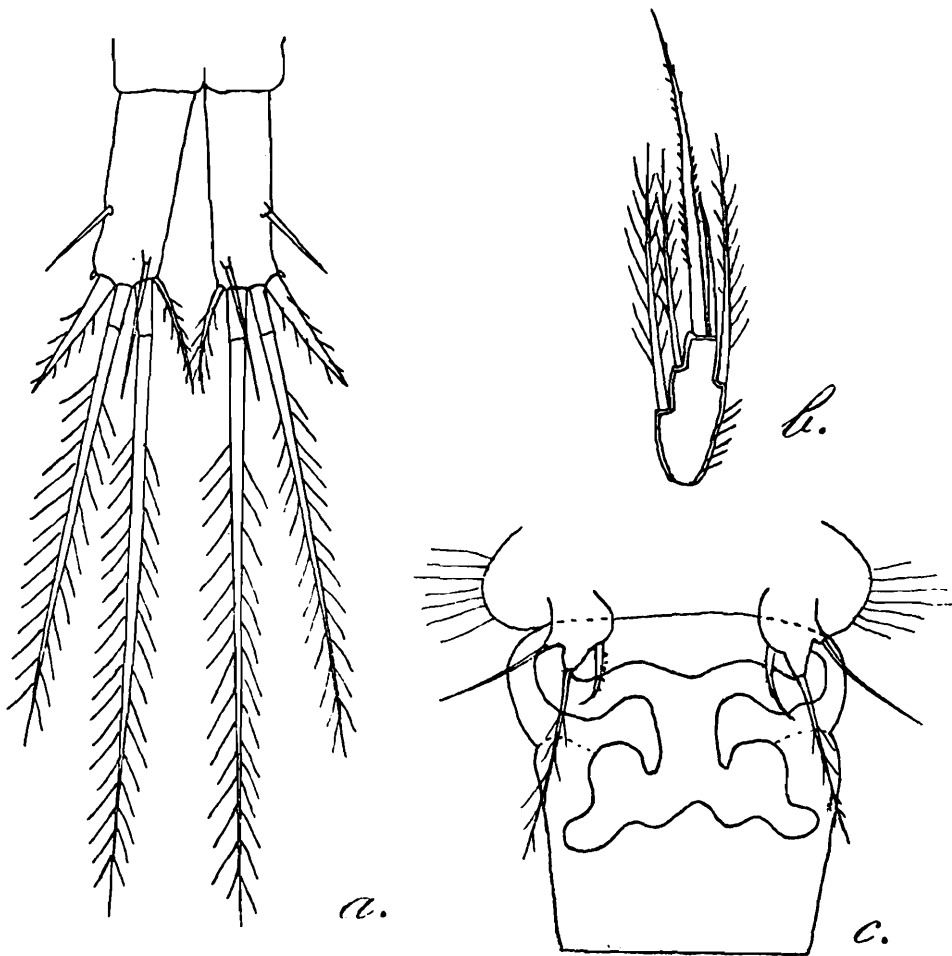


FIG. 1.—*Eucyclops (Tropocyclops) multicolor* ♀ (Oudaïpour).

a. Furca, face dorsale.

b. Enp. 4, article terminal.

c. Cinquième patte et segment génital.

Le réceptacle séminal m'a aussi semblé présenter des différences, mais, par suite de l'extrême difficulté de le distinguer d'une façon irréprochable, tant à l'état vivant qu'après la mort, il n'a pas été possible d'en tenir compte. (Figures 1, 2.)

Comme le *E.(T.) multicolor* avait été décrit à une époque quand je n'avais pas encore pu prendre connaissance du mémoire de Kiefer, un des buts du travail présent a été d'examiner si le *E.(T.) multicolor* pouvait être identifié à l'une ou l'autre des formes distinguées par Kiefer. La seule variété avec laquelle une comparaison a pu être faite est le *E.(T.) extensus* forma *longispina* que Kiefer a différencié d'après 4 échantillons rapportés de New Jersey dans l'Amérique du Nord. Comme cette forme n'est pas cosmopolite, n'ayant du reste pas été observée dans quelque autre partie du monde, il serait évidemment très extraordinaire si des animaux identiques fussent présents dans une région zoographique aussi différente de celle de l'Amérique du Nord comme celle de l'Inde, et, il faut dire tout de suite, que malgré des analogies, les deux formes semblent bien nettement distinctes, même en ne considérant que les caractéristiques mentionnées par Kiefer.

E.(T.) multicolor et *E.(T.) confinis* forma *frequens*.

(Tableaux I et II).

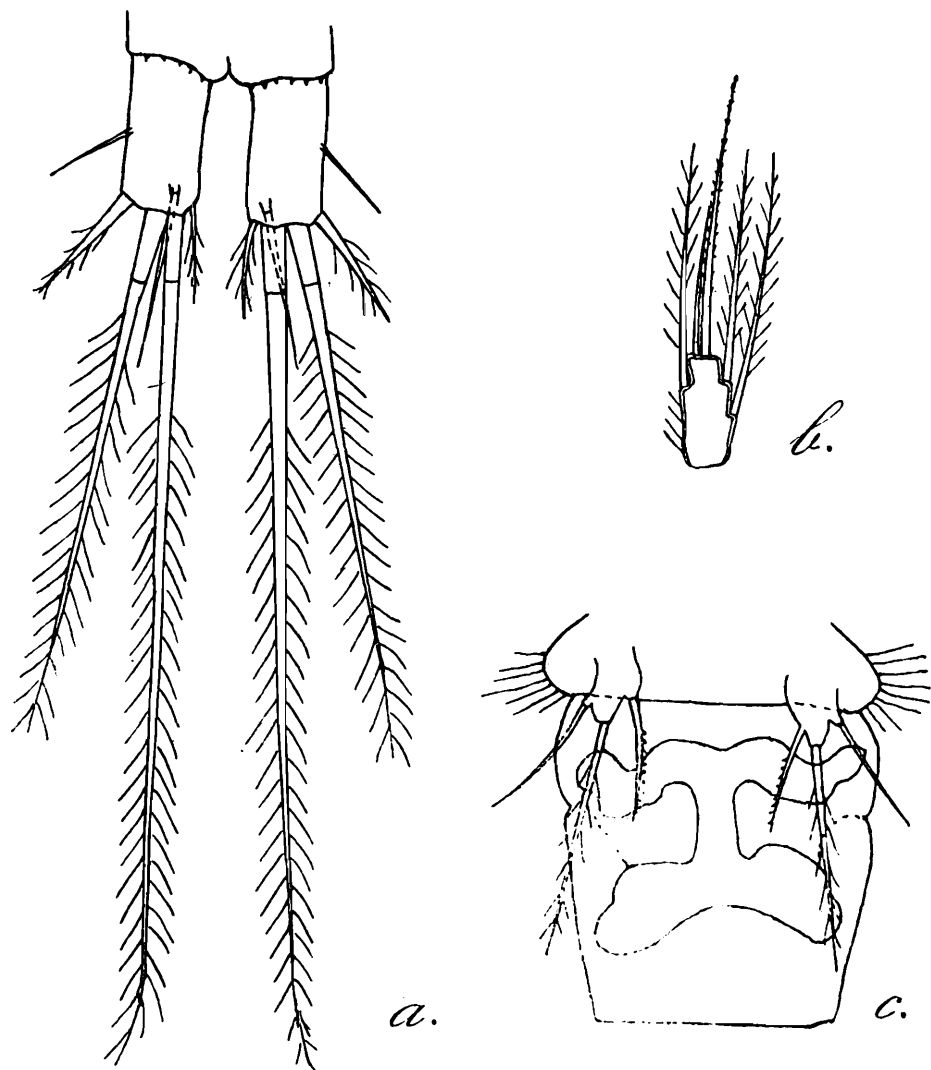


FIG. 2.—*Eucyclops (Tropocyclops) confinis* forma *frequens*. ♀ (Rivière près Lao Povář).

a. Furca, face ventrale.

b. Enp. 4 article terminal.

c. Cinquième patte et segment génital.

En résumé, le *E.(T.) extensus* forma *longispina* est un *Tropocyclops* à furca considérablement plus longue que celle du *E.(T.) multicolor*, à branches presque parallèles (selon le dessin de Kiefer), ayant une soie apicale interne de la furca très longue par rapport à la longueur de la soie apicale externe de la furca, ces deux soies étant à peu près

de la même longueur chez le *E.(T.) multicolor*. Les rapports principaux présentés par l'article terminal de l'enp. 4 et de ses épines apicales sont assez semblables, sauf celui entre la longueur de l'épine apicale interne et celle de l'article lui-même, la longueur de l'épine apicale interne surpassant celle de l'article dans des proportions plus grandes chez le *E.(T.) extensus* forma *longispina* que chez le *E.(T.) multicolor*. Ces caractéristiques sont résumées dans le tableau comparatif ci-dessous où sont données des valeurs moyennes (Tableau IV).

Plusieurs faits intéressants ont été mis à jour par le travail présent.

(1) La pauvreté relative du sous-genre *Tropocyclops* en membres indiens, 2 formes seulement ayant été trouvées aux cours de pêches d'assez grande envergure. La grande prépondérance de l'une de ces formes sur l'autre a déjà été mentionnée.

(2) Le plus souvent une seule des 2 espèces a été récoltée dans un même habitat, mais 4 fois les 2 formes se sont trouvées présentes ensemble (Liste d'habitats).

(3) Dans tous les cas la distinction des 2 espèces a été des plus aisées ; les 4 caractéristiques suivantes ont suffi à elles seules pour permettre cette distinction, 3 d'entre elles ont dans chaque cas montré des différences significatives et la quatrième à peu d'exceptions près. Ces caractéristiques sont :—

- (a) Le rapport entre la longueur et la largeur des branches de la furca.
- (b) Le rapport entre la longueur de la soie apicale médiane interne de la furca et celle de la branche de la furca.
- (c) La formule des épines.
- (d) La position des branches de la furca.

Chez 3 exemplaires de *E.(T.) multicolor* l'article terminal de l'exopodite de la troisième paire de pattes a été muni d'un côté de 3 épines et de l'autre de 4 épines ; les autres caractères montraient cependant que ces 3 spécimens étaient aussi des *E.(T.) multicolor* typiques. Une irrégularité semblable dans la formule des épines ne s'est vue chez aucun des animaux répondant aux caractéristiques du *E.(T.) confinis* forma *frequens*.

(4) Les différences dans les rapports principaux de l'article terminal de l'enp. 4 et de ses deux appendices qui existent chez les deux espèces sont peu importantes, les variations étant assez grandes. Ces différences peuvent se résumer ainsi : Les animaux à formule des épines de 3-4-3-3 (*E.(T.) confinis* forma *frequens*) ont : (a) l'article terminal de l'enp. 4 un peu moins allongé que celui du *E.(T.) multicolor* ; (b) les épines apicales plus allongées ; (c) ces épines présentant un peu moins de différences entre elles dans leur longueur respective ; (d) l'épine apicale interne plus longue par rapport à la longueur de l'article.

(5) Autres différences sont :

- (a) Une soie dorsale de la furca plus longue chez les animaux à formule des épines de 3-4-3-3.
- (b) Une soie apicale interne de la furca le plus souvent plus courte que la soie apicale externe de la furca ; la soie apicale interne étant plus souvent un peu plus longue que la soie apicale externe chez le *E.(T.) multicolor* ;

- (c) Une épine interne de la cinquième patte droite, longue et mince chez les exemplaires à formule des épines de 3-4-3-3, cette épine étant en général courbée, courte et forte chez le *E.(T.) multicolor*. Ces 3 derniers caractères n'ont cependant pas de valeur diagnostique absolue.



FIG. 3.—Carte montrant les localités d'où proviennent les animaux décrits dans ce mémoire.

(6) Les variations morphologiques que présentent les deux espèces sont peu marquées, bien que des échantillons ont été récoltés de biotopes très variés et à des saisons différentes. Des formes intermédiaires n'ont pas été observées même dans les habitats où les deux espèces se trouvaient présentes ensemble.

Tous les exemplaires ayant servi à cette étude sont des femelles adultes, presque toutes portant des sacs ovigères. Ils ont été récoltés par moi-même, sauf ceux d'Oudaïpou, qui ont été pêchés par mon assistant, le médecin indigène, Dr. George Daniel. (Carte).

SOMMAIRE.

- (1) Une étude détaillée a été faite de 121 exemplaires du sous-genre *Tropocyclops* provenant d'habitats très variés du Centre, de l'Ouest et du Sud de la Péninsule indienne.
- (2) Deux formes distinctes seulement ont été trouvées, dont la coexistence a été observée 4 fois.

- (3) La plus commune est le *E.(T.) multicolor* Lindberg. Les caractères différentiels entre celui-ci et le *E.(T.) extensus* forma *longispina* Kiefer, espèce du Nouveau Monde, sont donnés.
- (4) La forme plus rare répond aux caractéristiques du *E.(T.) confinis* forma *frequens* Kiefer. Un tableau comparatif a été dressé entre les animaux de l'Inde et ceux décrits par Kiefer, originaires des Indes néerlandaises, de l'Afrique du Sud et de l'Afrique Orientale allemande.
- (5) Le *E.(T.) multicolor* et les animaux offrant les caractères du *E.(T.) confinis* forma *frequens* sont nettement séparables par 4 caractères principaux, 3 d'entre eux ayant été envisagés par Kiefer dans son étude du sous-genre *Tropocyclops*.
- Trois autres caractéristiques ayant de l'importance diagnostique sont données, ces trois caractéristiques manquent cependant de valeur absolue.
- Les rapports présentés par l'article terminal de l'enp. 4 et de ses appendices ne peuvent pas servir pour la distinction certaine des deux espèces en question.
- (6) Des formes intermédiaires n'ont pas été observées.

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- Lindberg, K., 1935.—Notes sur des cyclopidés d'eau douce de l'Inde avec descriptions d'une espèce nouvelle et de deux variétés nouvelles. *Rec. Ind. Mus.* XXXVII, pp. 405-408.

TABLEAU I.

Localité.	No.	Longueur μ	Furca.	Sole apic. int. : Soie apic. ext.	Soie apic. méd. int. : Long. furca	Soie dorsale μ	Enp. 4. Long. : Larg.	Enp. 4. Epine int. : Epine ext.	Enp. 4. Epine int. : Long. art.	5e patte. Epine : Soie méd. Soie ext.	Formule des épines.
<i>Oudaipour</i>	1	665	53 : 17 = 3·12 : 1	0·94 : 1	3·92 : 1	33	33 : 13 = 2·54 : 1	71 : 28 = 2·54 : 1	2·15 : 1	25 : 53 : 33	3-4-4-3
<i>Citerne</i>	2	674	51 : 16 = 3·19 : 1	1 : 1	3·92 : 1	40	31 : 13 = 2·38 : 1	68 : 26 = 2·62 : 1	2·19 : 1	..	3-4-4-3
	3	675	58 : 18 = 3·22 : 1	1·09 : 1	3·45 : 1	..	35 : 13 = 2·69 : 1	75 : 33 = 2·27 : 1	2·14 : 1	..	3-4-4-3
<i>Lac Povat</i> (Ile de Salsette).	4	617	45 : 14 = 3·21 : 1	1·15 : 1	3·71 : 1	37	26 : 13 = 2 : 1	51 : 25 = 2·04 : 1	1·96 : 1	..	3-4-4-3
	5	570	35 : 15 = 2·33 : 1	0·82 : 1	5·71 : 1	38	26 : 13 = 2 : 1	70 : 35 = 2 : 1	2·69 : 1	20 : 50 : 30	3-4-3-3
<i>Mare de rivière</i>	6	608	46 : 15 = 3·07 : 1	1·27 : 1	3·69 : 1	50	28 : 12 = 2·33 : 1	66 : 27 = 2·44 : 1	2·36 : 1	..	3-4-4-3
	7	570	32 : 15 = 2·13 : 1	0·88 : 1	6·25 : 1	40	30 : 15 = 2 : 1	66 : 33 = 2 : 1	2·20 : 1	16 : x : 28	3-4-3-3
	8	579	50 : 14 = 3·57 : 1	1·07 : 1	2·84 : 1	..	28 : 11 = 2·54 : 1	58 : 25 = 2·32 : 1	2·07 : 1	..	3-4-4-3
	9	608	55 : 15 = 3·67 : 1	1·18 : 1	3·04 : 1	35	31 : 13 = 2·38 : 1	65 : 28 = 2·32 : 1	2·09 : 1	..	3-4-4-3
	10	613	53 : 15 = 3·53 : 1	1·06 : 1	3·17 : 1	..	30 : 15 = 2 : 1	63 : 28 = 2·25 : 1	2·10 : 1	..	3-4-4-3
	11	608	48 : 15 = 3·20 : 1	1·20 : 1	3·65 : 1	..	30 : 13 = 2·30 : 1	63 : 28 = 2·25 : 1	2·10 : 1	..	3-4-4-3
<i>Ghatkopar</i> (Ile de Salsette).	12	560	45 : 15 = 3 : 1	1·23 : 1	3·62 : 1	..	28 : 13 = 2·15 : 1	60 : 25 = 2·40 : 1	2·14 : 1	..	3-4-4-3
	13	551	46 : 15 = 3·06 : 1	1·14 : 1	3·69 : 1	..	29 : 13 = 2·23 : 1	63 : 27 = 2·33 : 1	2·17 : 1	..	3-4-4-3
<i>Mares de rivière</i>	14	..	..	..	..	..	30 : 12 = 2·50 : 1	63 : 27 = 2·33 : 1	2·10 : 1	..	3-4-4-3
	15	608	46 : 15 = 3·06 : 1	1·15 : 1	3·87 : 1	..	30 : 13 = 2·30 : 1	57 : 23 = 2·48 : 1	1·90 : 1	..	3-4-4-3
	16	608	46 : 15 = 3·06 : 1	1·15 : 1	3·69 : 1	41	31 : 13 = 2·38 : 1	58 : 25 = 2·32 : 1	1·87 : 1	16 : 60 : 33	3-4-4-3
<i>Djogèchvari</i> (Ile de Salsette) Etang.	17	608	46 : 15 = 3·06 : 1	1·19 : 1	3·89 : 1	36	30 : 13 = 2·30 : 1	61 : 26 = 2·35 : 1	2·03 : 1	..	3-4-4-3

TABLEAU I (SUITE).

Localité.	No.	Longueur μ	Furca.	Soie apic. int. : Soie apic. ext.	Soie apic. méd. int. : Long. furca	Soie dorsale μ	Enp. 4. Long. : Larg.	Enp. 4. Epine int. : Epine ext.	Enp. 4. Epine int. : Long. art.	5e patte. Epine : Soie méd. : Soie ext.	Formule des épines.
<i>Adjanta</i>	18	622	48 : 16 = 3 : 1	1.03 : 1	3.81 : 1	36	31 : 13 = 2.38 : 1	61 : 25 = 2.44 : 1	1.97 : 1	..	3-4-4-3
Grottes	19	636	48 : 15 = 3.20 : 1	1.06 : 1	3.65 : 1	36	32 : 14 = 2.29 : 1	66 : 30 = 2.20 : 1	2.06 : 1	× : × : 28	3-4-4-3
Mares de rivière	20	655	50 : 15 = 3.33 : 1	1 : 1	3.58 : 1	40	32 : 14 = 2.29 : 1	68 : 33 = 2.06 : 1	2.12 : 1	16 : 41 : 28	3-4-4-3
	21	665	51 : 15 = 3.40 : 1	1.10 : 1	3.43 : 1	41	30 : 13 = 2.30 : 1	..	..	..	3-4-4-3
	22	636	50 : 15 = 3.33 : 1	1.10 : 1	3.44 : 1	40	30 : 13 = 2.30 : 1	65 : 28 = 2.32 : 1	2.17 : 1	20 : 50 : 36	3-4-4-3
	23	646	51 : 15 = 3.40 : 1	1.1	3.80 : 1	40	31 : 15 = 2.07 : 1	67 : 26 = 2.58 : 1	2.16 : 1	18 : 55 : 33	3-4-4-3
	24	598	51 : 15 = 3.40 : 1	1.03 : 1	3.51 : 1	35	31 : 13 = 2.38 : 1	67 : 26 = 2.58 : 1	2.16 : 1	10 : 50 : ×	3-4-4-3
	25	623	50 : 15 = 3.33 : 1	1.03 : 1	3.66 : 1	41	30 : 13 = 2.30 : 1	63 : 27 = 2.33 : 1	2.10 : 1	18 : 50 : ×	3-4-4-3
<i>Aurangabad</i>	26	617	50 : 15 = 3.33 : 1	1.10 : 1	3.74 : 1	38	31 : 13 = 2.38 : 1	60 : 27 = 2.22 : 1	1.94 : 1	16 : 53 : 33	3-4-4-3
Mare de rivière	27	636	48 : 16 = 3 : 1	1 : 1	3.81 : 1	38	30 : 13 = 2.30 : 1	63 : 27 = 2.33 : 1	2.10 : 1	..	3-4-4-3
<i>Haiderabad</i>	28	684	56 : 15 = 3.73 : 1	1.06 : 1	3.27 : 1	35	30 : 13 = 2.30 : 1	65 : 27 = 2.40 : 1	2.17 : 1	20 : 50 : ×	3-4-4-3
Palais du Navab Salar Djang.	29	646	50 : 14 = 3.57 : 1	1 : 1	3.90 : 1	41	30 : 13 = 2.30 : 1	67 : 30 = 2.23 : 1	2.23 : 1	..	3-4-4-3
Puits	30	655	55 : 15 = 3.67 : 1	0.94 : 1	3.18 : 1	53	31 : 13 = 2.38 : 1	68 : 30 = 2.27 : 1	2.19 : 1	25 : 46 : 33	3-4-4-3
	31	646	50 : 15 = 3.33 : 1	0.94 : 1	3.66 : 1	36	30 : 13 = 2.30 : 1	67 : 30 = 2.23 : 1	2.23 : 1	20 : 50 : ×	3-4-4-3
	32	684	51 : 15 = 3.40 : 1	0.94 : 1	3.33 : 1	36	31 : 15 = 2.07 : 1	70 : 27 = 2.59 : 1	2.26 : 1	20 : 53 : ×	3-4-4-3
	33	684	50 : 15 = 3.33 : 1	0.94 : 1	3.74 : 1	45	31 : 13 = 2.38 : 1	75 : 27 = 2.78 : 1	2.42 : 1	20 : 63 : 33	3-4-4-3

<i>Hydrabad</i> Puits, hors ville	34	617	50 : 15 = 3·33 : 1	1 : 1	3·40 : 1	33	30 : 13 = 2·30 : 1	63 : 26 = 2·42 : 1	2·10 : 1	..	3-4-4-3
	35	608	50 : 15 = 3·33 : 1	1·07 : 1	3·34 : 1	..	30 : 13 = 2·30 : 1	60 : 25 = 2·40 : 1	2 : 1	18 : 41 : 20	3-4-4-3
	36	617	50 : 13 = 3·85 : 1	1·10 : 1	3·40 : 1	41	31 : 15 = 2·07 : 1	65 : 27 = 2·40 : 1	2·09 : 1	13 : 50 : ×	{ 3-4-4-3 3-4-3-3
	37	617	50 : 13 = 3·85 : 1	1·10 : 1	3·40 : 1	35	31 : 14 = 2·21 : 1	67 : 27 = 2·48 : 1	2·16 : 1	18 : 46 : ×	
<i>Ramling</i> (près Barsi). Citerne	38	655	48 : 15 = 3·20 : 1	1·15 : 1	3·48 : 1	36	30 : 13 = 2·30 : 1	61 : 30 = 2·03 : 1	2·03 : 1	..	3-4-4-3
	39	665	49 : 15·5 = 3·16 : 1	1·19 : 1	3·40 : 1	35	30 : 13 = 2·30 : 1	61 : 31 = 1·97 : 1	2·03 : 1	20 : 25 : ×	3-4-4-3
	40	674	51 : 13 = 3·92 : 1	1·27 : 1	3·27 : 1	38	31 : 14 = 2·21 : 1	60 : 30 = 2 : 1	1·94 : 1	18 : 28 : ×	3-4-4-3
	41	636	50 : 15 = 3·33 : 1	1·20 : 1	3·36 : 1	35	31 : 13 = 2·38 : 1	60 : 28 = 2·14 : 1	1·94 : 1	..	3-4-4-3
	42	665	50 : 13 = 3·85 : 1	1·08 : 1	3·50 : 1	33	30 : 13 = 2·30 : 1	58 : 20 = 2·90 : 1	1·93 : 1	20 : 45 : 33	3-4-4-3
<i>Gharipouri</i> (près Barsi). Mare de rivière	43	589	46 : 13 = 3·54 : 1	1·12 : 1	3·46 : 1	..	30 : 11 = 2·73 : 1	50 : 31 = 1·61 : 1	1·67 : 1	..	3-4-4-3
	44	589	48 : 15 = 3·20 : 1	1·12 : 1	3·58 : 1	..	28 : 13 = 2·15 : 1	55 : 25 = 2·20 : 1	1·96 : 1	..	3-4-4-3
<i>Kurduvadi</i> Puits, G. T.	45	703	51 : 15 = 3·40 : 1	1·15 : 1	3·59 : 1	35	31 : 13 = 2·38 : 1	70 : 28 = 2·50 : 1	2·26 : 1	..	3-4-4-3
	46	646	50 : 15 = 3·33 : 1	1·06 : 1	3·50 : 1	30	31 : 13 = 2·38 : 1	63 : 28 = 2·25 : 1	2·03 : 1	..	3-4-4-3
	47	598	50 : 13 = 3·85 : 1	1 : 1	3·66 : 1	33	30 : 15 = 2 : 1	67 : 27 = 2·48 : 1	2·23 : 1	16 : × : ×	3-4-4-3
	48	674	51 : 15 = 3·40 : 1	0·97 : 1	3·76 : 1	33	31 : 13 = 2·38 : 1	67 : 27 = 2·48 : 1	2·16 : 1	20 : 46 : 35	3-4-4-3
	49	646	50 : 13 = 3·85 : 1	1·07 : 1	3·58 : 1	35	31 : 13 = 2·38 : 1	67 : 26 = 2·58 : 1	2·16 : 1	× : 46 : 36	3-4-4-3
	50	617	50 : 15 = 3·33 : 1	1·04 : 1	3·54 : 1	33	30 : 13 = 2·30 : 1	67 : 26 = 2·58 : 1	2·23 : 1	16 : 45 : ×	3-4-4-3

TABLEAU I (SUITE).

Localité.	No.	Longueur μ	Furca.	Soie apic. int. : Soie apic. ext.	Soie apic. méd. int. : Long. furca	Soie dorsale μ	Enp. 4. Long. : Larg.	Enp. 4. Epine int. : Epine ext.	Enp. 4. Epine int. : Long. art.	5e patte. Epine : Soie méd. : Soie ext.	Formule des épines.
Kurduvadi	51	608	46 : 13 = 3.54 : 1	1.20 : 1	3.63 : 1	33	30 : 13 = 2.30 : 1	58 : 26 = 2.23 : 1	1.93 : 1	..	$\left\{ \begin{array}{l} 3-4-4-3 \\ 3-4-3-3 \end{array} \right.$
Puits, G.	52	608	50 : 13 = 3.85 : 1	1.10 : 1	3.40 : 1	38	31 : 11 = 2.82 : 1	66 : 23 = 2.87 : 1	2.13 : 1	21 : 32 : 28	3-4-4-3
	53	608	43 : 11 = 3.90 : 1	1.15 : 1	4.26 : 1	33	30 : 13 = 2.30 : 1	60 : 25 = 2.40 : 1	2 : 1	20 : 50 : x	3-4-4-3
	54	570	43 : 13 = 3.30 : 1	1.07 : 1	3.88 : 1	36	30 : 12 = 2.50 : 1	58 : 25 = 2.32 : 1	1.93 : 1	13 : 45 : 38	3-4-4-3
	55	560	45 : 13 = 3.46 : 1	1.12 : 1	3.56 : 1	36	30 : 13 = 2.30 : 1	60 : 21 = 2.86 : 1	2 : 1	16 : 41 : 33	3-4-4-3
Kurduvadi	56	..	45 : 14.5 = 3.10 : 1	1.07 : 1	4 : 1	..	32 : 11 = 2.91 : 1	68 : 28 = 2.43 : 1	2.12 : 1	..	3-4-4-3
Puits, K.	57	..	52 : 16 = 3.25 : 1	1 : 1	3.15 : 1	..	30 : 10 = 3 : 1	63 : 27 = 2.33 : 1	2.10 : 1	..	3-4-4-3
	58	..	60 : 18 = 3.33 : 1	1.13 : 1	2.67 : 1	..	30 : 10 = 3 : 1	61 : 25 = 2.44 : 1	2.03 : 1	..	3-4-4-3
	59	..	..	1 : 1	..	..	27 : 12 = 2.25 : 1	60 : 22 = 2.73 : 1	2.22 : 1	..	3-4-4-3
	60	589	50 : 16 = 3.12 : 1	0.90 : 1	3.50 : 1	36	30 : 13 = 2.30 : 1	67 : 27 = 2.48 : 1	2.23 : 1	20 : 55 : 40	3-4-4-3
	61	636	55 : 16 = 3.44 : 1	1 : 1	3.33 : 1	38	30 : 15 = 2 : 1	67 : 27 = 2.48 : 1	2.23 : 1	..	3-4-4-3
	62	646	50 : 15 = 3.33 : 1	1 : 1	3.66 : 1	33	31 : 13 = 2.38 : 1	70 : 28 = 2.50 : 1	2.26 : 1	..	3-4-4-3
	63	655	53 : 13 = 4.08 : 1	1 : 1	3.26 : 1	35	30 : 13 = 2.30 : 1	67 : 27 = 2.48 : 1	2.23 : 1	..	3-4-4-3
	64	636	50 : 15 = 3.33 : 1	1.06 : 1	3.74 : 1	40	31 : 13 = 2.38 : 1	67 : 25 = 2.68 : 1	2.16 : 1	..	3-4-4-3
Bhosra (près Kurduvadi).	65	589	48 : 15 = 3.20 : 1	1.15 : 1	3.65 : 1	28	30 : 13 = 2.30 : 1	63 : 28 = 2.25 : 1	2.10 : 1	18 : 36 : 25	3-4-4-3

Puits	66	598	48 : 15 = 3·20 : 1	1·18 : 1	3·48 : 1	41	30 : 13 = 2·30 : 1	61 : 26 = 2·35 : 1	2·03 : 1	16 : 41 : ×	3-4-4-3
	67	598	48 : 15 = 3·20 : 1	1·15 : 1	3·60 : 1	33	30 : 13 = 2·30 : 1	60 : 28 = 2·14 : 1	2 : 1	20 : × : ×	3-4-4-3
	68	560	48 : 15 = 3·20 : 1	1·10 : 1	3·48 : 1	43	30 : 12 = 2·50 : 1	58 : 26 = 2·23 : 1	1·93 : 1	..	3-4-4-3
	69	579	46 : 15 = 3·07 : 1	1·27 : 1	3·63 : 1	35	30 : 12 = 2·50 : 1	67 : 28 = 2·39 : 1	2·23 : 1	× : 46 : 33	3-4-4-3
	70	579	43 : 13 = 3·30 : 1	1·04 : 1	3·88 : 1	33	30 : 13 = 2·30 : 1	53 : 25 = 2·12 : 1	1·77 : 1	16 : 41 : 33	3-4-4-3
Pandharpour	71	584	43 : 13 = 3·30 : 1	0·93 : 1	3·90 : 1	30	30 : 13 = 2·30 : 1	60 : 26 = 2·30 : 1	2 : 1	18 : × : ×	3-4-4-3
Puits	72	584	46 : 15 = 3·07 : 1	1·15 : 1	3·54 : 1	33	30 : 13 = 2·30 : 1	60 : 26 = 2·30 : 1	2 : 1	..	3-4-4-3
	73	560	53 : 15 = 3·53 : 1	1·27 : 1	3·49 : 1	..	..	..	..	..	3-4-4-3
	74	612	48 : 15 = 3·20 : 1	1·15 : 1	3·81 : 1	33	30 : 13 = 2·30 : 1	60 : 24 = 2·50 : 1	2 : 1	15 41 : 28	} 3-4-4-3 3-4-3-3
	75	608	45 : 13 = 3·46 : 1	0·87 : 1	3·89 : 1	33	30 : 12 = 2·50 : 1	67 : 26 = 2·58 : 1	2·23 : 1	16 : 50 : 33	
											3-4-4-3
Pandharpour	76	665	48 : 16 = 3 : 1	1·10 : 1	3·81 : 1	36	31 : 13 = 2·38 : 1	66 : 28 = 2·36 : 1	2·13 : 1	..	3-4-4-3
Réservoir	77	532	33 : 15 = 2·20 : 1	1·08 : 1	6·06 : 1	41	28 : 11 = 2·54 : 1	63 : 25 = 2·52 : 1	2·25 : 1	× : 58 : 30	3-4-3-3
	78	551	33 : 16 = 2·06 : 1	0·78 : 1	6·30 : 1	38	28 : 13 = 2·15 : 1	67 : 25 = 2·68 : 1	2·39 : 1	..	3-4-3-3
	79	560	31 : 16 = 1·94 : 1	0·92 : 1	7 : 1	50	26 : 13 = 2 : 1	65 : 25 = 2·60 : 1	2·50 : 1	25 : 66 : 41	3-4-3-3
	80	532	50 : 15 = 3·33 : 1	1·11 : 1	3·84 : 1	..	30 : 13 = 2·30 : 1	57 : 27 = 2·11 : 1	1·90 : 1	16 : 58 : 33	3-4-4-3
	81	532	33 : 16 = 2·06 : 1	1·04 : 1	6·30 : 1	50	30 : 13 = 2·30 : 1	67 : 27 = 2·48 : 1	2·23 : 1	30 : × : ×	3-4-3-3
	82	551	30 : 15 = 2 : 1	0·96 : 1	6·77 : 1	46	31 : 13 = 2·38 : 1	65 : 21 = 3·09 : 1	2·09 : 1	30 : 63 : 46	3-4-3-3
	83	555	36 : 15 = 2·40 : 1	1·04 : 1	5·64 : 1	43	30 : 11 = 2·73 : 1	65 : 25 = 2·60 : 1	2·17 : 1	..	3-4-3-3

TABLEAU I (Fin).

Localité.	No.	Longueur μ	Furca.	Soie apic. int. : Soie apic. ext.	Soie apic. méd. int. : Long. furca	Soie dorsale μ	Enp. 4. Long. : Larg.	Enp. 4. Epine int. : Epine ext.	Enp. 4. Epine int. : Long. art.	5e patte. Epine : Soie méd. : Soie ext.	Formule des épines.
<i>Pandharpour</i>	84	646	45 : 15 = 3 : 1	1 : 1	3-71 : 1	..	30 : 13 = 2-30 : 1	63 : 25 = 2-52 : 1	2-10 : 1	..	3-4-4-3
<i>Rivière Bhima</i>	85	622	36 : 17 = 2-12 : 1	0-67 : 1	5-78 : 1	36	30 : 13 = 2-30 : 1	65 : 28 = 2-32 : 1	2-17 : 1	30 : 42 : 27	3-4-3-3
	86	617	35 : 17 = 2-06 : 1	0-90 : 1	6-20 : 1	35	30 : 11 = 2-73 : 1	..	..	..	3-4-3-3
	87	646	48 : 15 = 3-20 : 1	1-12 : 1	3-48 : 1	41	30 : 12 = 2-50 : 1	62 : 26 = 2-38 : 1	2-07 : 1	..	3-4-4-3
	88	608	35 : 16 = 2-19 : 1	0-84 : 1	5-94 : 1	51	30 : 15 = 2 : 1	68 : 26 = 2-62 : 1	2-27 : 1	..	3-4-3-3
	89	627	38 : 17 = 2-24 : 1	0-77 : 1	5-39 : 1	50	30 : 15 = 2 : 1	65 : 27 = 2-40 : 1	2-17 : 1	35 : 60 : 41	3-4-3-3
<i>Danoli</i> (Etat de Savant- vadi).	90	598	43 : 15 = 2-87 : 1	1-20 : 1	3-49 : 1	..	28 : 13 = 2-15 : 1	52 : 25 = 2-08 : 1	1-86 : 1	..	3-4-4-3
<i>Mares de rivière</i>	91	583	43 : 15 = 2-87 : 1	1-20 : 1	3-72 : 1	..	..	..	..	..	3-4-4-3
	92	570	41 : 13 = 3-15 : 1	1-17 : 1	3-90 : 1	33	30 : 15 = 2 : 1	65 : 28 = 2-32 : 1	2-17 : 1	..	3-4-4-3
	93	617	43 : 15 = 2-87 : 1	1-20 : 1	3-79 : 1	35	30 : 13 = 2-30 : 1	58 : 21 = 2-76 : 1	1-93 : 1	20 : 38 : x	3-4-4-3
	94	589	41 : 15 = 2-73 : 1	1 : 1	3-98 : 1	33	..	..	..	..	3-4-4-3
	95	589	45 : 13 = 3-46 : 1	1-13 : 1	3-71 : 1	33	30 : 12 = 2-50 : 1	53 : 25 = 2-12 : 1	1-77 : 1	18 : x : x	3-4-4-3
	96	598	41 : 15 = 2-73 : 1	1-12 : 1	3-95 : 1	33	28 : 11 = 2-54 : 1	50 : 28 = 1-78 : 1	1-78 : 1	..	3-4-4-3
<i>Vengurla</i>	97	646	40 : 16 = 2-50 : 1	1-18 : 1	5 : 1	..	30 : 11 = 2-73 : 1	63 : 28 = 2-25 : 1	2-10 : 1	..	3-4-3-3
<i>Mare</i>	98	617	40 : 15 = 2-67 : 1	1 : 1	5-50 : 1	..	..	..	..	..	3-4-3-3
	99	608	39 : 15 = 2-60 : 1	1 : 1	5-56 : 1	..	..	..	..	..	3-4-3-3
	100	608	36 : 16 = 2-25 : 1	0-88 : 1	5-28 : 1	36	30 : 13 = 2-30 : 1	66 : 31 = 2-13 : 1	2-20 : 1	26 : 66 : 42	3-4-3-3

Kolagiri (Elk). Mare	011	646	38 : 15 = 2.53 : 1	1.18 : 1	6 : 1	41	31 : 12 = 2.58 : 1	71 : 33 = 2.15 : 1	2.29 : 1	× 33 : × :	3-4-3-3
	102	589	40 : 16 = 2.50 : 1	0.86 : 1	6.05 : 1	46	30 : 13 = 2.30 : 1	75 : 33 = 2.27 : 1	2.50 : 1	26 : × : ×	3-4-3-3
	103	665	41 : 16 = 2.56 : 1	0.92 : 1	6.34 : 1	45	31 : 14 = 2.21 : 1	76 : 33 = 2.30 : 1	2.45 : 1	26 : 36 : 33	3-4-3-3
	104	680	40 : 16 = 2.50 : 1	0.82 : 1	6.55 : 1	41	31 : 13 = 2.38 : 1	76 : 35 = 2.19 : 1	2.45 : 1	..	3-4-3-3
	105	684	41 : 16 = 2.56 : 1	0.87 : 1	6.90 : 1	50	31 : 15 = 2.07 : 1	75 : 38 = 1.97 : 1	2.42 : 1	36 : 58 : 26	3-4-3-3
	106	608	38 : 15.5 = 2.45 : 1	0.85 : 1	6.89 : 1	..	28 : 13 = 2.15 : 1	70 : 31 = 2.26 : 1	2.50 : 1	× : 50 : 26	3-4-3-3
	107	655	41 : 15.5 = 2.65 : 1	0.86 : 1	5.90 : 1	41	31 : 15 = 2.07 : 1	75 : 33 = 2.27 : 1	2.42 : 1	33 : 58 : 25	3-4-3-3
Coonoor Etang	108	684	50 : 15 = 3.33 : 1	1.32 : 1	3.66 : 1	33	31 : 15 = 2.07 : 1	66 : 33 = 2 : 1	2.13 : 1	20 : 50 : ×	3-4-4-3
	109	684	50 : 16 = 3.12 : 1	1.03 : 1	3.44 : 1	..	33 : 15 = 2.20 : 1	71 : 35 = 2.03 : 1	2.15 : 1	33 : 58 : 25	3-4-4-3
	110	641	38 : 16 = 2.37 : 1	0.85 : 1	6.13 : 1	40	30 : 13 = 2.30 : 1	71 : 26 = 2.73 : 1	2.37 : 1	..	3-4-3-3
	111	655	50 : 16 = 3.12 : 1	0.97 : 1	3.66 : 1	..	31 : 14 = 2.21 : 1	66 : 26 = 2.54 : 1	2.13 : 1	25 : 58 : 33	3-4-4-3
	112	665	50 : 16 = 3.12 : 1	1.06 : 1	3.66 : 1	38	32 : 15 = 2.13 : 1	65 : 28 = 2.32 : 1	2.03 : 1	23 : 56 : 41	3-4-4-3
	113	665	46 : 15 = 3.07 : 1	1.09 : 1	4.41 : 1	36	31 : 15 = 2.07 : 1	67 : 27 = 2.48 : 1	2.16 : 1	16 : 53 : 36	3-4-4-3
	114	712	56 : 16 = 3.50 : 1	1.09 : 1	3.52 : 1	50	31 : 15 = 2.07 : 1	65 : 27 = 2.40 : 1	2.09 : 1	20 : 66 : ×	3-4-4-3
	115	665	51 : 15 = 3.40 : 1	1.06 : 1	4.02 : 1	..	31 : 15 = 2.07 : 1	70 : 28 = 2.50 : 1	2.26 : 1	× : 66 : ×	3-4-4-3
Mettupalaiyam Mares de rivière	116	712	50 : 15 = 3.33 : 1	0.96 : 1	3.34 : 1	..	30 : 13 = 2.30 : 1	60 : 26 = 2.30 : 1	2 : 1	..	3-4-4-3
	117	617	43 : 13 = 3.30 : 1	1.12 : 1	3.72 : 1	33	28 : 13 = 2.15 : 1	56 : 25 = 2.24 : 1	2 : 1	..	3-4-4-3
	118	560	43 : 15 = 2.87 : 1	1.20 : 1	3.67 : 1	36	30 : 13 = 2.30 : 1	53 : 23 = 2.30 : 1	1.77 : 1	23 : × : ×	3-4-4-3
	119	570	43 : 15 = 2.87 : 1	1.24 : 1	3.79 : 1	36	28 : 12 = 2.33 : 1	53 : 25 = 2.12 : 1	1.89 : 1	..	3-4-4-3
	120	579	45 : 13 = 3.46 : 1	1.24 : 1	3.51 : 1	..	29 : 11 = 2.64 : 1	53 : 25 = 2.12 : 1	1.83 : 1	..	3-4-4-3
	121	617	50 : 15 = 3.33 : 1	1.24 : 1	3.26 : 1	33	30 : 13 = 2.30 : 1	55 : 25 = 2.20 : 1	1.83 : 1	..	3-4-4-3

E.(T.) confinis forma frequens.

Nos. 5, 7, 77, 78, 79, 81, 82, 83, 85, 86, 88, 89, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 110.

E.(T.) multicolor.

Tous les autres numéros de la série.

NOTE.—Les mensurations des soies apicales de la furca ont été omises par suite de manque d'espace.

TABLEAU II(a).

Animaux à formule des épines de.

3-4-4-3.

(E. (T.) multicolor.)

—	Nombre	Moyennes	Valeurs extrêmes
Longueur totale	92	623 μ	532 μ —712 μ
Furca. Long. : larg.	95	48,57 : 14,73 = 3,29 : 1	2,73 : 1—4,08 : 1
Do. Soie apic. méd. int. : long. furca	95	174,44 : 48,57 = 3,59 : 1	2,67 : 1—4,41 : 1
Do. Soie apic. int. : soie apic. ext. ..	96	30,87 : 28,45 = 1,09 : 1	0,90 : 1—1,27 : 1
Do. Soie dorsale	72	36,49 μ	30 μ —53 μ
Do. Position des branches : Parallèles	4	....	....
Divergentes	91	....	....
Enp. 4. Long. : larg.	94	30,22 : 13,03 = 2,32 : 1	2 : 1—3 : 1
Do. Epine int. : ép. ext.	93	62,60 : 25,68 = 2,44 : 1	1,61 : 1—2,90 : 1
Do. Ep. int. : long. art.	93	62,60 : 30,22 = 2,07 : 1	1,67 : 1—2,42 : 1
Cinquième patte :			
Epine interne	44	18,84 μ	13 μ —33 μ
Soie médiane	42	48,26 μ	25 μ —66 μ
Soie externe	27	32,83 μ	20 μ —41 μ

TABLEAU II(b).

Animaux à formule des épines de.

3-4-3-3.

(E. (T.) confinis forma frequens.)

—	Nombre	Moyennes	Valeurs extrêmes
Longueur totale	24	606 μ	532 μ —684 μ
Furca. Long. : larg.	24	36,62 : 15,75 = 2,32 : 1	1,94 : 1—2,67 : 1
Do. Soie apic. méd. int. : long. furca	24	221,50 : 36,62 = 6,05 : 1	5 : 1—7 : 1
Do. Soie apic. int. : soie apic. ext.	24	27,17 : 29,92 = 0,90 : 1	0,67 : 1—1,18 : 1
Do. Soie dorsale	20	42,90 μ	35 μ —51 μ
Do. Position des branches : Parallèles	22	....	....
Divergentes	2	....	....
Enp. 4. Long. : larg.	22	29,64 : 13,09 = 2,26 : 1	2 : 1—2,73 : 1
Do. Epine int. : ép. ext.	21	68,76 : 29,43 = 2,34 : 1	1,97 : 1—3,09 : 1
Do. Ep. int. : long. art.	21	68,76 : 29,64 = 2,32 : 1	2,09 : 1—2,69 : 1
Cinquième patte :			
Epine interne	11	28,82 μ	20 μ —36 μ
Soie médiane	12	53,33 μ	33 μ —66 μ
Soie externe	11	31,73 μ	25 μ —42 μ

TABLEAU III.

E. (T.) confinis forma *frequens*.

	Afrique Sud, Est. Java. Flores. 14 exemplaires	Inde 24 exemplaires
Furca. Longueur : largeur	2,23 : 1	2,32 : 1
Do. Soie apic. méd. int. : long. furca.	6,53 : 1	6,05 : 1
Do. Soie apic. int. : soie apic. ext.	0,98 : 1	0,90 : 1
Enp. 4. Longueur : largeur	2,09 : 1	2,26 : 1
Do. Epine int. : épine ext.	2,31 : 1	2,34 : 1
Do. Epine int. : long. article	2,56 : 1	2,32 : 1

TABLEAU IV

	<i>E. (T.) extensus</i> <i>longispina</i> 4 exemplaires	<i>E. (T.) multicolor</i> 96 exemplaires
Furca. Longueur : largeur	4,06 : 1	3,29 : 1
Do. Position des branches	Presque parallèles	Blen divergentes
Do. Soie apicale int. : soie apicale externe	1,49 : 1	1,09 : 1
Enp. 4 Longueur : largeur	2,23 : 1	2,32 : 1
Do. Epine interne : épine ext.	2,70 : 1	2,44 : 1
Do. Epine interne : long. article	2,27 : 1	2,07 : 1

Liste d'habitats.

Animaux à formule des épines de

	3-4-4-3	3-4-3-3
Mares de rivière	7	1
Puits	7	....
Etangs	2	1
Mares de pluie temporaires .. ..	....	2
Citernes	2	....
Réservoirs	1	1
Rivières	1	1

ON A NEW SPECIES OF THE GENUS *EUPARADISTOMUM*
TUBANGUI (TREMATODA) FROM A BAT, *CERIVOULA PICTA*
(PALLAS) FROM BURMA.

By B. S. GOGATE.

(From the Biological Department, University of Rangoon.)

The following species of Trematode was recovered from the intestine of *Cerivoula picta* (Pallas 1767). The host was brought down to Rangoon from Tantabin, Insein district.

***Euparadistomum cerivoulae*, sp. nov.**

Host.—*Cerivoula picta* (Pallas 1767).

Location.—Intestine.

Locality.—Tantabin, Insein district (Burma).

Description.—Body broad, flat, more pointed posteriorly than anteriorly, 2.79×1.68^1 , maximum breadth in region of ovary posterior to ventral sucker. Cuticle smooth. Oral sucker subterminal, 0.401×0.556 , with moderately developed musculature. Ventral sucker 0.509×0.587 , with three-fourth of its length posteqatorial, with weak musculature, without cavity. Mouth subterminal; prepharynx absent; Oesophagus 0.163 long, thin walled, bifurcating at anterior third length of cirrus sac. Intestinal caeca much dilated, almost reaching posterior end of body.

Testes small, oval, with smooth margins, slightly oblique, partly overcaecal, directly preacetabular: right testis 0.163×0.134 , left 0.167×0.145 . Cirrus sac of moderate size, elongated, 0.265×0.076 , in median line; inclosing slightly coiled vesicula seminalis; genital opening ventral to oesophagus, midway between pharynx and caecal bifurcation.

Ovary oval, with slightly lobated margin, longer than testes, 0.247×0.130 , with long axis oblique to body axis, submedian in position and with about one-third of its breadth covered by ventral sucker; shell gland distinct, median, near posteromesial margin of the ovary, 0.142×0.172 ; receptaculum seminis small. Laurer's canal present. Uterine coils profusely distributed throughout the body from posterior end of the body to pharynx, not clearly arranged into ascending and descending loops. Vitellaria composed of small follicles distributed laterally, extracaecal, in two patches on either side: posterior patch very distinct, not covered by uterine coils, ending posteriorly about ends of caeca; anterior patch a little detached from the posterior one of the same side, partially covered all its length by uterine coils, and commencing at level of the testes.

Eggs yellow, operculated, with small circular constriction below the operculum, $0.0363-0.0581 \times 0.014-0.0272$. Excretory bladder Y-shaped; excretory pore at the posterior tip of the body.

The type slide, No. W3422/1, is preserved in the collection of the Zoological Survey of India (Ind. Mus.) Calcutta.

¹ All measurements in millimetres.

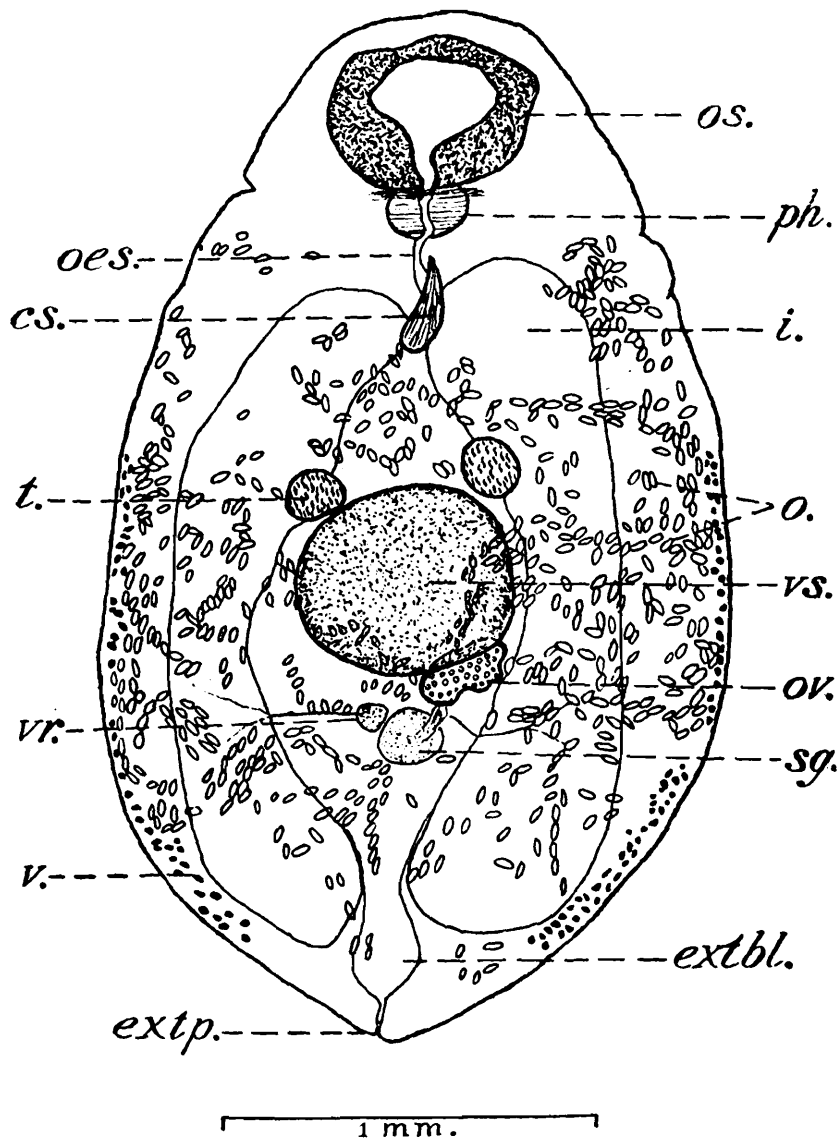
Tubangui (1931) established the genus *Euparadistomum* for the reception of a species *E. varani* from a lizard, (*Varanus salvator* Linn.), characterised, according to him, by the following points:—

- (a) The preacetabular position of the testes,
- (b) The profuse distribution of the uterine coils throughout whole body,
- (c) The equatorial position of the ventral sucker, and
- (d) The considerable distance separating cirrus sac and pharynx.

Of these the first is common both to *Euparadistomum* and to *Platy-notrema* Nicoll 1914—a genus not considered by Tubangui.

The present form agrees with *E. varani* Tubangui 1931 in many respects but differs in:—

- (a) The possession of a ventral sucker bigger than the oral, without any cavity, and with a position about three-fourth post-equatorial.



Euparadistomum cerivoulae, sp. nov.

cs. cirrus sac; extbl. excretory bladder; ex tp. excretory pore; i. intestine; o. ova; oes. oesophagus; os. oral sucker; ov. ovary; ph. pharynx; sg. shell gland; t. testis; v. vitellaria; vr. vitelline reservoir; vs. ventral sucker.

- (b) A genital pore anterior to caecal bifurcation, midway between the bifurcation and the pharynx.

- (c) A crenated margin to the ovary, the oblique position of its long axis to the axis of the body and its partial overlapping by the ventral sucker.
- (d) The splitting of the vitellaria into two lateral patches of fine follicles, and their commencement in the region of the testes instead of that of the cirrus sac.
- (e) The intestinal situation, and
- (f) The mammalian host.

The diagnosis of *Euparadistomum* Tubangui 1931 must, therefore, be emended as follows to include the above points.

Dicrocoeliinae.—Body relatively broad and flat, attenuated at both ends, cuticle smooth. Acetabulum equatorial or largely post-equatorial in position, with weaker musculature than of the oral, bigger or smaller than the oral, and with or without a cavity. Genital pore median, in front of acetabulum, anterior to or behind the caecal bifurcation. Cirrus sac small, midway between two suckers or closer to the oral. Ovary close to the median line, smooth or crenated, with its long axis parallel or oblique to that of the body; shell gland conspicuous median and postovarian; receptaculum seminis small. Uterine coils profusely distributed throughout most part of the body substance, not clearly arranged in ascending and descending loops. Vitellaria submoderate to moderate, formed of fine or medium sized follicles, lateral extracaecal, in one continuous patch on either side or split into two patches one behind the other, extending in the last third of the body. Excretory bladder Y-shaped, excretory pore terminal.

Type species.—*E. varani* Tubangui 1931.

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NOTES ON NEW AND KNOWN INDIAN THYSANOPTERA.

By T. V RAMAKRISHNA AYYAR, B.A., Ph.D. and V MARGABANDHU, M.A.,
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This contribution is presented as a continuation of a series of systematic papers on Indian Thysanoptera published till now either by the senior author or jointly by both the writers since 1925. Recent collections and studies having added considerably to supplement our knowledge of these little known insects, it was thought convenient to publish the results of these studies so far completed. In this paper about 23 species of thrips are included ; of these 8 forms appear to be new to science, 4 are found to belong to new genera and 3 of genera not previously recorded from India. In addition to short descriptions of the new forms recorded, bionomical notes are also added under each of the species noted either new or already recorded ones. The idea in presenting this paper is to bring our knowledge of this group of insects up to date as far as possible. The authors are especially indebted to Dr. H. Priesner, the world-famous Thysanopterologist for help and suggestions in the study of these forms.

The species included in this paper are :—

- | | |
|---|--|
| 1. <i>Neocorynothrips asiaticus</i> , gen. et sp. nov. | 12. <i>Isoneurothrips orientalis</i> Bag. |
| 2. <i>Frankliniella sulphurea</i> Schm. | 13. <i>Projectothrips pruthi</i> Moulst. |
| 3. <i>Heliothrips kadaliphila</i> Ram. & Marg. | 14. <i>Thrips florum</i> Schm. |
| 4. <i>Ayyaria chaetophora</i> Ky. | 15. <i>Thrips tabaci</i> Lind. |
| 5. <i>Fulmekiola saccharicida</i> , sp. nov. | 16. <i>Gnomonothrips coimbatorensis</i> , gen. et sp. nov. |
| 6. <i>Taeniothrips brunneicornis</i> (Bag.). | 17. <i>Oxyrrhinothrips beharensis</i> , sp. nov. |
| 7. <i>Taeniothrips distalis</i> Ky. | 18. <i>Oxyrrhinothrips rostrata</i> , sp. nov. |
| 8. <i>Taeniothrips nigricornis</i> (Schm.). (= <i>longistylus</i> Ky.). | 19. <i>Ecacanthothrips steinskyi</i> Schm. |
| 9. <i>Taeniothrips niloticus</i> Pr. | 20. <i>Androthrips melastomae</i> (Zim.). |
| 10. <i>Megaphysothrips subramanii</i> , gen. et sp. nov. | 21. <i>Neosmerinthothrips gloveri</i> , sp. nov. |
| 11. <i>Euphysothrips menozzi</i> Bag. | 22. <i>Gynaikothrips pallicrus</i> Ky. |
| | 23. <i>Chiridothrips indicus</i> , gen. et sp. nov. |

TEREBRANTIA.

Neocorynothrips, gen. nov.

This new genus comes near *Corynothrips*, *Trichromothrips* and *Macrurothrips*. It is allied to *Corynothrips* Williams in the head being produced in front of eyes into a triangular process upon which the antennae are inserted. It is allied to *Macrurothrips* Vuillet in the head widened

posteriorly and in having the sixth antennal joint the longest of all ; and lastly it is allied to *Trichromothrips* Priesner in the following characters : i. Antennae 8-jointed ; style 2-jointed, very slender but shorter than joint 6. ii. Bristles of body short. iii. Mouth cone short ; maxillary palpi slender, 2-jointed. iv. Body without any polygonal structures. v. Prothorax at hind angles with 2 moderately long bristles. vi. Bristles of abdominal segment 9 well developed. To sum up the genus can be distinguished by the features stated.

Genotype.—*Neocorynothrips asiaticus*, sp. nov.

***Neocorynothrips asiaticus*, sp. nov.**

Female.—Length 1.283 mm. General colour light greyish brown with plenty of pinkish pigment on the thorax and greater part of the abdomen ; head, the apical segment of the abdomen, wings and antennal joints 3 to 8 grey ; legs grey and covered with pigment excepting the front tibiae which appear light yellowish ; ocelli with reddish pigment ; eyes black.

Head.—Longer than broad ; vertex drawn forward between the bases of the antennae ; the produced portion of the vertex with two or three short spines on each lateral margin, situated to the anterior margin of the eyes ; there is a regular longitudinal conspicuous row of spines along the inner margin of each of the eyes, the row reaching almost to the bases of the antennae ; ocelli placed close to the posterior end of the eyes ; eyes large, projecting ; cheeks more or less corrugated ; mouth cone short and broadly rounded reaching the middle of the prosternum. Antennae elongated : joints 3 to 6 elongated ; joints 7 and 8 almost equal in length ; joint 6 the longest ; joints 3 to 6 more or less of uniform shape and provided with spines ; first two joints of the antennae concolorous with the head.

Thorax.—Prothorax broader than long and almost as long as head ; sides clearly arched ; posterior angles with two spines of which one is conspicuous ; anterior angle with a forwardly directed short spine. Fore legs comparatively stouter than the hind legs and fringed with bristles ; hind legs longer and also fringed with bristles. In fact all the legs fringed with bristles. Wings extend to the 8th abdominal segment, elongated and narrow ; lower vein with 11 or 12 setae at equal intervals ; upper vein with 2 spines at the apical region of the wing ; fore wing shows two rows of spines besides the costal but in the upper vein there are very few, practically only two spines at the distal end. Body without polygonal sculpturing.

Abdomen.—Elongated, as long as head and thorax together ; segment 9 abnormally elongated, with very strong laterally pointed spines along posterior margin ; segment 10 tubular with shorter spines ; posterior margins of the abdominal segment on the ventral side provided with about half a dozen short bristles in a transverse row.

Measurements.—Head : length 0.143 mm., breadth 0.121 mm. ; prothorax : length 0.114 mm., breadth 0.186 mm. ; pterothorax breadth 0.243 mm. Abdomen : length 0.750 mm. 9th abdominal segment length 0.143 mm., 10th abdominal segment length 0.107 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	21	18	64	64	50	79	14	14
Breadth	21	21	14	18	14	14	7	7

Described from a single specimen collected on garden crotons in Coimbatore (V M. Coll.—T. V R. No. 221).

Frankliniella sulphurea Schmutz.

1913. *Frankliniella sulphurea*, Schmutz, *Sitz. Akad. Wiss. Wien* CXXII, p. 1019.

1925. *Frankliniella sulphurea*, Ramakrishna, *Journ. Bomb. Nat. Hist. Soc.* XXX, p. 865.

1926. *Frankliniella sulphurea*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 195.

1928. *Frankliniella sulphurea*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 255.

1929. *Frankliniella sulphurea*, Moulton, *Rec. Ind. Mus.* XXXI, p. 93.

Habitat and Locality.—From Prickly pear flowers, Adoni, Bellary. (T. V R. Coll.—T. V R. No. 415). A very common species noted in almost all flowers ; some of the previous records are on Jasmine flowers from Kollegal, on shoots of chillies from Kadiyam, Godaveri, in ground-nut flowers from Guntur, in cotton flowers in Coimbatore, etc., and in flowers of *Datura fastosa* at Barkuda Island, Chilka Lake, Orissa.

Heliothrips kadaliphila Ramakrishna and Margabandhu.

1931. *Heliothrips kadaliphila*, Ramakrishna and Margabandhu, *Journ. Bomb. Nat. Hist. Soc.* XXXIV, p. 1033.

Habitat and Locality.—On Banana, Ponnani, Malabar. (T. V R. Coll.—T. V R. No. 481). Previous record is from the same plant from Coimbatore. This insect was first described from material collected on Banana from Kallar at the foot of the Nilgiri hills in 1930. The insect was later noted on one or two occasions as a fairly serious pest on the same food plant in parts of Malabar and control measures had to be adopted to check its injuries.

Ayyaria chaetophora Karny.

1926. *Ayyaria chaetophora*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 193.

1928. *Ayyaria chaetophora*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 255.

1931. *Ayyaria chaetophora*, Ramakrishna and Margabandhu, *Journ. Bomb. Nat. Hist. Soc.* XXXIV, p. 1034.

Habitat and Locality.—On *Dolichos lablab*, Malabar. (K. P. A. Coll.—T. V R. No. 448). Previously collected from castor shoots from Samalkota, on garden croton in Coimbatore and in grass sweepings in Walayar forests, Malabar.

Fulmekiola saccharicida, sp. nov.

Female.—Length 0.864—0.893 mm. General colour yellowish grey ; abdomen of a darker hue ; thorax and head light yellowish grey ; legs

pale yellowish ; antennal joints 3, 4 and 5 and basal half of 6 pale yellow or hyaline, the upper half of 6 and 7 shaded grey ; eyes black, ocelli with red pigment ; wings light grey ; abdomen and tip of mouth cone of a darker hue.

Head.—As long as broad and as long as prothorax ; vertex slightly produced anteriorly and there is a distinct bristle on the vertex near the anterior inner margin of each eye ; head surface behind eyes transversely striated ; there are very minute setae on the cheeks, behind each eye and also along eye margin ; there are also three or four small bristles in a transverse row behind eyes ; cheeks slightly arched ; ocelli crescent-shaped, placed near each other ; mouth cone bluntly tipped and reaching middle of prosternum. Antennal joints 3 and 4 equal, elongate and cylindrical, 2 and 5 equal but 2 stouter, 6 longest and 7 very small, pointed.

Thorax.—Each of the posterior angles of the prothorax with two fairly long weak bristles. Pterothorax as long as head and thorax together, broader anteriorly. Wings reaching the 8th abdominal segment. Forewing : costa with 16 spines ; upper vein with 8 spines at the basal fourth, one beyond and another at the distal fourth ; lower vein : with 11 spines in a regular row from opposite the 7th of upper vein and ending just before its last bristle. All legs and joints of antennae, surface of head and prothorax with minute setae.

Abdomen.—Abdominal segments of about same breadth up to 8th ; 9th and 10th with some strong bristles directed backwards.

Measurements.—Head : length 0.100 mm., breadth 0.100 mm. ; prothorax : length 0.100 mm., breadth 0.121 mm. ; pterothorax breadth 0.157 mm. ; abdomen length 0.543 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII
Length	14	29	36	36	29	43	14
Breadth	16	16	14	14	14	14	7

Described from specimens collected on sugarcane leaves in Coimbatore. (V M. Coll.—T. V R. No. 218).

This species can be distinguished from *Fulmekiola indica* Ram. & Marg. by the variation in measurements of the different parts and in the number of wing spines.

***Taeniothrips brunneicornis* (Bagnall).**

1916. *Physothrips brunneicornis*, Bagnall, *Ann. Mag. Nat. Hist.* (8) XVII, p. 218.

1918. *Physothrips brunneicornis*, Bagnall, *Ann. Mag. Nat. Hist.* (9) XIX, p. 206.

1928. *Taeniothrips brunneicornis*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 256.

Habitat and Locality.—On Lucerne, Poona, Bombay. (T. V R. No. 281). Species first described from Japan and previously recorded from India on rose at Darjeeling.

Taeniothrips distalis Karny.

1913. *Taeniothrips distalis*, Karny, *Arch. Naturg.* 79 A, p. 122.
 1926. *Taeniothrips distalis*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 196.
 1928. *Taeniothrips distalis*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 256.

Habitat and Locality.—In flowers of *Nepelium litchi*, Pusa (T. B. Fletcher Coll.—T. V. R. No. 263) and on Lucerne, Poona, Bombay. Previously recorded from lab lab flowers, Anakapalle, on sannhemp (*Crotalaria juncea* flowers from Coimbatore and Samalkota and in *Pongamia glabra* flowers from Bangalore. A very common and widely distributed species.

Taeniothrips nigricornis (Schmutz).

1913. *Frankliniella nigricornis*, Schmutz, *Sitz. Akad. Wiss. Wien.* CXXII, p. 1020.
 1923. *Taeniothrips longistylus*, Karny, *Journ. Siam. Socy.* XVI, p. 99.
 1926. *Taeniothrips longistylus*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 196.
 1928. *Taeniothrips longistylus*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 258.

Habitat and Locality.—On *Mimosa pudica* flowers, Wynaad hills, 2,000 ft. (T. V. R. Coll.—T. V. R. No. 465). Previously recorded from flowers of *Cajanus indicus*, *Crotalaria juncea*, Lucerne and in shoots of *Melia azadarichta* from Coimbatore and from flowers of *Vigna catiang* from Malabar.

Taeniothrips niloticus Priesner.

1930. *Taeniothrips niloticus*, Priesner, *Bull. Soc. Roy. Ent. Egypte*, p. 11.

Habitat and Locality.—On Babul (*Acacia arabica*), Kollegal and Hanur. (T. V. R. Coll.—T. V. R. No. 330a and 425). Also from Guntur in the same plant (V. M. Coll.). This is the first record of this species for India.

Megaphysothrips, gen. nov.

This genus can be separated by the following distinguishing features :—the lower vein with only four but exceedingly long bristles ; there is practically only one long postero-angular bristle on prothorax, the second being much smaller ; hind margin with six pairs of additional bristles. The genus is also characterised by the presence of a long incurved postocular spine characteristic of *Euphysothrips* Bagnall.

Genotype.—*Megaphysothrips subramanii*, sp. nov.

Megaphysothrips subramanii, sp. nov.

Female.—Length 1.217—1.250 mm. General colour dark yellowish brown ; head behind eyes, portions of thorax, antennal joints 1, 2 and 4-8 and all femora yellowish brown ; tibiae, tarsi, ocellar region and antennal joints 3-5, 7 and 8 of a lighter yellowish tinge ; wings uniformly yellowish grey, base lighter ; eyes black, ocelli without pigment ; abdomen, ovipositor, head and thorax brownish. Some specimens have a uniform lighter colour.

Head.—Slightly broader than long; vertex distinctly produced in front between the bases of the antennae; eyes large and oval, slightly projecting laterally; ocelli indistinct; two or three short postocular setae, one of these projecting beyond each cheek; the setae are more or less arranged in a transverse line on the head behind eyes; also one short bristle abutting the inner margin of the eye also placed posteriorly; away from the eyes, in between, two more bristles; from the posterior margin of the eyes a long inward curved spine; again in between eyes two short bristles; thus head beset with short bristles or setae; head behind eyes transversely striated; cheeks slightly arched behind eyes, margin slightly corrugated. Antennal joints 1 and 2 short, stout and cylindrical; joint 3 slightly constricted at base, gradually widens and again narrows towards apex, almost jar-shaped; joint 4 the longest, more or less of similar shape as joint 3 but with no basal constriction; joint 5 narrow at base and of almost the same breadth beyond; joint 6 as broad as 5 at base and narrowing distally; joints 7 and 8 short and narrow; joints 3 and 4 with forked sense cones. Mouth cone short and blunt extending to middle of prosternum.

Thorax.—Prothorax almost of the same length as or slightly longer than the head and much broader than head; prothorax itself broader than long; sides of prothorax distinctly arched; surface fringed with a number of minute setae; anterior and posterior margins with 13 to 14 spines in a line; each of the posterior angles with two not very conspicuous spines. Pterothorax broad, longer than head and thorax together, and lateral sides rounded or convex and broader than prothorax. Legs of uniform size and colour. Wings: costa of upper vein with 20-21 spines; upper vein: one-fifth away from the base 3 distinct spines and with 9 spines on the whole; lower vein with 4 conspicuously long spines placed farther apart; the wing-scale with 2 or 3 spines at apex.

Abdomen.—A transverse fringe of cilia along apical margin of 8th segment; posterior abdominal segments with conspicuous lateral spines and 9th segment with 6 or 8 long spines along apical margin longer than those on 10th segment; 9th segment longer than 10th; abdomen broadest between 5th and 7th segments.

Measurements.—Head: length 0.100 mm., breadth 0.136 mm.; prothorax: length 0.114 mm., breadth 0.164 mm.; pterothorax breadth 0.228 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	14	29	50	57	36	43	7	7
Breadth	21	21	21	21	21	14	7	7

Described from specimens found feeding on coffee rust, Dodhkhan Estate, Mysore, collected by Mr. T. V. Subramaniam, Mysore State Entomologist after whom the authors have named the species. (T. V. R., No. 331).

Genus **Euphysothrips** Bagnall.

1926. *Euphysothrips*, Bagnall, *Ann. Mag. Nat. Hist.* (9) XVIII, p. 646.

This is the first record of the genus from India. It was originally erected by Bagnall and is characterised by the following features according to him : " head widening from behind eyes to base ; antennae with 2-jointed style ; mouth-cone long reaching across prosternum ; maxillary palpi 3-jointed, long ; two pairs of long postocular bristles ; two long bristles at each hind angle of the pronotum, the outer much longer than the inner ; lower vein of fore wing without a regular series of setae, but with a few scattered ones ; fringe of abdominal tergite 8 long." The genus is easily recognised chiefly by the presence of two pairs of postocular bristles and the chaetotaxy of the wing which corresponds to that of *Anaphothrips* Uzel in having both veins of forewing furnished with a few scattered setae.

The following key may be found useful in distinguishing the allied genera :

- I. Fore vein of forewing with distinct intervals between groups of spines, (posterior vein with regularly placed spines).
 - i. Forewing with transverse bands .. *Taeniothrips*, s. str.
 - ii. Forewing without transverse bands .. *Physothrips* Karny.
- II. Lower vein of forewing without a regular series of setae, but with a few scattered ones ; two pairs of long postocular bristles .. *Euphysothrips* Bagnall.
- III. Both veins of forewing regularly set with spines *Isochaetothrips* Moulton.

Euphysothrips menozzi Bagnall.

1926. *Euphysothrips menozzi*, Bagnall, *Ann. Mag. Nat. Hist.* (9) XVIII, p. 646.

1927. *Euphysothrips menozzi*, Bagnall, *Ann. Mag. Nat. Hist.* (9) XIX, p. 570.

1933. *Euphysothrips menozzi*, Priesner, *Bull. Soc. Roy. Ent. Egypte*, 1-3, p. 4.

Habitat and Locality.—On ears of cumbu (*Pennisetum typhoideum*), Koilpatti, South India. (T. V R. Coll.—T. V R. No. 431). Also on Lucerne from Coimbatore (V M. Coll.—T. V R. No. 431). The species was first described by Bagnall from insects obtained from flowers of *Clematis vitalba* from France. Priesner has recorded both sexes from Egypt " in the vineyards belonging to the Royal Khassa where it very likely lives on grasses which grow between the vines."

Isoneurothrips orientalis Bagnall.

1915. *Isoneurothrips orientalis*, Bagnall, *Ann. Mag. Nat. Hist.* (8) XV, p. 593.

1926. *Isoneurothrips orientalis*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 197.

1928. *Isoneurothrips orientalis*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 261.

Habitat and Locality.—On Jasmine, Poona, Bombay. (T. V R. No. 285). First noted in Sarawak in 1915 and the previous records are from flowers of *Morinda tinctoria* and Jasmine from Coimbatore and Kollegal.

Projectothrips pruthi Moulton.

1929. *Projectothrips pruthi*, Moulton, *Rec. Ind. Mus.* XXXI, p. 96.

Habitat and Locality.—On Screwpine (*Pandanus*), Coimbatore. (T. V R. Coll.—T. V R. No. 482). The specimens collected generally agree with the description of Moulton and especially in the possession of an extra long joint of the antennae. First noted in Orissa.

Thrips florum Schmutz.

1913. *Thrips florum*, Schmutz, *Sitz. Akad. Wiss. Wien* CXXII, p. 1003.

1926. *Thrips florum*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 198.

1928. *Thrips florum*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 261.

1929. *Thrips florum*, Moulton, *Rec. Ind. Mus.* XXXI, p. 98.

1934. *Thrips florum*, Ramakrishna, *Rec. Ind. Mus.* XXXVI, p. 493.

Habitat and Locality.—On Tea and Rose flowers from Byrekhan, Mysore. (D. S. Rao Coll.—T. V R. Nos. 417 and 429). Priesner is of opinion that the one on rose flowers is a variety with somewhat shorter antennae and with the 4th antennal joint pale at basal fourth.

Thrips tabaci Lindeman.

1888. *Thrips tabaci*, Lindeman, *Die Schädl. Ins. d. Tabac. Basl. Bull. Soc. Imp. Nat. Moscou* I, p. 10.

1902. *Thrips tabaci*, Hinds, *Proc. U. S. Nat. Mus.* XXVI, p. 179.

1926. *Thrips tabaci*, Karny, *Ent. Mem. Dept. Agri. India* IX, p. 199.

1928. *Thrips tabaci*, Ramakrishna, *Ent. Mem. Dept. Agri. India* X, p. 265.

1932. *Thrips tabaci*, Ramakrishna, *Agri. and Livestock, India* II, p. 394.

Habitat and Locality.—On Daisy flowers, Ootacamund, Nilgiri Hills (T. V R. No. 288). A species of very great economic importance and a serious pest of onions and hence popularly called the "onion thrips". Previous Indian records are from cabbage, onion, garlic, cotton, etc. It has a world wide distribution.

Gnomonothrips, gen. nov.

This genus comes close to *Rhaphidothrips* Uzel but the antennae are different. It can be easily distinguished by the antennal structure and the feeble general armature of the body. The generic characters are as given for the species *G. coimbatorensis*—the genotype described below.

Gnomonothrips coimbatorensis, sp. nov.

Female.—Length 1.133 mm. General colour yellowish grey suffused with red pigment especially on thorax; head, abdomen and antennae of darker hue; eyes black, ocelli with red pigment; legs and wings of a lighter yellowish colour. Body comparatively long, thorax and abdomen being appreciably so.

Head.—Surface of head smooth; cheeks slightly arched; head slightly produced forwards, not armed; anterior ocellus close to the vertex and the other two placed very close to the inner margin of each eye towards its anterior end; mouth cone short reaching middle of prosternum. Antennal joints 4 and 6 equal, both being long, widening at middle and narrowing towards apex; joints 3 and 4 short and broad; 7 small and 8 longer than 7 and narrow.

Thorax.—Each of the posterior angles of prothorax with two long weak bristles. Legs comparatively short ; fore femora slightly swollen ; all legs unarmed ; hind tibia with a short stout spur at inner margin of apex. Wings reach 6th abdominal segment.

Abdomen.—Abdomen long and of almost uniform breadth up to the 8th segment, beyond which it narrows towards the anal end ; anal apex feebly armed.

Measurements.—Head : length 0.129 mm., prothorax : length 0.143 mm. ; pterothorax : breadth 0.193 mm. ; abdomen : length 0.643 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	21	21	32	43	29	43	9	14
Breadth	18	18	21	21	14	18	7	7

Described from a single specimen obtained from *Cyperus bulbosus*, Coimbatore. (V M. Coll.—T. V R. No. 226).

***Oxyrrhinothrips beharensis*, sp. nov.**

Female.—Length 1.00 mm. General colour golden yellow ; body margin narrow and apex of mouth cone dark ; ocelli with orange red pigment ; antennal joints 3 to 8 greyish ; eyes large and black ; wings hyaline with fringes grey.

Head.—Head slightly broader than long ; vertex not arched ; cheeks almost straight ; eyes large and roundish ; mouth cone pointed and reaching beyond prosternum. Antennal joints 3 to 6 more or less similar in structure ; joint 7 smallest of all ; joints with short bristles.

Thorax.—Prothorax broader and longer than the head and broader than long ; sides arched and slightly broadening posteriorly ; posterolateral angle of each side with two long bristles. Pterothorax broadest region of the body. Two conspicuous spurs on the hind tibiae. Wings reaching almost the apex of the abdomen ; basal portion of upper vein with 7 or 8 spines, one in the middle and distally two to three ; the lower vein with 14 spines in a regular row ; the row of bristles on the lower vein begins almost opposite to the 7th basal setae of the upper vein.

Abdomen.—Abdomen long, gradually broadening from the 1st to the 6th and slightly narrowing down ; 9th and 10th forming a cone pointed below and almost equal in length ; abdominal segments distinct and with lateral spines.

Measurements.—Head : length 0.100 mm., breadth 0.129 mm. ; prothorax : length 0.129 mm., breadth 0.164 mm. ; pterothorax : breadth 0.228 or 0.200 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	21	29	43	57	36	43	7	7
Breadth	21	21	14	14	14	14	7	7

Described from specimens got on Mango, Pusa. (D. P. S. Coll.—T. V R. No. 230).

Oxyrrhinothrips rostrata, sp. nov.

Female.—Length 0.817 mm. This is different from the last species *O. beharensis* (No. 230) and is distinguished by the following features : i. Mouth cone distinctly elongated and tubular reaching middle of the mesosternum ; ii. cheeks distinctly arched and narrowing abruptly behind ; iii. body comparatively longer ; iv. prothorax much more conspicuous ; v. the postangular prothoracic spines more conspicuous ; vi. the outer margin of the front tibiae armed with short setae ; and vii. the posterolateral spines of the 9th and 10th abdominal segments also more conspicuous. On the whole the armature and mouth cone very strong and conspicuous. In most other respects it is similar to *O. beharensis*.

Measurements.—Head : length 0.075 mm., breadth 0.100 mm. ; prothorax : length 0.083 mm., breadth 0.117 mm. ; pterothorax breadth 0.183 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	17	17	33	33	33	38	8	4
Breadth	17	17	17	17	17	17	8	4

Described from a single specimen obtained from cotton in Coimbatore. (T. V R. Coll.—T. V R. No. 266).

TUBULIFERA.

Ecacanthothrips steinskyi Schmutz.

1913. *Ecacanthothrips steinskyi*, Schmutz, *Sitz. Akad. Wiss. Wien* CXXII, p. 1028.

1930. *Ecacanthothrips steinskyi*, Priesner, *Treubia* XI, p. 362.

Habitat and Locality.—Collected from Cotton by the Mysore State Entomologist Mr. T. V Subramaniam in Mysore. (T. V R. No. 371). Priesner gives a key to the species of the genus (Priesner, 1930). The species is a new record for India.

***Androthrips melastomae* (Zimmermann).**

1900. *Mesothrips melastomae*, Zimmermann, *Bull. Inst. Bot. Buitenzorg* VII, p. 17.
 1912. *Androthrips melastomae*, Karny, *Marcellia* XI, p. 153.
 1913. *Androthrips melastomae*, Karny and Docters v. Leeuwen-Reijnvaan, *Bull. Jard. Bot. Buitenzorg*, (2) X, p. 66.
 1923. *Androthrips melastomae*, Karny, *Treubia* III, p. 314. (Reference).

Habitat and Locality.—In galls of some wild plant, Nilgiri hills (S. Rao. Coll.—T. V R. No. 376).

***Neosmerinthothrips gloveri*, sp. nov.**

Female.—Length 2.583–2.933 mm. General colour dark grey with portions here and there lighter; isolated patches of reddish pigment on the different parts of the body; eyes black; antennal joints 1, bases of 2, 5, 6, 7 and 8, head, thorax and tube of a darker hue; all the femora, middle and hind tibiae, abdominal joints, and antennal joints 3 and 4 are of a lighter tinge; antennal joint 3 and foretibiae and all tarsi paler; wings hyaline with borders faintly yellowish, fringes grey.

Head.—Head slightly longer than broad; cheeks almost parallel; eyes large; ocelli conspicuous with slight pigment, the posterior two placed in a line with the hind margin of the eyes; one long postocular bristle projecting laterally forwards over the eyes; cheeks with isolated spines behind the eyes; mouth cone short and bluntly pointed, not reaching the middle of prosternum. Antennae elongate, slightly longer than head, 8-jointed; joint 1 short as usual cup-shaped; 2 also cup-shaped, broad towards apex and narrowed at base; 3 to 6 almost similar in shape, narrowed at base and broadening towards apex; 7 of almost same breadth throughout, and the last pointed; all the joints carry bristles; 3 and 4 with conspicuous sense-cones also.

Thorax.—Prothorax broader than head but shorter in length; each of the posterior angles carries a pair of spines and there are two or three smaller ones along posterior margins. Fore legs with the femur swollen; the tarsus with a stout conspicuous tooth; the outer margin of the front tibiae slightly curved. Wings with cross fringes 10 or 11; 4 short spines on the wing-scale.

Abdomen.—Abdomen elongate, longer than head and thorax together; wing-retaining spines of the abdominal segments 3 to 5 conspicuous.

Measurements.—Head: length 0.329 mm., breadth 0.279 mm.; prothorax: length 0.221 mm., breadth 0.421 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	43	64	93	86	71	64	50	36
Breadth	29	36	29	34	29	29	29	14

Described from specimens obtained on *Zizyphus jujuba* in Namkum, Ranchi, by Mr. P. M. Glover. (T. V R. No. 450).

Though the general form of this insect appears to be that of *Mesothrips*, the shape of the head, prothorax, tube, wings and antennae bring it nearer to *Bolothrips* Priesner; but this does not belong to this latter genus either as the fore legs of the female are stout and the tarsi heavily toothed as in certain species of *Neosmerinthothrips* Schmutz; the head and antennae are however considerably longer than in recorded species of the latter.

We have pleasure in naming this insect after Mr. P. M. Glover, Entomologist, Lac Research Institute, Ranchi, who discovered the insect and allowed us to study it.

Gynaikothrips pallicrus Karny.

1923. *Gynaikothrips pallicrus*, Karny, *Treubia* III, p. 315.

Habitat and Locality.—On some wild plant galls, Nilgiri Hills. (S. Rao. Coll.—T. V R. No. 377). The species is not recorded before from India. Karny has described his species from Malaya collected on leaves of *Vitis lanceolaria*.

Chiridothrips, gen. nov.

This is an interesting new genus which can conveniently be included under the group *Plectrothripini* of Priesner. The characteristic and noteworthy features are: i. the long tube; ii. the large prothorax; iii. the short middle antennal joints as in *Margaritothrips*; iv. especially the produced antennal joints in joint 2 as in *Chirothrips*; v. one of the legs probably with a tooth-like projection; and vi. fore femora seem to have 1-2 teeth inside and may be fore tibiae as well.

Genotype.—*Chiridothrips indicus*, sp. nov.

Chiridothrips indicus, sp. nov.

Female.—Length 1.229 mm. General colour dark brown; tube, posterior portion of abdomen and hind tibiae and 1st antennal joint dark brown; the rest with the exception of antennal joints yellowish grey; the hind part of 2nd joint and the tip of 8th joint dark grey; the rest of the antennal joints uniformly light yellowish; eyes dark, ocelli with deep pigment.

Head.—Head slightly longer than broad or almost rounded in front with cheeks arched; cheeks carry a conspicuous bristle behind eye; mouth cone broadly triangular, almost reaching the hind margin of prosternum. Antennae apparently 7-jointed, no marked division between 7th and 8th joints; looks like a 7-jointed specimen. It is curious to note that the specimen shows only 7 joints in both the antennae; the 1st, i.e., the basal joint very short and stout; the 2nd joint more or less funnel-shaped, broadened towards the outer margin distally; joints 3 to 6 narrow at base and broadening distally; 7th narrow and not bulging; the last joint elongate.

Thorax.—Prothorax with front margin short, hind margin very broad, general shape pyramidal with the sides curved and arched out-

wards ; anterior portion of thorax curved like a hat and each of the anterior angles with a forwardly directed spine ; each of the posterior angles with two long bristles ; pterothorax of uniform breadth throughout gradually narrowing posteriorly, broadest towards the base. Legs short. Wings reaching almost to the last abdominal segment ; wing-retaining spines are conspicuous on the abdominal segments.

Abdomen.—Ninth abdominal segment with two spines on each lateral side almost half as long as the tube. Tube elongated, provided with 5 or 6 spines at the tip.

Measurements.—Head : length 0·179 mm., breadth 0·157 mm. : prothorax : length 0·143 mm., breadth 0·314 mm.

Antennal joints.

—	I	II	III	IV	V	VI	VII	VIII
Length	29	43	36	36	36	36	29	43
Breadth	..	36	29	29	21	18	14	11

Described from a single specimen on *Dolichcs lablab*, in Coimbatore. (V M. Coll.—T. V R. No. 224).

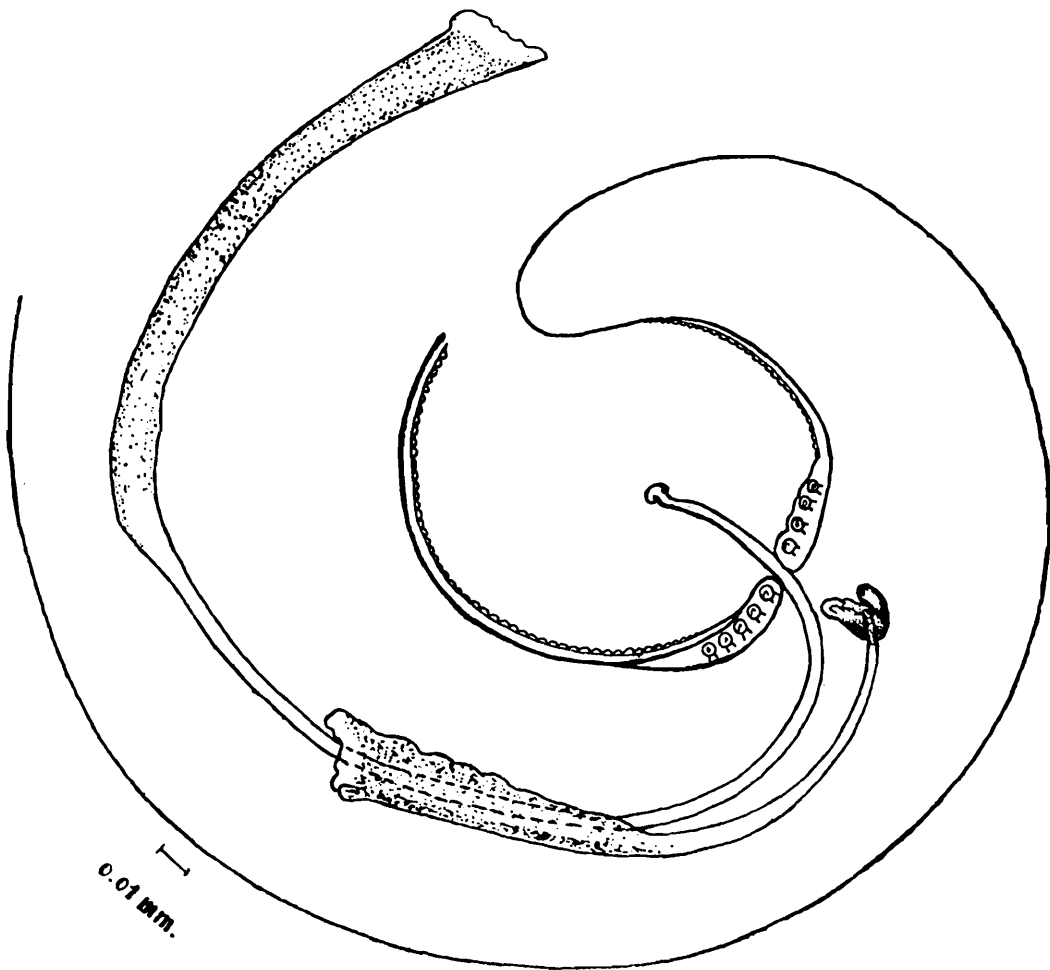
THE TAIL OF THE MALE *WUCHERERIA BANCROFTI*.

By P. A. MAPLESTONE, *D.S.O., D.Sc., M.B., B.S., D.T.M.* and
S. SUNDAR RAO, *L.M.P.*

(From the School of Tropical Medicine, Calcutta.)

Wuchereria bancrofti was re-described by Maplestone¹ and special attention was paid to the tail of the male because the few descriptions of this worm available in the literature were indefinite and showed considerable discrepancies. Moreover, such drawings as were in existence do not carry conviction of accuracy in some of their particulars.

The description given in 1929 was taken from two specimens and as the opportunity has occurred recently of examining some new and well fixed material it was decided to sacrifice one specimen so that the detailed structure of the tail of the male could be again properly examined. The result of this examination has been confirmation of the earlier observations of one of the above writers, and as some books on para-



Wuchereria bancrofti, tail of male, magnified.

sitology, that have appeared since 1929, still contain the old drawings and descriptions, it is considered worth while again drawing attention

¹ Maplestone, P. A., *Ind. Journ. Med. Res.* XVI, p. 683.

to this subject. In the accompanying description the dimensions indicate the variations noted between the specimens originally examined and the present material.

The tail is rolled in about three close spiral turns so that it cannot be properly examined unless the terminal portion is cut off. The cloaca is 0.11 to 0.14 mm. from the tip of the tail. The two pairs of minute papillae on the ventral surface near the tip of the tail could not be made out in the present specimen, probably because it was not possible to roll it sufficiently to get an exact ventral view. In relation with the cloaca there are five pairs of preanal papillae and four pairs of postanal papillae; these are pedunculated and attached to narrow caudal alae. The broad cuticular flap described in the original material could not be made out in the new specimen, probably because an exact profile view could not be obtained.

The spicules are unequal and dissimilar. The long spicule measures 0.49 to 0.52 mm. in length, and consists of a stout proximal portion about 0.2 mm. in length and a longer fine distal portion which ends in a small spoon-shaped expansion. The short spicule is 0.19 to 0.21 mm. in length and the proximal portion is stout like that of the long one. In the original material the short spicule appeared to taper gradually and evenly from base to tip, and the terminal portion was much stouter than the corresponding part of the long spicule, but in the present material the short spicule appears to become suddenly narrower about its middle and from there to taper very slightly towards the tip. The gubernaculum is a broad U-shaped structure with the concavity facing ventrally; in all the specimens examined the tip of the short spicule is lying in close contact with this structure.

The ventral surface for a short distance behind and for a considerable distance anterior to the cloaca is marked by closely-set transverse corrugations, which are possibly exaggerated by the close ventral curve in which this portion of the worm is habitually held.

The relatively close agreement of the specimen now examined with the earlier ones indicates that the characteristic male structures of this worm show very little variation, and that the normal number of large papillae is nine pairs, and in those instances where long rows of small preanal papillae have been described the fine corrugations seen in profile have been mistaken for papillae.

INDIAN EARTHWORMS.

VI. *NELLOSCOLEX*, gen. nov.

By G. E. GATES, *Judson College, Rangoon, Burma.*

The types of *Woodwardia burkilli* are characterized by an anterior homoeosis of one segment of all reproductive organs, which, together with other characteristics, shows that these worms are more closely related to species of *Tonoscolex* than to any of the *Woodwardiellas*. Differences from known species of *Tonoscolex* are such as to indicate advisability of generic or at least subgeneric separation. Unfortunately in this case as well as in others mentioned in preceding papers, material available for study has been limited and of an importance (as types) or in such poor condition that a satisfactory account cannot be given of important structures or characteristics. Accordingly again, diagnosis can only be tentative, subject to revision when further material can be studied.

The author's thanks are once more expressed to Dr. B. Prashad for the privilege of studying material belonging to the Indian Museum. Thanks are also due to Dr. Thiel and the late Dr. W. Michaelsen for the courtesies of the Hamburg Museum.

Nellosclex, gen. nov.

Diagnosis.—Quadrithecal, spermathecal pores on or close to 6/7-7/8. Male pores on xvii, in short seminal grooves restricted to xvii. Female pores paired, on xiii. Setae lumbricine, ventral setae of xvii lacking. Clitellum annular, on xiii-xvi. First dorsal pore on 8/9-9/10. Unpigmented.

All septa, at least from 6/7, present. Gizzard large, in vi. Calciferous tissue in vertical lamellae within paired, lateral pouches in ix-xii that are not constricted off from the gut. Intestine begins in xiv (?), typhlosole present. Last hearts in xii (four pairs of latero-oesophageal hearts?). (Excretory organs enteronephric meganephridia? and exonephric micronephridia?). Testes in ix and x; seminal vesicles in x and xi. Prostates strap-shaped. Ovaries in xii.

Genotype.—*Woodwardia burkilli* Michaelsen 1907

Distribution.—Western Burma and Assam.

Remarks.—Distinguished from *Tonoscolex*, for the present, by the restriction of the short seminal grooves to xvii and the more primitive condition of the calciferous glands.

Like the quadrithecal species of *Lampito*, the species of *Nellosclex* and *Tonoscolex* may have been derived from an ancestral form with penial setae, loss of which explains the absence of ventral setae on the male pore segment.

Shifting of certain reproductive organs such as prostates and male pores from one segment to another has been recorded in several Megascolecoid genera (*Pheretima*, *Diplocardia*) or has been assumed in theorizing

on earthworm phylogeny, but location of testes in ix and x and of ovaries in xii is, so far as can be discovered from available literature, unknown elsewhere in the Megascolecidae. In the absence of embryological and other evidence it is impossible to do more than guess as to how this shifting has been brought about. It is obvious however that organs other than the reproductive structures are one segment further forward than usual in the Megascolecidae; spermathecal pores on 6/7-7/8 rather than 7/8-8/9, last hearts in xii rather than xiii, first intestinal segment xiv rather than xv. In these circumstances rather than postulate a translocation of organs from one segment into another a better guess would appear to be a total loss of one segment in front of the spermathecal region.

In some species of *Dichogaster* the first segment is small and the intersegmental furrow between the first and second segments is lacking or when recognizable so only in part. In a Ceylonese Megascolecine species, *Notoscolex decipiens*, intersegmental furrow 1/2 has entirely disappeared, but the setae of ii are present, at least in part. If a similar loss of segmental boundaries between i and ii (both internally and externally) took place in a common ancestral form of *Nelloscolex* and *Tonoscolex* and was then followed by reduction in size of the combined metamere and loss of setae belonging to segment ii the condition characteristic of these two genera would be obtained. *Nelloscolex* may represent an ancestral stage from which *Tonoscolex* is to be directly derived by constriction from the gut of the calciferous pouches. This suggestion is advanced but tentatively in absence of information regarding the nephridia.

***Nelloscolex burkilli* (Michaelsen).**

1907. *Woodwardia burkilli*, Michaelsen, *Mitt. Mus. Hamburg* XXIV, p. 152
(Type locality Buthidaung, Akyab district, Burma. Types in the Indian and Hamburg Museums).
1909. *Woodwardia burkilli* + *W. burkilli* Michaelsen, *Mem. Ind. Mus.* I, pp. 108, 162.
1923. *Woodwardia burkilli*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 185.

Material examined.—From the Hamburg Museum :

- 1 aditellate specimen and fragments of another specimen labelled, " V 71766 *Woodwardia burkilli* Michlsn. Burma. W. Akyab Dist. J. H. Burkill ".

From the Indian Museum :

- 1 clitellate, undissected specimen labelled, "*Woodwardia burkilli* Michlsn. Earthworms from damp spot in high forest, west. Buthidaung, Akyab district. 17 Jan. 1907. J. H. Burkill ".

External characteristics.—The prostomium is prolobous. Secondary annuli are present on vii-x, a slight trace of a postsetal secondary furrow on vi. Nephropores not found. Setae begin on ii; *a* and *b* lacking (or invisible) on vii, viii, xvii, very closely paired on the clitellar segments; *ab* < *cd*. The first definitely functional dorsal pore is on 9/10, a pore-like but apparently imperforate marking on 8/9. The clitellum is yellowish not protuberant, annular, extending from 12/13 to 16/17; intersegmental furrows and dorsal pores lacking but sites of the pores indicated by pit-like depressions, setae present.

The spermathecal pores are very small, but larger than the male and female pores, in *ab*, on 6/7-7/8.

The female pores are on xiii, just anterior and slightly median to *a*.

A male genital shield is marked off, at least in part, by a fine greyish translucent line in the epidermis. The body wall is slightly depressed along the midventral line, the depression extending across xvii and the anterior half of xviii. On each side of this depression but on xvii there is a slightly protuberant area, elliptical but so short as to be almost circular, extending anteroposteriorly between the pre- and postsetal secondary furrows which are displaced anteriorly or posteriorly and laterally to just beyond *b*, the areas almost in contact midventrally. From a point about at the middle of each of these areas a seminal groove extends posteriorly almost but not quite in a straight line to 17/18 which is dislocated posteriorly. Behind the postsetal secondary furrow is a short transverse furrow present only ventrally and which does not pass into 17/18 on either side. The male pores have not been identified definitely but are probably represented by greyish translucent pits near the anterior ends of the seminal grooves.

Internal characteristics.—Septum 6/7 is slightly thinner than 7/8, but no septa are especially muscular.

The gizzard is in vi. The gut widens gradually in xxii-xxiii (oesophageal valve?). The oesophagus is deeply constricted and moniliform in viii-xii, the lateral pouches not shut off from the oesophageal lumen and with vertical lamellae. The typhlosole is large, lamelliform, reaching in xxii-xxiii to the floor of the gut.

The last pair of hearts is in xii.

Small clusters of micronephridia (?) are visible in xii-xvi. In each of the segments near the tail there is a pair of (enteronephric?) meganephridia.

Male funnels are free in ix and x, characterized by a brilliant spermatozoal iridescence. There is very little testicular coagulum in either male segment. The seminal vesicles are small, acinous, vertically placed structures, in x and xi, on the posterior faces of 9/10 and 10/11. The prostates are friable, flattened and strap-like, extending through xvii-xxii, both margins deeply incised by the septa. The duct is translucent and emerges from the median margin of the gland in xviii, in that segment bent into tiny U-shaped quirks, then passing straight anteriorly into xvii where it is covered over by diagonal muscle fibres. About half way to 16/17 the duct curves around towards the midventral line and then passes into the parietes, the anterior portion with a shape like an interrogation mark.

The spermathecae are relatively large, in vi and viii, the diverticula of the anterior spermathecae in vii. The ampulla is translucent. The duct is slender, somewhat shorter than the ampulla from which it may be clearly marked off. The diverticulum is longer than the duct, with brilliant spermatozoal iridescence, the seminal chamber rather ellipsoidal but narrowing ectally to a very short stalk with no iridescence, passing into the median face of the duct near the parietes.

Remarks.—The clitellum may be in an early stage of regression.

Michaelsen (1909, p. 163) maintains that the grooves on the male held are not seminal grooves since prostatic and male pores are not separate (deferent ducts opening into the ental portion of the prostatic

ducts). Stephenson (1923, p. 186) characterizes the grooves as pseudo-spermatic but is not consistent for in the same work (p. 159) he calls grooves of *Drawida sulcata* that are quite unconnected with the male pores and possibly only artefacts, seminal furrows.

In *burkilli* the male pores are in clear cut, definite grooves as in species of *Tonoscolex*. In this latter genus the grooves are not transient structures but are present even in older juveniles as well as aclitellate worms, and further are so characteristic as to be of major importance for specific characterisation. The function of these grooves is unknown, in absence of observations on copulation, but since the male pores are always located in these characteristic furrows it seems quite likely that the spermatozoa do pass along the grooves in a copulatory transfer to the spermathecae of another worm. The grooves accordingly have been termed "seminal grooves" and a similar practice will be followed in other genera or species in which similar conditions prevail. A separate term scarcely appears to be necessary merely because prostatic and deferent duct pores are or are not distinct.

Nellosolex strigosus, sp. nov.?

Material examined.—From the Indian Museum :

1 clitellate, macerated specimen labelled, "Dumpep, Khasi Hills, Assam. Dr. S. L. Hora".

External characteristics.—Length 97 mm. Diameter 2 mm. Unpigmented; clitellum reddish. Secondary annulations are lacking or unrecognizable, hence no possibility of confusion in segmental enumeration. The prostomium is proepilobous, almost prolobous.

Setae begin on ii: *ab* and *cd* apparently about equal, *ab* possibly a trifle smaller in some regions, size of *aa* relative to *bc* variable in different regions and indeterminable on xx (ratios not accurately determinable on account of maceration). Setae *a* and *b* of xvii, *a* on the right side of vii, *b* on the right side of viii, and *a* on the left side of viii are lacking. A minute greyish marking on viii at site of seta *b* may represent a pit from which the seta has dropped out.

The first dorsal pore is probably on 8/9 though this aperture is certainly not as large as that on 9/10.

The clitellum is annular and extends from 12/13 to 16/17; intersegmental furrows and dorsal pores lacking, setae present.

The spermathecal pores are on 6/7-7/8, on or very slightly lateral to *a*.

The female pores are anterior and only very slightly median to *a*.

On xvii a transversely placed, anteroposteriorly short, fairly deep depression extends laterally, on each side, into *bc*, with a slightly protuberant and firm marginal rim. The posterior margin in *aa* is slightly concave anteriorly, the anterior margin also slightly concave in *aa* but posteriorly. From the anterior margin in *ab*, on each side there is a rather conspicuous protuberance into the depression. On the posterior faces of each of these protuberances there is a tiny, vertically placed seminal groove, passing from a point about at the ventral level of the body dorsally nearly to the roof of the depression. Male pores were not definitely identified, but the prostatic duct was dissected out from the

parietes on the right side, leaving a tiny aperture at the dorsal end of the seminal groove.

Internal anatomy.—None of the septa are thickly muscular; 6/7 and several succeeding septa funnel-shaped, the apices of the funnels directed posteriorly.

The rather rounded gizzard is in vi. The intestine apparently begins in xvi(?). In xii there is a pair of large swellings laterally on the esophagus, each hemiovoidal and with the long axis longitudinal, not quite reaching either 12/13 or 13/14. Somewhat similar but less well developed swellings are present in xi-ix, the size decreasing anteriorly. In the posterior portion of viii there may be rudiments of similar swellings.

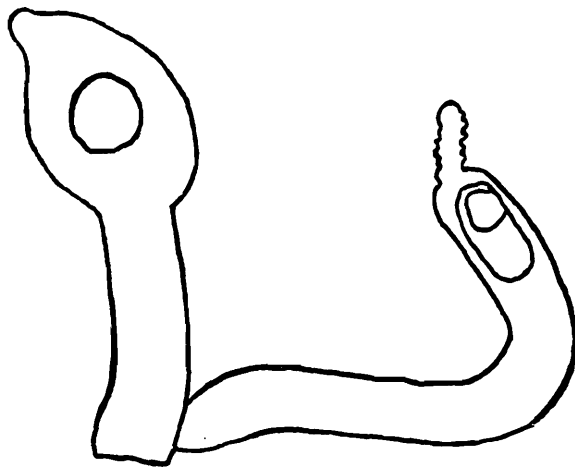
The last pair of hearts is in xii.

The male funnels are in ix and x. The seminal vesicles are small and acinous, in x and xi. The prostates are very thin, flattened against the parietes in xviii-xx, the median margin smooth, the lateral margin with deep incisions.

The duct is bent ectally into a U-shaped loop, the ental half slender, the ectal half thickened and with muscular sheen.

The ovaries are small, that on the right side containing only five mature ova. In xiv there is a pair of small ovisacs (?).

The spermathecal ampulla (text-fig. 1) is small, not much wider than the duct which may be slightly bulbous ectally. The diverticulum which passes into the duct close to the parietes is tubular and longer



TEXT-FIG. 1. Spermatheca of *Nellosolex strigosus*, sp. nov. $\times$ ca 95.

than the combined lengths of duct and ampulla. One spermatheca was removed and cleared. The lumen in both duct and diverticulum is rather wide but reduced by ridges which are circular in the diverticulum and longitudinal in the duct, the ridges lacking in the entalmost portion of the diverticulum, and in the duct ectal to the diverticular junction. There is no spermatozoal iridescence but in the ental portion of the diverticulum there is a ball of opaque material, a hard sphere of transparent material imbedded in a softer opaque mass, a similar ball within the ampulla. The appendix shown at the ental end of the diverticulum in the figure presumably is an abnormality.

Remarks.—The coelomic cavities are filled with a sticky coagulum that is adherent to the body wall and to the gut. Washing out this

coagulum may have resulted in loss of nephridia. Excretory organs have not been definitely identified.

N. strigosus can be distinguished at present from *N. burkilli* only by characteristics of the spermathecae (greater length of the spermathecal diverticulum relative to lengths of ampulla and duct) and of the male areas on xvii. There is however some indication that the spermathecae of the type may be abnormal, while differences in the male field that appear to be striking at first glance may after all be of little if any importance or significance (possibly due to a different stage of development or manner of contraction on killing). The calciferous portion of the oesophagus of the type of *strigosus* certainly appears to be different from that of *burkilli* but requires further study on better material and more adequate characterisation.

In the closely related genus, *Tonoscolex*, characteristics of importance for specific definition are mainly of the spermathecae and the male region on xvii. *Nelloscolex* may be similar to *Tonoscolex* in this respect also, but until many more specimens have been studied, it will be of little use to attempt to determine whether variations (in particular those noted on the three types just studied) are of individual or specific value.

***Nelloscolex* sp.**

Material examined.—From the Indian Museum :

- 1 clitellate, fairly well preserved specimen labelled, "Dumpep, Khasi Hills, Assam. Dr. S. L. Hora".

External characteristics.—Length 46 mm. Diameter $1\frac{1}{2}$ mm. Unpigmented, clitellum light yellowish. Prostomium prolobous. There are no secondary annulations, hence no possibility of confusion in segmental enumeration. The first dorsal pore is on 8/9.

The setae begin on ii and are enlarged on the posteriormost segments ; on xx, *ab* slightly larger than *cd*, *aa* and *bc* about equal, *aa* a trifle larger than *bc*, *dd* smaller than one-half the circumference ; *a* and *b* lacking on xvii, on vii, and the left side of viii, *a* present on the right side of viii.

The clitellum is annular and extends from 12/13 to 16/17 ; intersegmental furrows and dorsal pores lacking, setae present.

The spermathecal pores are two pairs, on the anteriormost margins of vii and viii, in *ab*. Each pore is surrounded by a protuberant but small, annular lip, the protuberance with an appearance of a transversely placed porophore of elliptical outline.

The female pores are on xiii, each pore slightly anterior and median to *a*.

On xvii, on each side, there is a slightly protuberant, fairly sharply demarcated area of epidermal thickening, rather elliptical in outline, the long axis longitudinal, extending from *a* into *bc* and from 16/17 or slightly posterior to 16/17 to 17/18. On each area is a seminal groove, in line *b*, the groove nearly straight. On the midventral region between the two male pore areas the body wall may be very slightly thickened and is crossed transversely by three slight furrows. The seminal grooves reach approximately to the level of the anteriormost and posteriormost of these the slight furrows. The minute male pore is at the anterior

end of the seminal groove (confirmed by dissecting prostatic duct out of body wall, right side).

Internal anatomy.—Septum 6/7 and several succeeding septa are funnel shaped, the apices of the funnels directed posteriorly; 7/8 and the next few septa slightly strengthened.

The well developed gizzard is in vi. Calciferous pouches are represented by slight lateral swellings of the oesophagus in ix-xii and possibly also in the posterior portion of viii. The intestine begins in xiv.

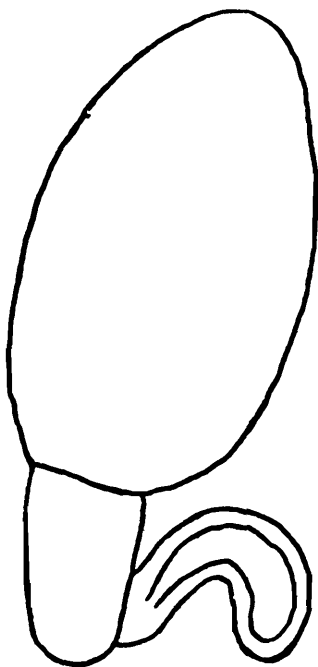
The last pair of hearts is in xii.

In segments xi-xxiii on the parietes, on each side, about in *bc*, or *cd*, there is a single, rosette-like clump or cluster of nephridial tubules. From xxiv posteriorly for several segments no nephridia are visible, but more posteriorly there are much smaller clusters, on the parietes, in the region of *cd*.

Male funnels and testes are in ix and x. The seminal vesicles are small, acinous bodies in x and xi, those of x about half the size of the vesicles of xi. The prostates are strap-shaped, extending through xviii-xxiv, the lateral (dorsal) and median (ventral) margins deeply constricted by the septa, the lateral margins with slighter marginal incisions. The duct emerges from the gland in xx and passes anteriorly almost straight into xvii where it bends mesially to pass into the parietes, gradually widened ectally and with slight muscular (?) sheen.

In xiv there is a pair of ovisacs.

The spermathecae (text-fig. 2) are in vi and viii; the ampulla large, duct short, almost confined to the parietes. The diverticulum which passes into the duct within or close to the parietes is slightly longer



TEXT-FIG. 2. Spermatheca of *Nelloscolex* sp. $\times$ ca. 95.

than the duct but much shorter than the ampulla, bent into a U-shaped loop, rather slenderly club-shaped, not marked off externally into stalk or seminal chamber, the lumen gradually narrowed ectally. There is no spermatozoal iridescence visible in the diverticulum.

Remarks.—This specimen is the only one examined in which the first intestinal segment could be definitely determined.

Excretory organs are not well preserved, having been imbedded in coelomic coagulum. In washing out the coagulum it is possible that some of the nephridia were flooded away.

The relative shortness of the spermathecal diverticulum, the (apparent) segmental location of the spermathecal pores and characteristics of the male field on xvii may be of sufficient value, if constant, to warrant erection of a new species. Distinction from *strigosus* is however impossible until the latter is more adequately characterized.

CYCLOPIDES (CRUSTACÉS COPÉPODES) DE L'INDE. I.

Par KNUT LINDBERG.

Paracyclops vagus, sp. nov.

Description.—Espèce présentant les caractères généraux de *P. fimbriatus* (Fischer), notamment un corps à aplatissement dorso-ventral marqué, une première antenne courte et trapue, à soies en partie ciliées, une furca à branches longues, bien séparées, légèrement divergentes.

Longueur de la femelle adulte entre 700 μ et 950 μ ; largeur de 240 μ à 290 μ . Bord postérieur du quatrième segment thoracique portant sur les ailes latérales quelques fins poils et celui du cinquième segment thoracique une courte rangée de soies très fortes. Bords postérieurs du premier, deuxième et troisième segments abdominaux très finement découpés sur l'aspect ventral ; celui du quatrième segment portant une rangée de fortes épines, qui, sur la face dorsale, n'est présente que sur le tiers externe. Côté ventral du deuxième et troisième segments abdominaux ornementé de deux ou trois rangées irrégulières de dents minuscules difficiles à distinguer. Une ornementation semblable peut se voir aussi sur la face ventrale du premier segment abdominal mais ne semble pas y être constante.

Branches de la furca de longueur très variable de 4.5 à 7.35 fois aussi longues que larges. Soie latérale externe à insertion bien dorsale, située le plus souvent à peu près à l'union du tiers distal avec les deux tiers proximaux. Au-dessus de l'insertion de la soie latérale externe se trouve une rangée de petites épines s'étendant chez tous les animaux indiens que j'ai examinés jusqu'au bord interne de la branche de la furca, cette rangée pouvant être de direction horizontale ou légèrement oblique de bas en haut et de dehors en dedans ; elle contourne la face externe et s'arrête sur la face ventrale un peu en dehors du milieu, 3 ou 4 épines seulement s'apercevant sur l'aspect ventral. Une seconde rangée d'épines semblables se trouve sur la face ventrale, commençant au-dessus de l'insertion de la soie apicale externe de la furca et se terminant au-devant de l'insertion de la soie apicale interne de la furca. Soie apicale interne nettement plus longue que la soie apicale externe qui a les caractères d'une épine. Les deux soies apicales médianes bien développées, à pennation hétéronyme. Première antenne à 8 articles. Pattes natatoires tri-articulées ; formule des épines de 3.4.4.3. Article terminal de l'enp. 4 environ 2 fois ou moins de 2 fois aussi long que large ; épine apicale interne considérablement plus longue que l'article et de 2 à 2.5 fois aussi longue que l'épine apicale externe. Epine interne de la cinquième patte mince et allongée ; sa longueur s'approche souvent de celle de la soie médiane, mais elle est toujours bien inférieure en longueur à celle de la soie externe. Réceptacle séminal ressemblant à celui de *P. fimbriatus*. Des 21 femelles adultes examinées des sacs ovigères ne se trouvaient que chez 4 ; ils étaient grands,

accolés, atteignant le milieu ou le tiers distal de la furca et contenaient de 6 à 8 gros oeufs. La couleur n'a pas été observée à l'état vivant.

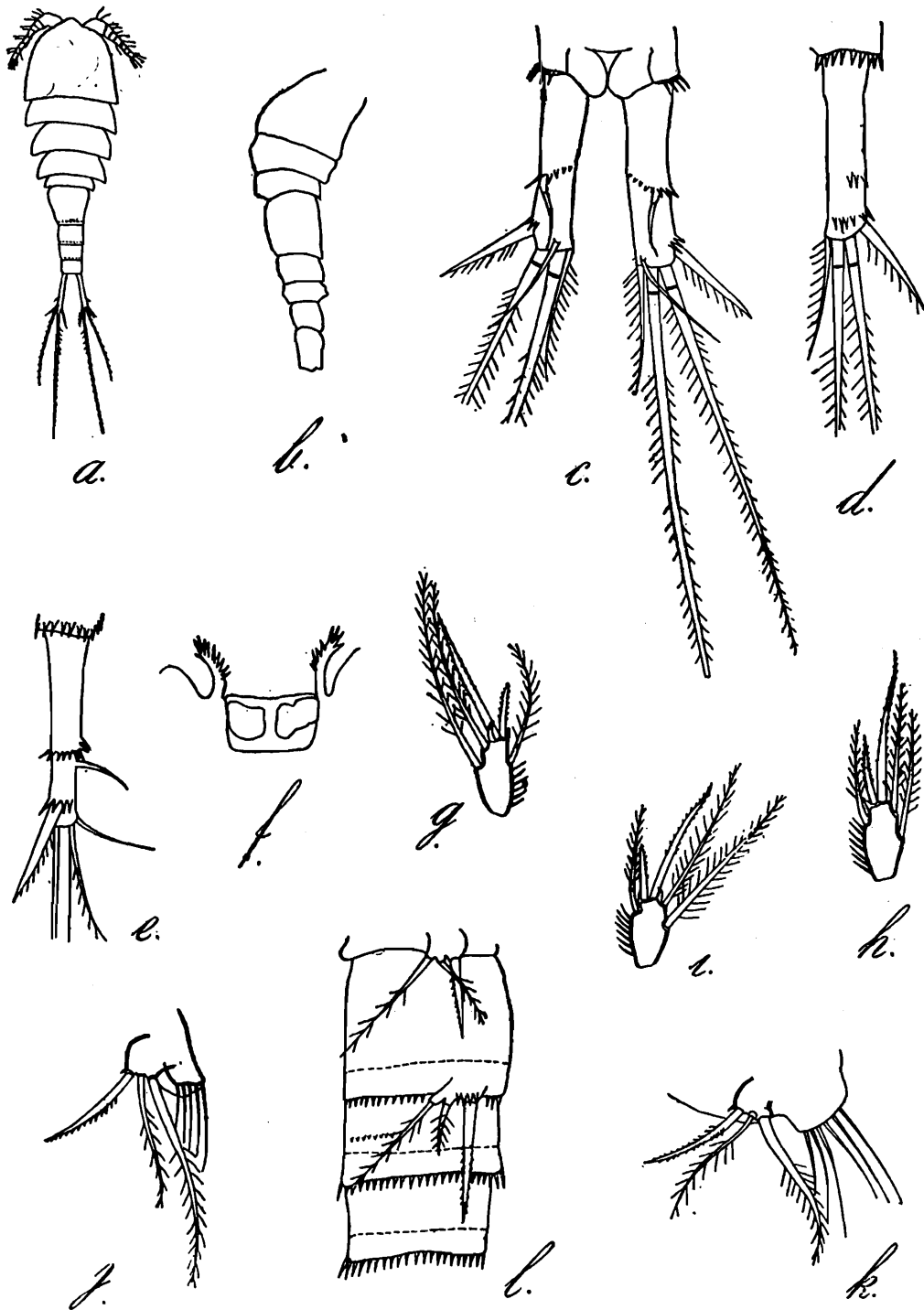


FIG. 1. *Paracyclops vagus*, sp. nov.

a. ♀ Configuration générale (Pandharpour); b. ♀ Première antenne (Pandharpour); c. ♀ Furca, face dorsale (Pandharpour); d. ♀ Furca (vue partielle), face ventrale (Pandharpour); e. ♀ Furca, face latérale (Latour); f. ♀ Lamelle réunissant quatrième paire de pattes (Ellora); g. ♀ Article terminal de l'enp. 4 (Pandharpour); h. ♀ Article terminal de l'enp. 4 (Ellora); i. ♀ Article terminal de l'enp. 4 (Ridora); j. ♀ Cinquième patte (Pandharpour); k. ♀ Cinquième patte (Ellora); l. ♂ Cinquième et sixième pattes (Aurangabad).

Mâle.—Longueur entre 600 μ et 860 μ . Première antenne portant des appendices chitineux semblables à ceux présents chez *P. fimbriatus* Branches de la furca parallèles, de 4 à 6 fois aussi longues que larges, munies de rangées d'épines pareilles à celles de la femelle. Sixième

patte rudimentaire composée d'une forte épine interne atteignant ou dépassant le bord postérieur du deuxième segment abdominal et de 2 soies dont l'externe est de 2 à 3 fois aussi longue que la soie médiane qui est peu développée.

Habitats.—Grottes de *Karli*, Deccan (petite mare); *Pandharpour*, Deccan (un grand ruisseau à eau stagnante pendant une partie de l'année; un puits abandonné; la rivière *Bhima* à environ 3 m. de profondeur. *Sangli* (rivière *Krichna*, près des bords). *Ridora*, Deccan (rivière *Sina*, près des bords); *Latour*, Etat de Haïdérahbad (un grand étang artificiel). *Aurangabad*, Etat de Haïdérahbad (petite mare de rivière; petit ruisseau). *Ellora*, Etat de Haïdérahbad (petite mare de rivière, petit ruisseau). *Coonor*, Nilgiris (petit torrent, un mâle seulement).

Récolté pendant les mois de février, avril, mai, octobre et décembre.

Remarques.—L'espèce qui vient d'être décrite ressemble beaucoup à *P. fimbriatus* et a peut-être aussi été confondue avec celui-ci, puisque la présence de *P. fimbriatus* dans l'Inde a déjà été signalée. Les exemplaires étudiés, provenant de régions et d'habitats très divers, montrent des variations notables dans certains caractères, mais, comme ils présentent tous essentiellement la même structure de la furca et de ses ornements, de la cinquième patte et de l'armature génitale du mâle, il ne semble pas justifié de séparer des variétés différentes, d'autant plus que le matériel étudié a été très restreint et que l'examen d'un plus grand nombre d'animaux montrerait probablement l'existence de formes intermédiaires.

Le tableau comparatif ci-dessous donne trois caractéristiques importantes distinguant le *P. vagus* du *P. fimbriatus*.

P. fimbriatus.

P. vagus.

- | | |
|---|---|
| (1) Rangée d'épines sur face dorsale de la furca s'arrêtant au milieu de l'aspect dorsal. | Rangée d'épines sur face dorsale de la furca s'étendant jusqu'au bord interne de l'aspect dorsal. |
| (2) Epine interne de la cinquième patte large et courte. | Epine interne de la cinquième patte mince et allongée. |
| (3) Soie externe et soie médiane de la sixième patte du mâle fortes, de longueur à peu près égale (Kiefer). | Soie médiane peu développée, atteignant tout au plus la moitié de la longueur de la soie externe. |

TABLEAU 1.
Paracylops vagus ♀

Localité.	Long. : larg.	Furca. Long. : larg.	Enp. 4. Long. : larg.	Enp. 4. Ep. int. : ép. ext.	Enp. 4. Ep. int. : long. art.	Cinquième patte. Ep. int.-soie méd.-soie ext.
<i>Pandharpour.</i> Takli nala (Toutes récoltées à des dates différentes).	940 : 275=3.42 : 1	(86+36) : 17=7.18 : 1	38 : 20=1.9 : 1	66 : 31=2.13 : 1	1.74 : 1	58 : 53 : 66
	864 : 252=3.43 : 1	(62+33) : 18=5.28 : 1	40 : 20=2 : 1	70 : 31=2.26 : 1	1.75 : 1	50 : 53 : 58
	760 : 266=2.85 : 1	(70+30) : 18=5.56 : 1	35 : 23=1.52 : 1	61 : 30=2.03 : 1	1.74 : 1	
	855 : 266=3.25 : 1	(69+36) : 20=5.25 : 1	36 : 20=1.8 : 1	60 : 30=2 : 1	1.67 : 1	38 : 50 : 75
<i>Pandharpour.</i> Puits abandonne	722 : 256=2.82 : 1	(57+31) : 20=4.4 : 1	33 : 18=1.83 : 1	58 : 25=2.32 : 1	1.76 : 1	
<i>Pandharpour.</i> Rivière Bhima	826 : 285=2.89 : 1	(87+33) : 20=6 : 1	40 : 20=2 : 1	66 : 31=2.13 : 1	1.65 : 1	51 : 58 : 75
<i>Ridora.</i> Rivière Sina	855 : 266=3.25 : 1	(76+40) : 16=7.25 : 1	40 : 18=2.22 : 1	68 : 31=2.19 : 1	1.70 : 1	50 : 58 : 68
	826	(64+36) : 16=6.25 : 1	35 : 19=1.84 : 1	58 : 25=2.32 : 1	1.66 : 1	50 : 53 : 66

<i>Sangli.</i> Rivière Krichna	760 : 285=2·67 : 1 798 855 : 256=3·34 : 1 —	(89+36) : 17=7·35 : 1 (81+36) : 16=7·31 : 1 —	40 : 20=2 : 1 36 : 20=1·8 : 1 —	66 : 31=2·13 : 1 61 : 28=2·18 : 1 —	1·65 : 1 1·69 : 1 —	50 : 76 : 86 46 : 48 : 75 48 : 50 : 75 48 : 50 : 58
<i>Latour.</i> Etang Papnas	712 : 256=2·78 : 1	(72+36) : 15=7·2 : 1				48 : 50 : 66
<i>Aurangabad.</i> Mare de rivière	902 : 294=3·07 : 1	116 : 20=5·8 : 1	40 : 20=2 : 1	70 : 28=2·5 : 1	1·75 : 1	55 : 54 : 71
<i>Aurangabad.</i> Petit ruisseau	874 : 285=3·07 : 1	(90+40) : 20=6·50 : 1 108 : 16=6·75 : 1	35 : 18=1·94 : 1	63 : 28=2·25 : 1	1·80 : 1	51 : 60 : 76 53 : 60 : 66
<i>Ellora.</i> Mare de rivière	812 : 247=3·29 : 1 893	(65+30) : 16=5·94 : 1 (87+36) : 17=7·23 : 1	40 : 20=2 : 1	70 : 31=2·26 : 1	1·75 : 1	45 : 61 : 75 48 : 66 : 80
<i>Ellora.</i> Ruisseau	769 : 266=2·89 : 1	(87+36) : 18=6·83 : 1	38 : 23=1·65 : 1	73 : 45=1·62	1·92 : 1	52 : 66 : 76
<i>Karli.</i> Grottes, Petite mare	788 : 285=2·76 : 1 741 : 245=3·02 : 1	(67+33) : 21=4·76 : 1 (73+33) : 20=5·30 : 1	36 : 21=1·71 : 1 36 : 20=1·80 : 1	58 : 31=1·87 : 1 58 : 31=1·87 : 1	1·61 : 1 1·61 : 1	50 : X : X 43 : 43 : 50

TABLEAU 2.

Paracylops vagus ♂

Localité.	Long. : larg.	Furca. Long. : larg.	Enp. 4. Long. : larg.	Enp. 4. Ep. int. : ép. ext.	Enp. 4. Ep. int. : long. art.	Cinquième patte. Ep. int.- soie méd.- soie ext.	Sixième patte. Epine-soie méd.-soie ext.
<i>Pandharpour.</i> Takli nala	750 : 247 = 3.04 : 1	(57 + 26) : 18 = 4.61 : 1	32 : 18 = 1.78 : 1	60 : 26 = 2.30 : 1	1.87 : 1	33 : 36 : 41	43 : 20 : 61
<i>Ridora.</i> Rivière Sina		70 : 15 = 4.67 : 1				33 : 50 : X	46 : 23 : 50
<i>Sangli.</i> Rivière Krichna	627 : 231 = 2.71 : 1	(49 + 31) : 20 = 4 : 1	33 : 16 = 2.06 : 1	53 : 26 = 2.04 : 1	1.60 : 1		46 : 21 : 50
<i>Aurangabad.</i> Petit ruisseau	703 : 247 = 2.85 : 1	93 : 16 = 5.81 : 1	36 : 21 = 1.71 : 1	56 : 31 = 1.8 : 1	1.56 : 1	40 : 50 : 50	60 : 26 : 50
	712 : 256 = 2.78 : 1	92 : 18 = 5.11 : 1	38 : 20 = 1.90 : 1	58 : 33 = 1.76 : 1	1.53 : 1		
	769 : 266 = 2.89 : 1	(61 + 40) : 21 = 4.81 : 1				40 : 58 : 58	50 : 25 : 50
						33 : X : 50	48 : 23 : 50
						41 : 50 : 58	53 : 21 : 50
<i>Coonoor.</i> Petit torrent	864 : 266 = 3.25 : 1	(58 + 25) : 18 = 4.61 : 1				30 : 33 : 42	41 : 18 : 46

Paracyclops affinis Sars.

Comme cette espèce n'a, à ma connaissance, jamais été rapportée de l'Inde quelques notes et figures sont données ici concernant une unique femelle récoltée au mois de décembre 1936 dans une petite rivière de l'île de Salsette à environ 3 km. de Ghatkopar (près de Bombay). Ce spécimen s'est conformé dans les caractères essentiels à la description de Sars de *P. affinis*. La présence de *P. affinis* dans la péninsule indienne n'a du reste rien de surprenant puisque cette forme semble être cosmopolite, ayant aussi été trouvée en Mésopotamie et dans le Turkestan.

Longueur 712 μ ; largeur 228 μ . Furca (48+15) : 23=2.74 : 1 ; soie dorsale 58 μ . Soie apicale externe 50 μ ; soie apicale médiane

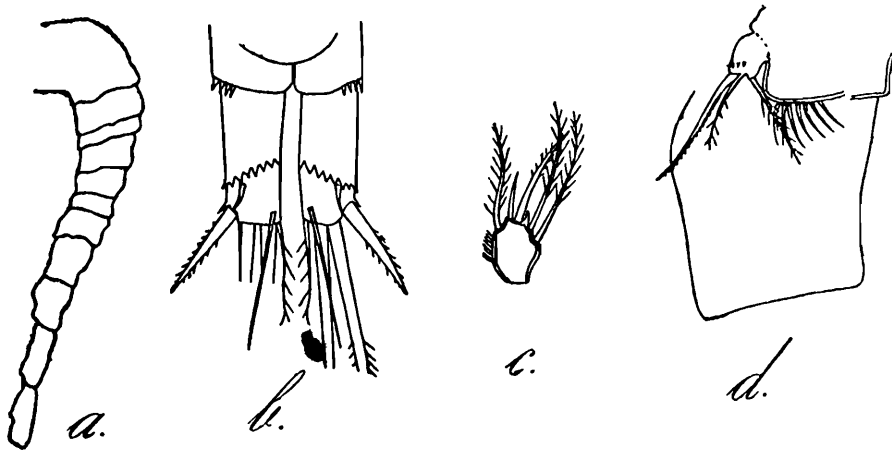


FIG. 2. *Paracyclops affinis* Sars.

a. ♀ Première antenne (Ghatkopar) ; b. ♀ Furca (Ghatkopar) ; c. ♀ Article terminal de l'enp. 4 (Ghatkopar) ; d. ♀ Cinquième patte (Ghatkopar).

externe 175 μ ; soie apicale médiane interne cassée ; soie apicale interne 50 μ . Article terminal de l'enp. 4 : longueur : largeur 27 : 18=1.50 : 1 ; épine interne : épine externe 50 : 21=2.38 : 1. Cinquième patte : épine interne 55 μ ; soie médiane 40 μ soie externe 50 μ .

Ectocyclops medius Kiefer (SYN. *E. hirsutus* Kiefer ?).

Cette espèce a été décrite en 1930 par Kiefer qui avait trouvé chez des animaux de l'Inde et de l'Afrique que l'appendice interne de la cinquième patte était notablement plus long par rapport aux autres appendices et aussi plus développé que chez *E. phaleratus* (Koch), auquel autrement elle ressemble beaucoup. De plus, Kiefer a remarqué que la première antenne est constamment composée de 11 articles.

Chez les exemplaires du type *phaleratus* que j'ai récoltés dans l'Inde l'appendice interne de la cinquième patte s'est aussi montré bien développé et considérablement plus long que les deux autres appendices, atteignant en général chez la femelle le bord postérieur du segment génital et pouvant le dépasser chez le mâle. La première antenne s'est également trouvée formée de 11 articles chez les femelles adultes, mais le troisième article a souvent présenté une division incomplète, et, chez quelques spécimens, cet article a porté une ébauche de 2 divisions, donnant ainsi, en tenant compte des divisions incomplètes, une première antenne formée chez les uns de 12 articles et chez

les autres de 13 articles. Les bords latéraux du deuxième, troisième, quatrième et cinquième segments thoraciques portent quelques poils

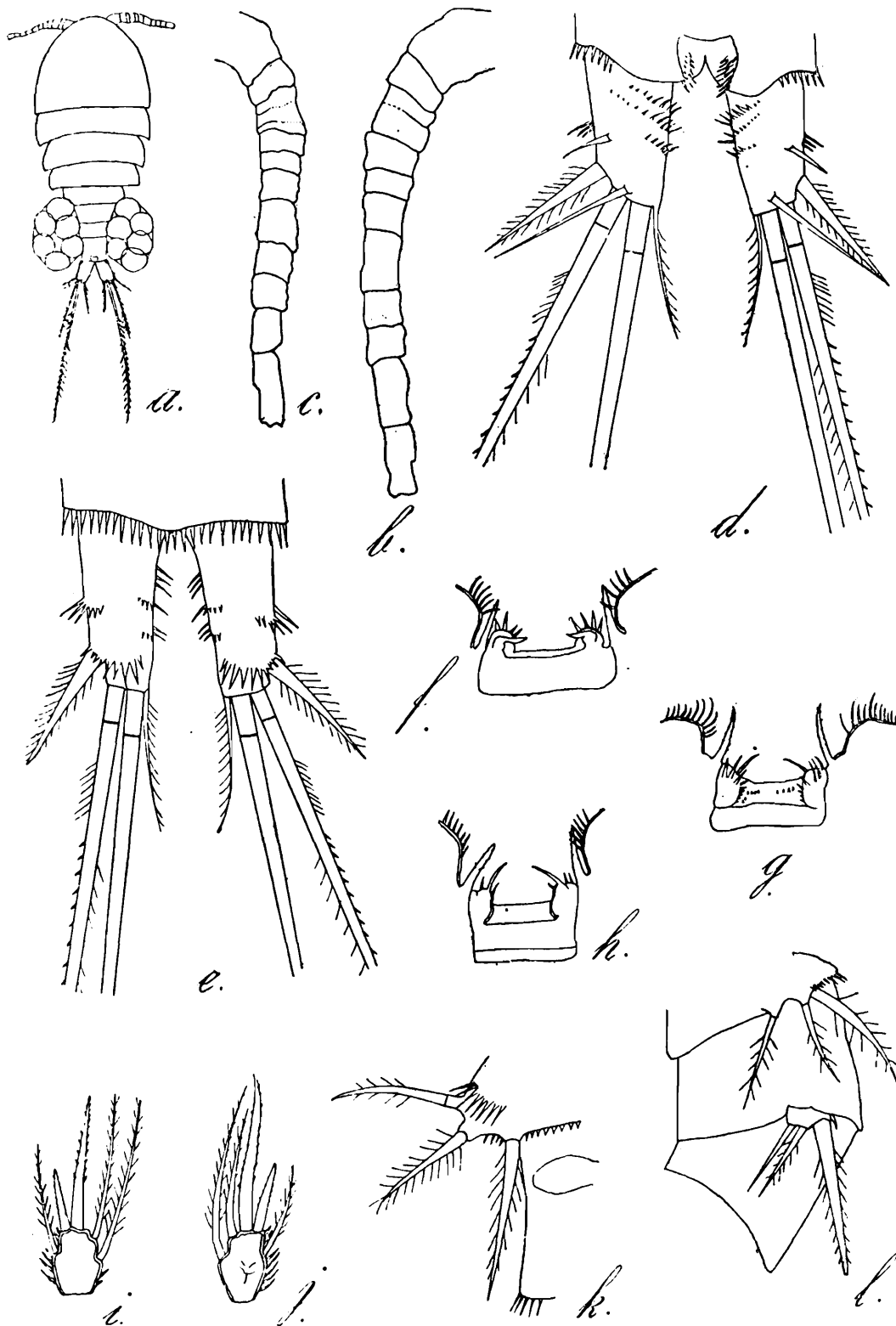


FIG. 3. *Ectocyclops medius* Kiefer.

a. ♀ Configuration générale (Adjanta); b. ♀ Première antenne (Ootocamund); c. ♀ Première antenne (Adjanta); d. ♀ Furca, face dorsale (Ellora); e. ♀ Furca, face ventrale (Ellora); f. ♀ Lamelle réunissant quatrième paire de pattes, face ventrale (Ellora); g. ♀ Lamelle réunissant quatrième paire de pattes, face dorsale (Adjanta); h. ♀ Lamelle réunissant quatrième paire de pattes, face ventrale (Pandharpour); i. ♀ Article terminal de l'enp. 4 (Adjanta); j. ♀ Article terminal de l'enp. 4 (Ellora); k. ♀ Cinquième patte (Adjanta); l. ♂ Cinquième et sixième pattes (Ellora).

assez épais; sur la face dorsale du bord postérieur du troisième et quatrième segments thoraciques se trouve une courte rangée de très petites

épines située à une certaine distance en dedans des poils des bords latéraux et s'arrêtant loin du milieu. Le bord postérieur du cinquième segment thoracique est muni sur la face ventrale d'une rangée très régulière de petites épines, interrompue cependant au milieu du segment tout comme chez *E. phaleratus*. Les élevures latérales de la lamelle basale réunissant la quatrième paire de pattes ne sont munies sur l'aspect ventral que d'une seule épine mince et pointue dirigée, soit horizontalement en dedans, soit en haut et en dedans. Chez un spécimen mâle il y avait d'un côté deux épines et de l'autre une seule de configuration normale. Sur la face dorsale par contre ces élevures portent de chaque côté tout un groupe de fines épines ou de petites soies de direction verticale et oblique.

Chez le mâle l'épine interne de la sixième patte rudimentaire est très forte pouvant dépasser le bord postérieur du troisième segment abdominal ; les deux autres appendices sont moins développés et de longueur à peu près égale entre eux.

Les ovisacs sont allongés mais ne dépassent que rarement l'extrémité de la furca ; les oeufs s'y trouvent parfois disposés sur deux rangs seulement. J'en ai compté de 5 à 11 dans chaque ovisac ; le plus souvent ils contiennent de 6 à 8 oeufs assez gros. Après la mort les sacs ovigères se trouvent accolés contre l'abdomen, mais chez les animaux se mouvant librement dans l'eau ils sont tenus bien écartés du corps. Dans les bocaux ces animaux semblent abandonner leurs habitudes fouisseuses, puisqu'on les voit souvent nager à la surface de l'eau.

A l'oeil nu ils apparaissent de couleur noire foncée ; à la loupe la coloration n'a été observée que chez trois spécimens. Chez deux le céphalothorax était jaune-orange, la queue bleu foncé, l'oeil rouge ; chez le troisième le deuxième segment céphalothoracique était bleu clair et le restant du corps brun-rougeâtre ; les oeufs étaient chez tous bleu foncé ou noirâtre. Un spécimen contenait des globules de graisse d'un rouge intense.

Habitats et repartition.—Il est probable que l'espèce en question a une distribution générale dans la péninsule indienne, mais peu d'exemplaires se laissent d'ordinaire pêcher dans un même endroit. Les spécimens étudiés ici provenaient des localités suivantes : *Pandharpour* (un réservoir et grand ruisseau ensemble avec *Paracyclops vagus*). *Miradj* (mare de rivière). *Haïdérabad* (Mir Alam talab, grand réservoir). *Aurangabad* (petites mares de rivière). *Ellora* (petite citerne près du réservoir et un petit torrent dans les montagnes). *Adjanta* (petites mares dans les rochers). *Nadiad* (mare de rivière). *Ootacamund* (Lac).

Remarques.—La description de Kiefer de *E. medius* étant très succincte et manquant de figures détaillées il n'est évidemment pas possible d'affirmer d'une façon certaine que les animaux du type *phaleratus* récoltés par moi dans l'Inde appartiennent à cette même espèce. Par conséquent j'ai trouvé nécessaire de donner des moyennes de certains rapports et des valeurs extrêmes ainsi que des figures plus nombreuses, et, c'est à titre provisoire, que les animaux étudiés ici sont rangés dans la forme *E. medius* Kiefer.

D'autre part Kiefer a antérieurement à la description de *E. medius* décrite une forme originaire de Madagascar sous le nom de *E. hirsutus*

qui, d'autant qu'on puisse s'en rendre compte d'après les quelques lignes et la seule figure qui y sont consacrées, doit être identique à *E. medius*. La seule qualité distinctive serait que l'appendice interne de la cinquième patte est plus court chez *E. medius* que chez *E. hirsutus*. Cependant il est dit au sujet de *E. hirsutus* que les appendices de la cinquième patte " atteignent à peu près le bord postérieur du segment génital " et, concernant *E. medius*, que l'appendice le plus ventral " atteint presque le bord postérieur du segment génital " Ainsi Kiefer n'a réellement donné aucune caractéristique distinctive entre ces deux " espèces ", et, en ne considérant que la description et les figures publiées jusqu'à ce jour de *E. hirsutus* et de *E. medius*, ces deux formes apparaissent identiques et le nom de *E. hirsutus* doit avoir la priorité sur celui de *E. medius*.

Mensurations.

—	Nombre.	Moyenne.	Valeurs extrêmes.
<i>A. Femelle.</i>			
Longueur	36	909 μ	700 μ —1245 μ
Longueur : largeur	34	2.73 : 1	2.28 : 1—3 : 1
Furca. Longueur : largeur	34	2.22 : 1	1.83 : 1—3.09 : 1
Art. term. enp. 4. Long. : larg.	26	1.45 : 1	1 : 1 —1.73 : 1
Do. Epine int. : épine ext.	26	2.29 : 1	1.93 : 1—2.50 : 1
Do. Epine int. : long. art.	26	2.19 : 1	1.83 : 1—2.51 : 1
Cinquième patte :—			
Appendice interne	24	90 μ	66 μ —117 μ
Appendice médian	24	70 μ	53 μ —100 μ
Appendice externe	24	65 μ	42 μ —83 μ
<i>B. Mâle.</i>			
Longueur	7	684 μ	589 μ —807 μ
Longueur : largeur	6	2.71 : 1	2.49 : 1—3.27 : 1
Furca. Longueur : largeur	4	1.98 : 1	1.89 : 1—2.15 : 1
Cinquième patte :—			
Appendice interne	5	76 μ	66 μ — 96 μ
Appendice médian	5	59 μ	41 μ —100 μ
Appendice externe	5	52 μ	41 μ — 66 μ
Sixième patte :—			
Appendice interne	6	73 μ	66 μ — 76 μ
Appendice médian	6	32 μ	26 μ — 41 μ
Appendice externe	6	39 μ	33 μ — 50 μ

Cyclops (Microcyclops) karvei Kiefer et Moorthy.

Kiefer et Moorthy ont décrit en 1935 un *Microcyclops* nouveau ayant une première antenne courte et trapue, composée de 9 articles rappelant celle de *P. fimbriatus*. Cette forme nouvelle provenait d'un

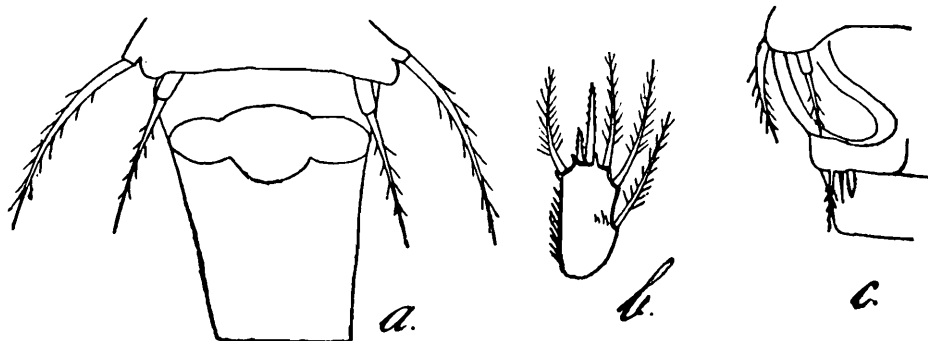


FIG. 4. *Cyclops (Microcyclops) karvei* Kiefer et Moorthy.

a. ♀ Cinquième patte et réceptacle séminal (Sangli); b. ♀ Article terminal de l'enp. 4 (Sangli); c. ♂ Cinquième et sixième pattes (Sangli).

puits ou étang artificiel à Tchitaldrug (Etat de Maïsore) et seulement 5 femelles furent récoltées.

J'ai retrouvé cette même espèce dans l'eau courante de la rivière Krichna à Sangli (ensemble avec *P. vagus*) et dans le grand réservoir à Ellora (Etat de Haïdérad).

Comme j'ai pu observer le réceptacle séminal et aussi examiner un mâle, je trouve utile de donner ici des figures et des mensurations pour compléter les données déjà fournies par Kiefer et Moorthy.

	Sangli. ♀	Ellora. ♀
Longueur	665 μ	660 μ
Largeur	232 μ	237 μ
Furca :		
Longueur : largeur	$(32+26) : 22 = 2.64 : 1$	$(31+25) : 20 = 2.80 : 1$
Soie dorsale	41 μ	
Soies apicales	48 : 167 : 292 : 48 μ	48 : 175 : 312 : 51 μ
Art. term. de l'enp :—		
Longueur : largeur	51 : 25 = 2.04 : 1	58 : 20 = 2.90 : 1
Epine interne : épine externe	35 : 16 = 2.19 : 1	41 : 21 = 1.95 : 1
Long. art. : épine interne	51 : 35 = 1.46 : 1	58 : 41 = 1.41 : 1
Cinquième patte :—		
Article. Longueur : largeur	10 : 5 = 2 : 1	
Soie apicale	50 μ	
Soie thoracique	78 μ	

Mâle (Sangli) : Longueur 560 μ Largeur 180 μ . Furca. (28+15) : 15=2.87 : 1. Sixième patte : Epine interne 13 μ . Soie médiane 15 μ . Soie externe 26 μ .

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ON A NEW TREMATODE *PALITREMA MACRORCHIS*, GEN. ET SP. NOV. FROM RANGOON LIZARDS.

By B. S. GOGATE, *Biological Department, University of Rangoon.*

From the intestine of the lizards *Calotes versicolor* (Daudin 1802) and *Hemidactylus brooki* Gray 1845, five and two trematodes respectively belonging to the family Lecithodendriidae Odhner 1911 were obtained. As may be seen from the following table the specimens obtained from *H. brooki* were larger than those from *C. versicolor*. It follows that the specimens obtained from *H. brooki* were full grown and that the worms may attain maturity before they reach full size.

—				Specimens from <i>H. brooki</i> gray 1845.	Specimens from <i>C. versicolor</i> (Daudin 1802).
Length	..	..	..	2.75—2.78 ¹	1.25—1.37
Breadth	..	..		1.47—1.49	1.05—1.11
Oral sucker	..	..	{	0.191—0.194	0.112—0.119
				× 0.250—0.260	× 0.163—0.190
Pharynx	..	..	{	0.076—0.078	0.041—0.084
				× 0.101—0.104	× 0.051—0.098
Oesophagus	..	..	..	0.384—0.389 long	0.098—0.142 long
Ventral sucker		..	{	0.191—0.194	0.142—0.149
				× 0.203—0.205	× 0.154—0.171
Testes	..	..	{	0.487—0.571	0.300—0.415
				× 0.480—0.493	× 0.360—0.439
Cirrus sac	.	..	{	0.512—0.542	0.360—0.413
				× 0.150—0.190	× 0.130—0.142
Ovary ..	..	..	{	0.356—0.358	0.233—0.293
				× 0.253—0.257	× 0.196—0.218
Ova ..	..	..	{	0.013—0.030	0.016—0.026
				× 0.007—0.015	× 0.0081—0.015

Palitrema macrorchis, gen. et sp. nov.

Hosts.—*Calotes versicolor* (Daudin 1802) and *Hemidactylus brooki* Gray 1845.

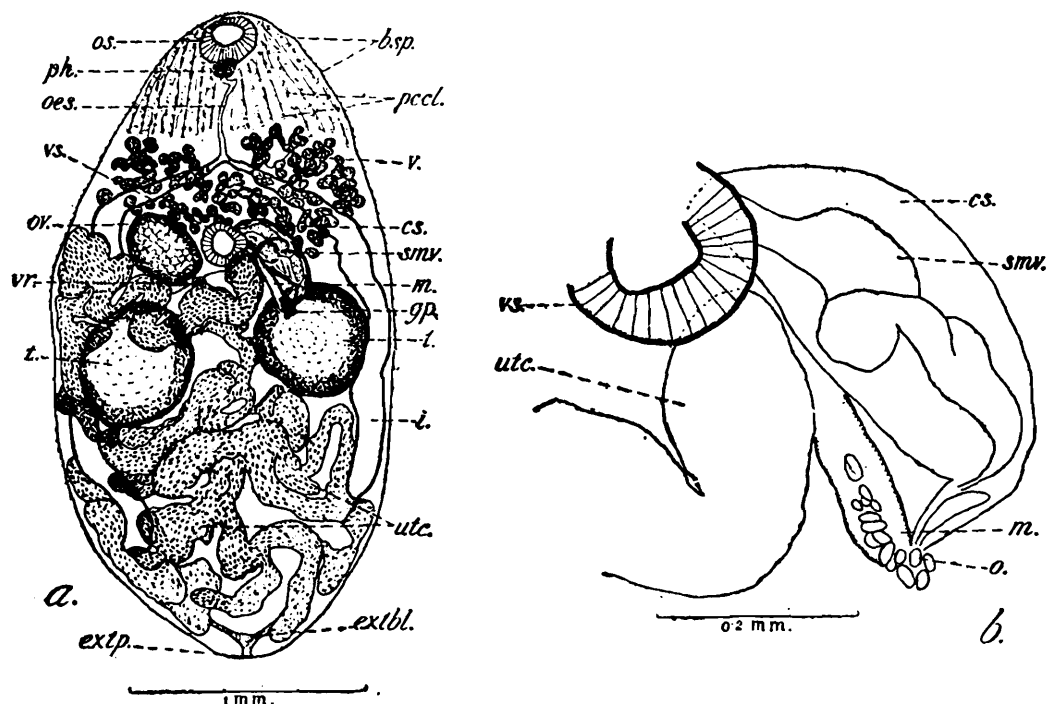
Location.—Intestine.

¹ All measurements in millimetres.

Locality.—Rangoon.

Description.—Body small, $1.25-2.78 \times 1.05-1.49$, elliptical or elongated, covered with spines. Suckers moderately muscular: ventral sucker $0.142-0.194 \times 0.154-0.205$, oral sucker $0.112-0.194 \times 0.163-0.260$; prepharynx very short, visible only in sections; pharynx $0.041-0.084 \times 0.051-0.104$. Oesophagus sinuous, $0.098-0.389$ long. Caeca broad, sinuous, overlapped partially or completely by testes and continuing into the last third of the body. In the anterior region of the body, extending from the oral to ventral sucker, are clusters of peculiar parenchymatous cells, arranged in longitudinal rows converging towards the oral sucker.

Testes big, $0.300-0.571 \times 0.360-0.493$, round to oval, symmetrically situated in the middle of body, separated from one another and closer to body margin than to the median line. Cirrus sac $0.360-0.542 \times 0.13-0.19$, situated on the left side of ventral sucker commencing at its anterior border, with its axis oblique to that of the body and its tip



TEXT-FIG. 1.—*Palitrema macrorchis*, gen. et sp. nov., from *H. brooki* Gray, 1895.

a. Entire ventral view.

b. Cirrus sac and Metraterm.

slightly curved; a coiled vesicula seminalis enclosed in the cirrus sac. Genital pore ventro sinistral, overlying the left testis. Metraterm running parallel to cirrus sac on its inner side.

Ovary $0.233-0.358 \times 0.196-0.257$, transversely oval, on right side of ventral sucker and often partially overlapped by it. Shell gland and receptaculum seminis in median line of body and obscured in whole mounts by the uterine coils. Vitellaria a dorsal layer extending from side to side of the body between pharynx and ventral sucker. Vitelline ducts oblique to median line of body, meeting medially behind ventral sucker in the intertesticular region to form a vitelline reservoir. Uterus filling posterior half of the body, consisting of heavy transverse coils with descending and ascending limbs; the latter in its final course covering the right testis and sometimes ovary and then passing over the

posterior border of ventral sucker is continued as matraterm, running dorsal to cirrus sac in its early portion and parallel in the later one. Eggs $0.013-0.030 \times 0.007-0.015$, yellow and operculate.

Excretory bladder V-shaped. Excretory pore terminal.

The type slides, No. W3423/1, are preserved in the collection of the Zoological Survey of India (Ind. Mus.), Calcutta.

Remarks.—The present form differs from all others (except *Parabascoides* Stunkard 1938) at present included in the family Lecithodendriidae by the combination of the following characters: lateral postacetabular position of genital pore, presence of cirrus sac, long intestinal caeca, and V-shaped excretory bladder. From *Parabascoides* Stunkard 1938 it differs in the big isolated testes, oblique cirrus sac, acetabular position of ovary and preacetabular band of vitellaria extending from side to side. It is obvious that for it must be created a new genus for which I propose the name *Palitrema* with the diagnosis given below. Both *Palitrema* and *Parabascoides* differ from all other forms of the family Lecithodendriidae in the combination of characters just given. These characters appear to be as important as those used to separate the various sub-families of the Lecithodendriidae and, therefore, justify the creation of a new sub-family. I propose the name Palitreminae with the diagnosis given below.

Macy (1935) erected the sub-family Gyrabascinae for the reception of those forms with "genital pore postacetabular, lateral to nearly median; seminal vesicle sinuous, lying free in the body parenchyma, not surrounded by a definite prostate mass" and included within it the genera *Gyrabascus* Macy 1935 and *Ophiosacculus* Macy 1935. The nature of the seminal vesicle of the latter is still disputed and Macy was, therefore, of the opinion that, should it prove to be a true cirrus sac, a new sub-family should be created for it. In that case it would automatically be included within the new sub-family Palitreminae.

PALITREMINAE, subfamily nov.

Body oval to elongated, spined, suckers of about same size. Caeca extending posterior to testes. Genital pore postacetabular, situated over the left testis or anterior to it. Cirrus sac partly postacetabular and oblique to the axis of body or wholly postacetabular and transverse to it. Ovary in the acetabular zone or posterior to it. Vitellaria either a transverse band of moderately sized follicles between pharynx and ventral sucker, or a horse shoe of big follicles anterior and lateral to ventral sucker. Uterus with heavy coils occupying posterior half of body, anteriorly not extending beyond acetabular zone.

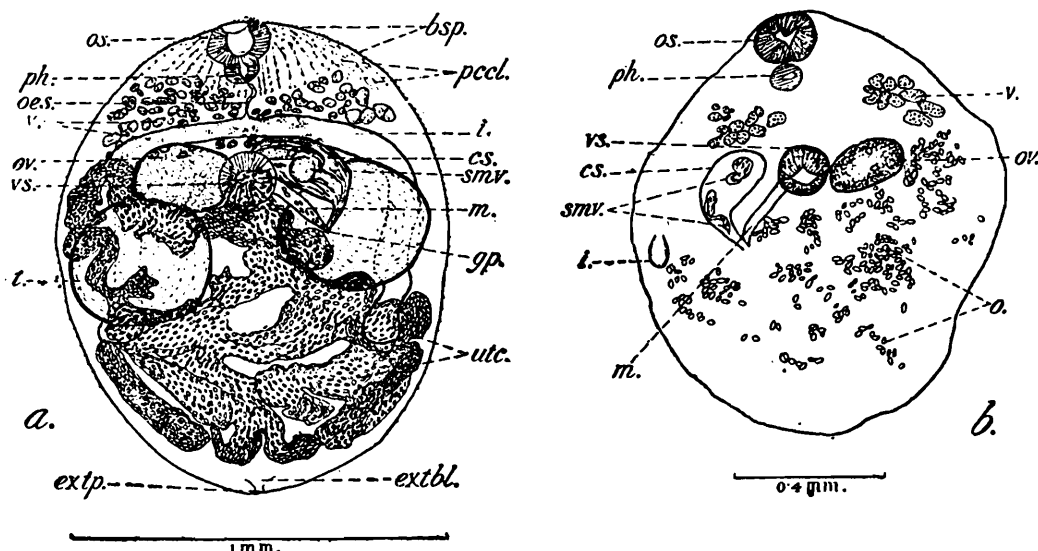
Parasites of bats and lizards.

Type Genus.—*Palitrema*, gen. nov.

Palitrema, gen. nov.

Oesophagus long and sinuous. Caeca broad, sinuous, extending to the posterior third of body. Peculiar parenchymatous cells arranged in longitudinal rows converging towards oral sucker anterior to ventral sucker. Testes rounded to oval, symmetrical, situated in middle of body, and separated from one another. Cirrus sac partly postacetabular,

oblique to body axis, with tip slightly curved, and sinistral to ventral sucker. Genital pore overlying the left testis. Ovary dextral, oval, situated in acetabular zone and often partially overlapped by it. Shell gland and receptaculum seminis median, situated in the



TEXT-FIG. 2.—*Palitrema macrorchis*, gen. et sp. nov., from *C. versicolor* (Daudin), 1802.

a. Entire ventral view.

b. H. L. section, dorsal view.

intertesticular region. Vitellaria extending from side to side between pharynx and ventral sucker. Uterus with heavy transverse coils; the ascending limb of uterus in its terminal portion covering the right testis and finally the posterior border of ventral sucker runs parallel to cirrus sac on its inner side as metraterm.

Parasitic in the intestine of lizards.

Type Species.—*Palitrema macrorchis*, sp. nov.

ABBREVIATIONS FOR TEXT-FIGURES.

bsp., body spines; *cs.*, cirrus sac; *extbl.*, excretory bladder; *extp.*, excretory pore; *gp.*, genital pore; *i.*, intestine; *m.*, metraterm; *o.*, ova; *oes.*, oesophagus; *os.*, oral sucker; *ov.*, ovary; *pccl.*, clusters of parenchymatous cells; *ph.*, pharynx; *smv.*, seminal vesicle; *t.*, testis; *ut.*, uterine coils; *v.*, vitellaria; *vr.*, vitelline reservoir; *vs.*, ventral sucker.

LIST OF REFERENCES.

- Macy, R. W., 1935—*Gyrabascus brevigastrus*, n. g., n. sp., a bat trematode, with a note on *Distomum méhelji* Mödinger. *Journ. Parasit.* XXI, pp. 413-415.
- Mehra, H. R., 1935—New trematodes of the family Lecithodendriidae Odhner 1911, with a discussion on the classification of the family. *Proc. Acad. Sci. U. P. India* V, pt. 1, pp. 99-121.
- Stunkard, H. W., 1938—Parasitic flat worms from Yucatan. *Carnegie Inst. of Washington, Pub. No. 491*, pp. 33-50.

THE CEPHALOPODA IN THE INDIAN MUSEUM, CALCUTTA.

By W ADAM, *Musée royal d'Histoire naturelle de Belgique, Brussels.*

(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 species¹ (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	<i>Sepia singaporensis</i> Pfeffer ..	p. 3 ..	p. 225 ..	—	—
2	<i>Sepia aculeata</i> Orbigny ..	p. 3 ..	p. 223 ..	—	p. 64
3	<i>Sepia singalensis</i> 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	<i>Sepia esculenta</i> Hoyle	—	p. 225 ..	—	—
5	<i>Sepia elliptica</i> Hoyle	—	p. 226 ..	—	—
6	<i>Sepia arabica</i> Massy	—	p. 228 ..	—	—
7	<i>Sepia andreanoides</i> Hoyle	—	p. 229 ..	—	—
8	<i>Sepia kbiensis</i> Hoyle	—	p. 230 ..	—	—
9	<i>Sepia</i> sp. Massy	—	p. 231 ..	—	—
10	"Sepiidae" ? Massy	—	p. 237 ..	—	—
11	<i>Sepiella inermis</i> (Orbigny) ..	p. 5 ..	p. 231, pl. xxiii, fig. 6; pl. xxiv, figs. 1-9.	—	p. 65
12	<i>Sepiella</i> sp. Massy	—	p. 237 ..	—	—
13	<i>Sepiadarium kochii</i> Steenstrup ..	p. 3 ..	—	—	—
14	<i>Euprymna morsei</i> (Verrill) ..	<i>Inioteuthis morsei</i> , p. 3	p. 216 ..	—	—
15	"Sepiolidae" ? Massy	—	p. 217 ..	—	—
16	<i>Inioteuthis japonica</i> Verrill ..	—	p. 215 ..	—	—
17	<i>Inioteuthis maculosa</i> Goodrich ..	p. 2, pl. i, figs. 1-3.	p. 216 ..	—	—
18	<i>Loliolus investigatoris</i> Goodrich ..	p. 8, pl. ii, figs. 29-37.	p. 222 ..	—	p. 66
19	<i>Loligo duvaucelii</i> Orbigny ..	<i>Loligo indica</i> Pfr., p. 7, pl. ii, figs. 20-28.	<i>Loligo indica</i> Pfr., p. 218, pl. xxiii, fig. 9; pl. xxiv, fig. 11.	—	p. 67
20	<i>Loligo</i> sp.	—	p. 222 ..	—	—
21	<i>Sepioteuthis arctipinnis</i> Gould ..	—	p. 237 ..	—	—
22	<i>Sepioteuthis indica</i> Goodrich ..	p. 5, pl. i, figs. 9-19.	—	—	—
23	<i>Doryteuthis singhalensis</i> (Ortmann) ..	—	? <i>Loligo spectrum</i> , p. 221.	—	p. 70
24	<i>Abraia andamanica</i> Goodrich ..	p. 9, pl. ii, figs. 38-45.	p. 239 ..	—	—
25	<i>Abraia lineata</i> Goodrich	p. 10, pl. iii, figs. 46-50.	—	—	—
26	<i>Onychoteuthis banksii</i> Leach	p. 11 ..	—	—	—
27	<i>Stigmatoteuthis hoylei</i> (Goodrich) ..	<i>Histiopsis hoylei</i> , p. 15, pl. iv, figs. 62-71.	—	—	—
28	<i>Stigmatoteuthis japonica</i> Pfeffer ..	—	p. 242 ..	—	—
29	? <i>Calliteuthis reversa</i> Verrill ..	p. 16 ..	—	—	—
30	<i>Bathyteuthis abyssicola</i> Hoyle	—	p. 241 ..	—	—
31	<i>Chiroteuthis macrosoma</i> Goodrich ..	p. 12, pl. iii, figs. 51-57.	—	—	—
32	<i>Chiroteuthis pellucida</i> Goodrich ..	p. 14, pl. iv, figs. 58-61.	—	—	—
33	<i>Chiroteuthis imperator</i> Chun	—	p. 243 ..	—	—
34	<i>Megalocranchia abyssicola</i> (Goodrich)	<i>Taonius abyssicola</i> , p. 17, pl. v, figs. 72-80.	—	—	—
35	<i>Hensenioteuthis joubini</i> (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	? <i>Hymenoteuthis macrope</i> (Berry) ..	—	<i>Cirrotheuthis macrope</i> , p. 187.	II, p. 110	—
37	? <i>Grimpoteuthis pacifica</i> (Hoyle) ..	<i>Cirrotheuthis pacifica</i> , p. 19.	—	II, p. 142	—
38	? <i>Grimpoteuthis grimaldii</i> (Joubin) ..	—	<i>Cirrotheuthis grimaldii</i> , p. 186.	II, p. 148	—
39	<i>Argonauta böttgeri</i> Maltzan ..	—	p. 188 ..	II, p. 195	—
40	<i>Octopus (Octopus) rugosus</i> (Bosc) ..	<i>O. granulatus</i> (pars), p. 19.	<i>Polypus rugosus</i> , p. 189. <i>Polypus</i> sp., p. 212.	I, p. 63	p. 71
41	<i>Octopus (Octopus) tonganus</i> Hoyle ..	—	<i>P. tonganus</i> , p. 200.	I, p. 77	p. 74
42	<i>Octopus (Octopus) microphthalmus</i> Goodrich	p. 20, pl. v, figs, 83, 84.	<i>P. microphthalmus</i> , p. 205.	I, p. 89	—
43	<i>Octopus (Octopus) globosus</i> Appellöf ..	<i>O. globosus</i> , p. 19. <i>O. granulatus</i> (pars), p. 19.	<i>P. globosus</i> , p. 202.	I, p. 93	p. 75
44	<i>Octopus (Octopus) cyaneus</i> Gray ..	<i>O. vulgaris</i> p. 19.	? <i>P. cyanea</i> , p. 195. <i>P. herdmanni</i> , p. 206.	I, p. 94 I, p. 86.	p. 79
45	<i>Octopus (Octopus) macropus</i> Risso. ..	? p. 20 ..	<i>P. macropus</i> , p. 192.	I, p. 101	p. 81
46	<i>Octopus (Octopus) areolatus</i> Orbligny ..	—	<i>P. areolatus</i> , p. 193.	I, p. 122	p. 83
47	<i>Octopus (Octopus) fusiformis</i> Brock ..	—	<i>P. fusiformis</i> , p. 203.	I, p. 132	p. 86
48	<i>Octopus (Octopus) defilippii</i> Vérany ..	—	<i>P. defilippii</i> , p. 196.	I, p. 135	p. 87
49	<i>Octopus (Octopus) niveus</i> Lesson ..	<i>O. aculeatus</i> , p. 20. <i>O. macropus</i> (pars), p. 20.	<i>P. aculeatus</i> , p. 191.	I, p. 141	p. 88
50	<i>Octopus arborescens</i> (Hoyle). ..	—	<i>P. arborescens</i> p. 207.	I, p. 151	p. 96
51	<i>Octopus prashadi</i> , sp. nov. ..	—	<i>P. levis</i> , p. 198.	? <i>Benthoc- topus levis</i> p. 227.	p. 103
52	<i>Octopus</i> sp.	—	<i>Polypus</i> sp., p. 210.	—	—
53	<i>Octopus</i> sp.	—	<i>Polypus</i> sp., p. 211.	—	—
54	<i>Octopus</i> sp.	—	<i>P. hongkong- ensis</i> (pars), p. 197.	—	p. 106
55	<i>Octopus</i> sp.	—	—	—	p. 108
56	<i>Octopus (Macrotritopus) bandensis</i> (Hoyle). ..	—	<i>P. bandensis</i> , p. 201.	I, p. 170	—
57	<i>Paroctopus hongkongensis</i> (Hoyle) ..	—	<i>P. hongkong- ensis</i> (pars), p. 197.	I, p. 199.	p. 97
58	<i>Hapalochluena fasciata</i> (Hoyle) ..	<i>O. pictus</i> var. <i>fasciata</i> , p. 82.	—	<i>Hapalo- chluena macu- losa</i> , I, p. 211.	p. 98
59	<i>Berrya hoylei</i> (Berry)	—	<i>P. hoylei</i> , p. 207.	<i>O. hoylei</i> var. <i>annae</i> , I, p. 219.	p. 101
60	<i>Benthoctopus profundorum</i> Robson ..	—	<i>P. januarii</i> (pars), p. 199.	II, p. 238	—
61	<i>Teretoctopus indicus</i> Robson ..	—	<i>P. pricei</i> , p. 209, pl. xxiii, figs. 7, 8.	II, p. 249	—
62	<i>Teretoctopus alcocki</i> Robson ..	<i>O. januarii</i> , p. 19.	<i>P. januarii</i> (pars), p. 199.	II, p. 251	p. 105

Cephalopoda of the Indian Museum described in literature—concl'd.

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

Order DECAPODA.

Family SEPIIDÆ.

***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. xlv, 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 denticles 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, 16a.
 1884. *Diphtherosepion Martini*, Rochebrune, *Bull. Soc. Philom. Paris* (7) VIII, p. 81.
 ?1884. *Rhombossepion 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).

	<i>a</i>	<i>b</i> ¹	<i>b</i> ²	<i>b</i> ³	<i>b</i> ⁴	<i>b</i> 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.

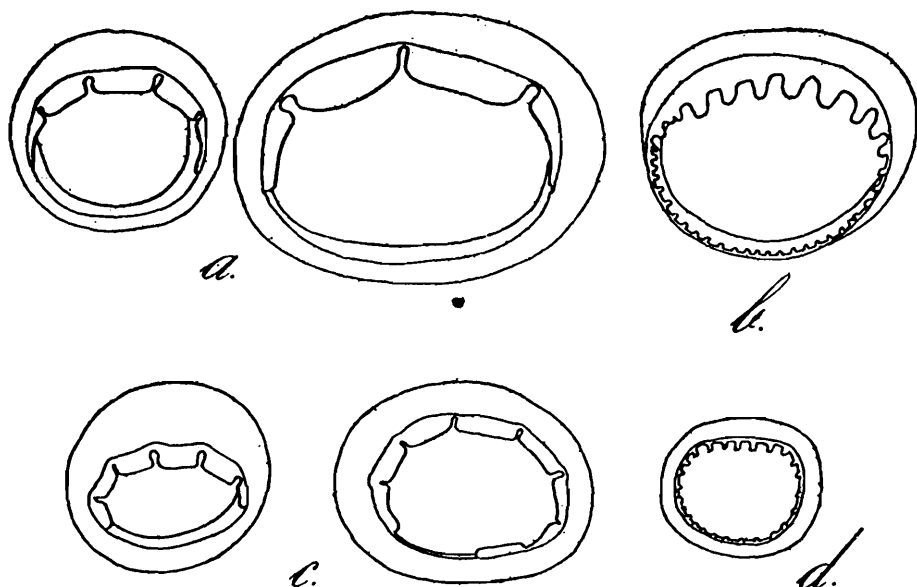
1896. *Loliolus investigatoris*, Goodrich, *Trans. Linn. Soc. London*, Zool. VII, p. 8, pl. ii, figs. 29-37.
1916. *Loliolus investigatoris*, Massy, *Rec. Ind. Mus.* XII, p. 222.

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).

	<i>a</i> ¹	<i>a</i> ²	<i>a</i> 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 ♀: $\times 20$; b. Ring of tentacular sucker of ♀: $\times 20$; c. Rings of arm-suckers of ♂: $\times 20$; d. Ring of tentacular sucker of ♂: $\times 20$.

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.
 1834. *Loligo indica*, Pfeffer, *Abh. Naturw. Ver. Hamburg* VIII, p. 4, figs. 3, 3a.
 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. (?).

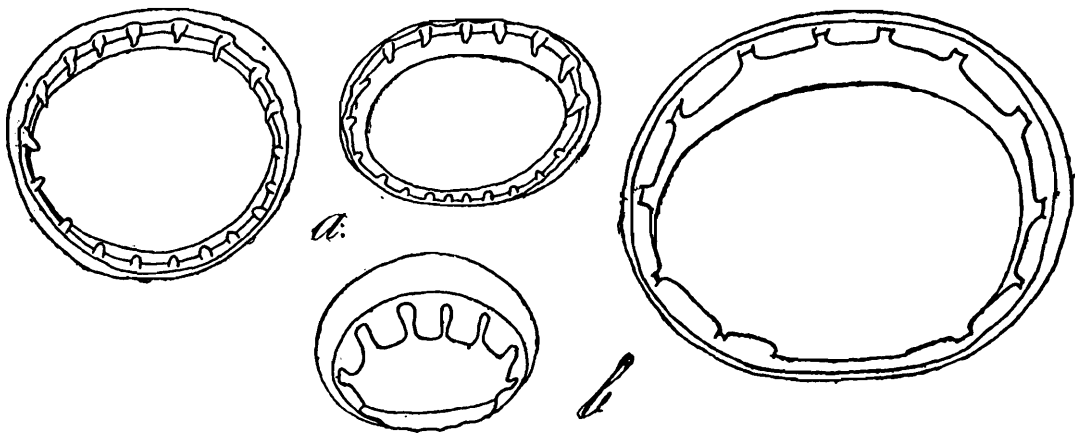
Measurements (in millimetres).

		<i>a</i> ¹	<i>a</i> ²	<i>a</i> ³	<i>a</i> ⁴	<i>b</i> ¹	<i>b</i> 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.

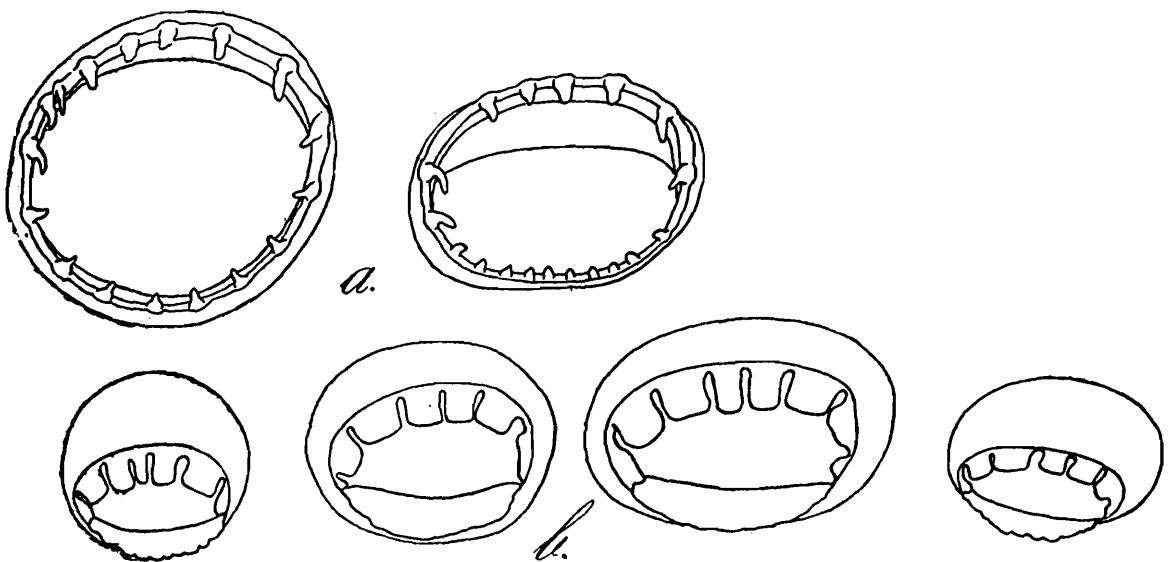
In the largest suckers of the males there are up to 13 teeth (text-fig. 2*b*), but in the smaller suckers there are only 6-8 teeth (text-fig. 2*b*). In



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

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

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): $\times 20$. *b.* Rings of arm suckers of ♀ (a^1): $\times 20$.

The hectocotylyzed 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. xlv, 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.

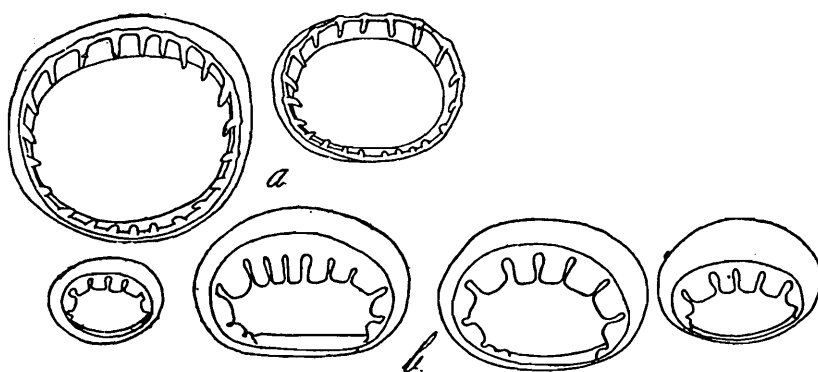
Specimens examined.—*a*. Sandheads, River Hooghly (P. V. Lady Fraser) 6.i.1926: 1♂; *b*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel, February-March, 1925: 1♂, 1 Juv.(?).

Measurements (in millimetres).

	<i>a</i>	<i>b</i> ¹	<i>b</i> 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); $\times 13$. b. Rings of arm suckers of ♂ (a): $\times 13$.

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

The hectocotyliized 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).

	<i>a</i>	<i>b</i>	<i>c</i>	<i>a</i>	<i>e</i> 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	—
<i>Indices :—</i>					
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	—

				<i>e</i> ²	<i>e</i> ³	<i>e</i> ⁴	<i>e</i> ⁵	<i>f</i>	<i>g</i>
Sex	♀	♀	♀	♀	♀	♀	♀	♀	♂
End of body to eye	32	39	33	14	11.5	38	30	11.5	38
End of body to mantle-margin	23	34	26	11	10	30	—	10	30
Eye to dorsal web	12	19	13	8	6.5	—	—	6.5	—
Breadth of body	23	29	21	12	9.5	33	—	9.5	33
Breadth of head	15	20	16	10	8.5	24	—	8.5	24
1st right arm	70	80	86	±28	—	85	—	—	85
1st left arm	—	80	65+	±28	—	85	—	—	85
2nd right arm	83	86	70+	±28	—	95	—	—	95
2nd left arm	75	86	92	±28	—	95	—	—	95
3rd right arm	88	92	75+	±28	—	82	—	—	82
3rd left arm	95	92	100	±28	—	110	—	—	110
4th right arm	86	—	95	±28	—	—	—	—	—
4th left arm	98	92	100	±28	—	105	—	—	105
Hectocotylus	—	—	—	—	—	3	—	—	3
Web between 1st arms	12	17	13	—	—	17	—	—	17
Web between 1st and 2nd arms, right	18	21	23	—	—	—	—	—	—
Web between 1st and 2nd arms, left	18	23	23	—	—	26	—	—	26
Web between 2nd and 3rd arms, right	23	23	25	—	—	—	—	—	—
Web between 2nd and 3rd arms, left	21	23	29	—	—	26	—	—	26
Web between 3rd and 4th arms, right	23	22	30	—	—	—	—	—	—
Web between 3rd and 4th arms, left	24	24	31	—	—	26	—	—	26
Web between 4th arms	21	20	25	—	—	22	—	—	22
Length of funnel	18	21	19	—	—	—	—	—	—
Funnel-organ	—	W	—	—	—	5	—	—	5
Diameter of largest sucker	3.5	4	4.2	—	—	—	—	—	—
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	—	—	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	—	—	B=C=D.E.A
<i>Indices :—</i>									
Width-index	72	74.5	63.5	86	82.5	87	—	—	87
Interocular index	47	51	48.5	71.5	74	65	—	—	65
Web-index	24.5	26	31	—	—	23.5	—	—	23.5
Sucker-index	11	10.2	12.7	—	—	13.2	—	—	13.2
Hectocotylus-index	—	—	—	—	—	3.7	—	—	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 cirrhous 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.

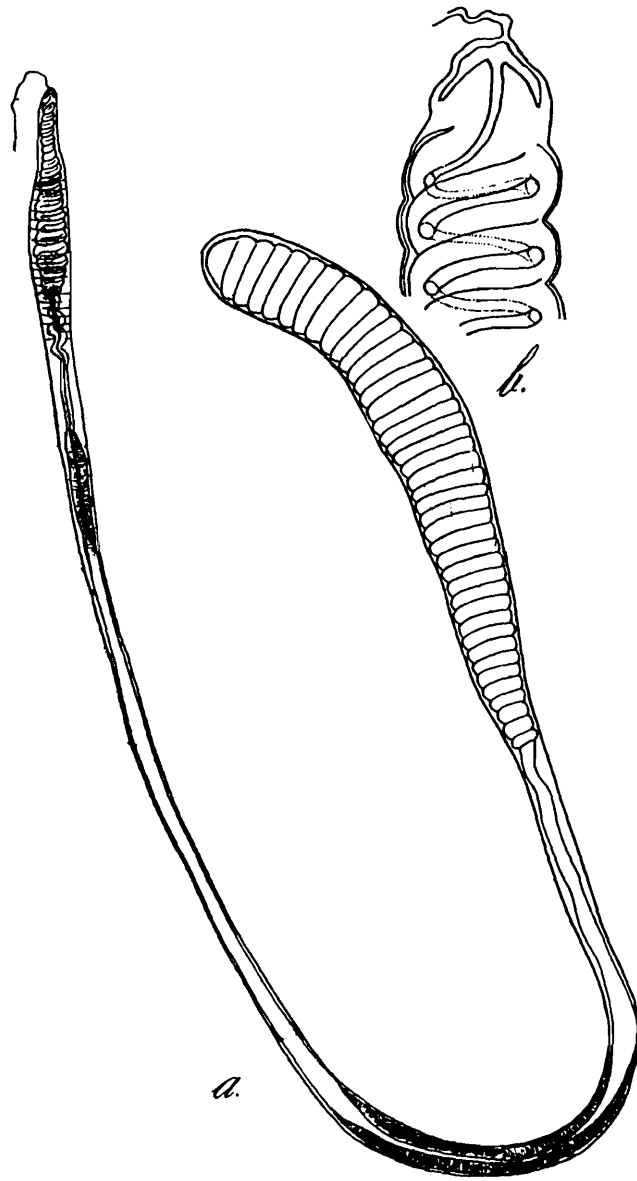
Specimen examined.—"Investigator" station 242, 2.x.1898, Arabian Sea, 17° 27'N., 71° 41'E., 56-58 fathoms: 1♂ (No. M 796/1).

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): $\times 16$. b. Its anterior end: $\times 136$.

***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).

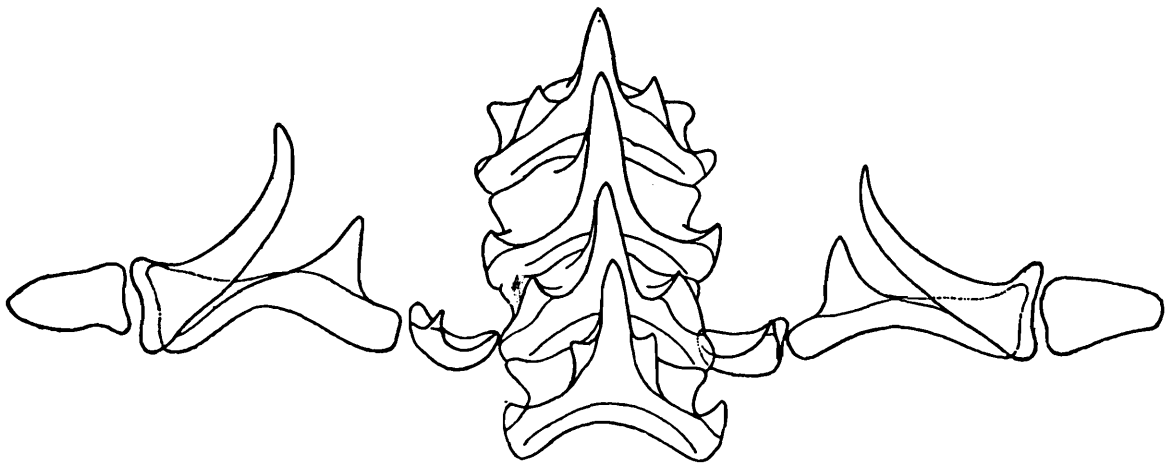
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>
Sex	♀	♀	♂	♂	♀
End of body to eye	22	15	17	15	10
End of body to mantle-margin	16	11	12	13	7
Eye to dorsal web	19	16	—	—	6
Breadth of body	16.5	12	14	14	8
Breadth of head	15	13	12	12	7.5
1st right arm	52	45	64	43	27
1st left arm	55	45	60	44	27
2nd right arm	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
<i>Indices :—</i>					
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	—

	<i>f</i>	<i>g</i> ¹	<i>g</i> ²	<i>g</i> ³	<i>g</i> ⁴	<i>h</i>
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
<i>Indices :—</i>						
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): $\times 170$.

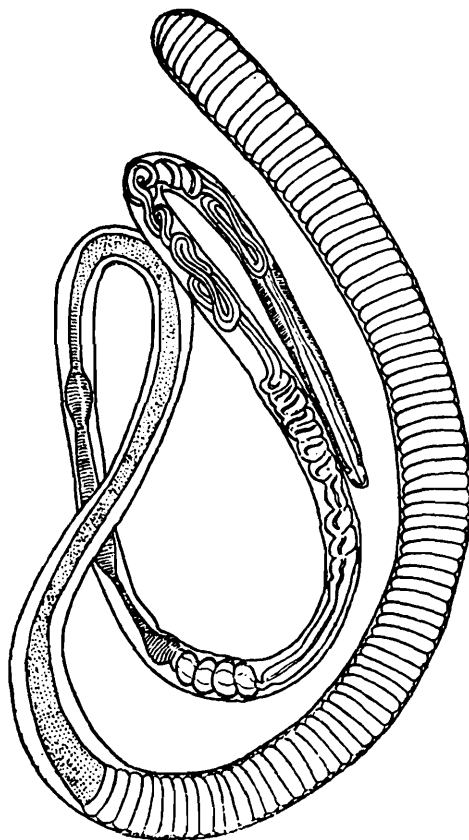
rhachidian teeth have a symmetrical seriation (A_{2-3}). The first laterals have an arched base and a prominent outer cusp; the second laterals have a deeply indentated base line and lack an endocone, but a long internal heel is present; the third laterals are strong and moderately curved; the marginal 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): $\times 19$.

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 herdmanni*, 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 herdmanni* 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).

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i> ?	<i>e</i> ¹	<i>e</i> 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
<i>Indices :—</i>						
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 cirrus.

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

82

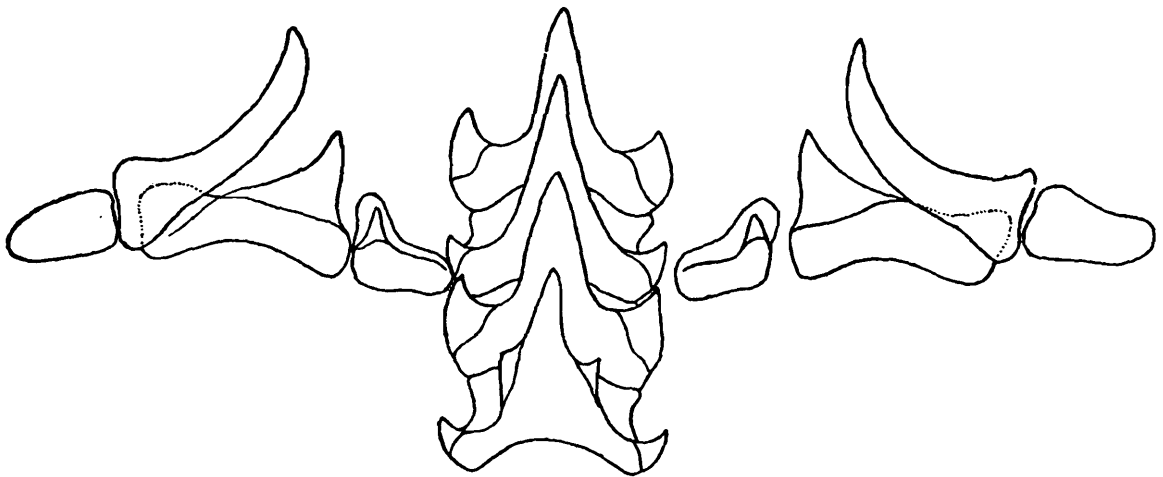
	a	b	c	d ¹	d ²	d ³
Sex	♂	♂	♀	♂	♂	♀
End of body to eye	28	43	45	46	55	32
End of body to mantle-margin	19	32	40	41	45	28
Eye to dorsal web	27	27	50	57	40	32
Breadth of body	26	23	35	42	48	28
Breadth of head	21	20	24	33	45	24
1st right arm	137	—	—	175+	395	225
1st left arm	145	196	250	270	360	185
2nd right 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): $\times 96$.

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.

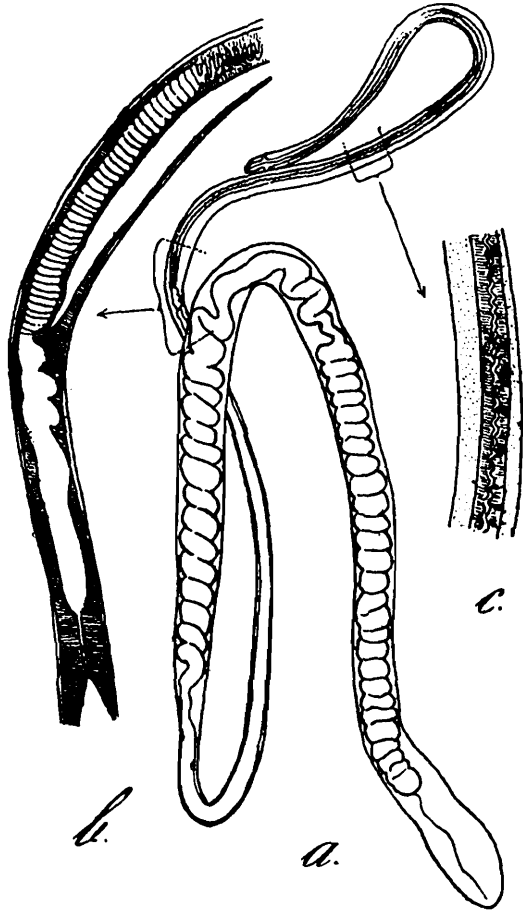
Specimens examined.—*a*. Gulf of Martaban, 14° 46'N., 95° 52'E., 61 fathoms, 7.iii.1904 : 1 ♂ (No. M 3272/1) (=Massy 1916 : No. M 8272/1); *b*. Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel, 10 Mill. N. and S. of Eastern Channel Light Vessel (P. V. Lady Fraser), February-March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

Measurements (in millimetres).

	<i>a</i>	<i>b</i>
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	—
<i>Indices :</i>		
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. $\times 18$; *b.* and *c.* $\times 68$.

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.

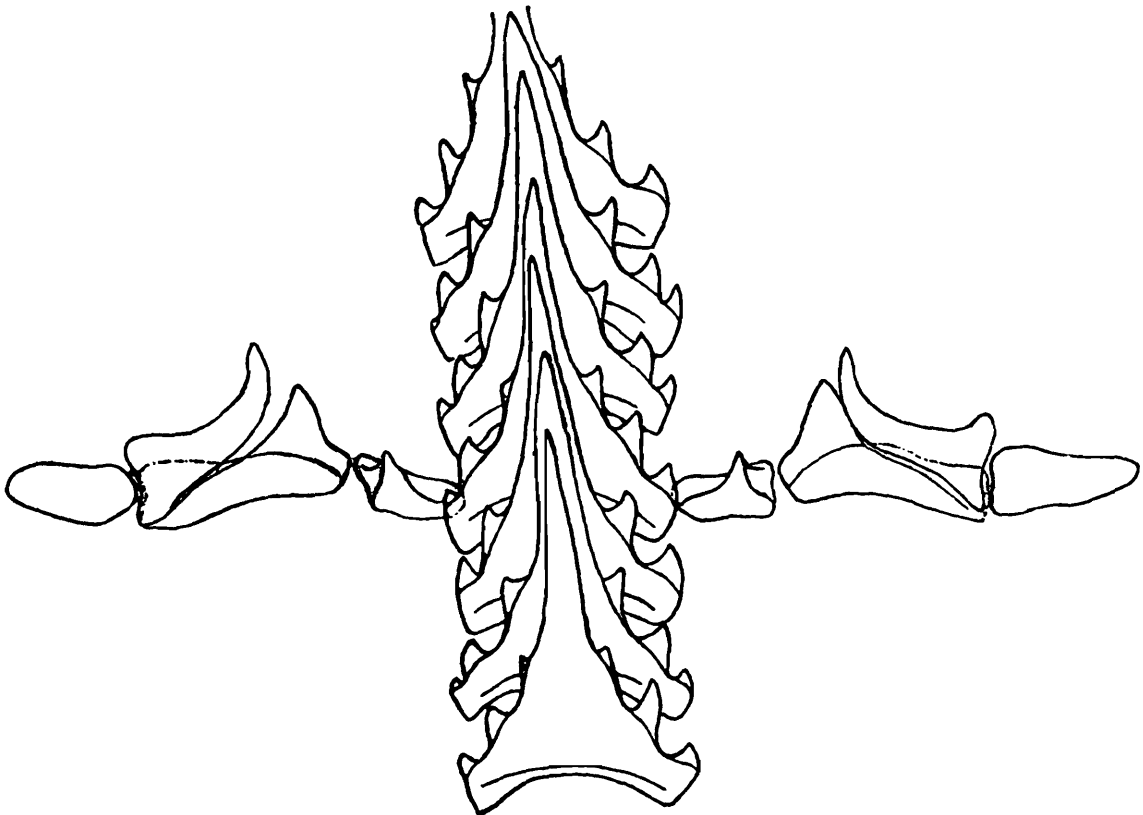
1916. *Polypus fusiformis*, Massy, *Rec. Ind. Mus.* XII, p. 203.

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.**

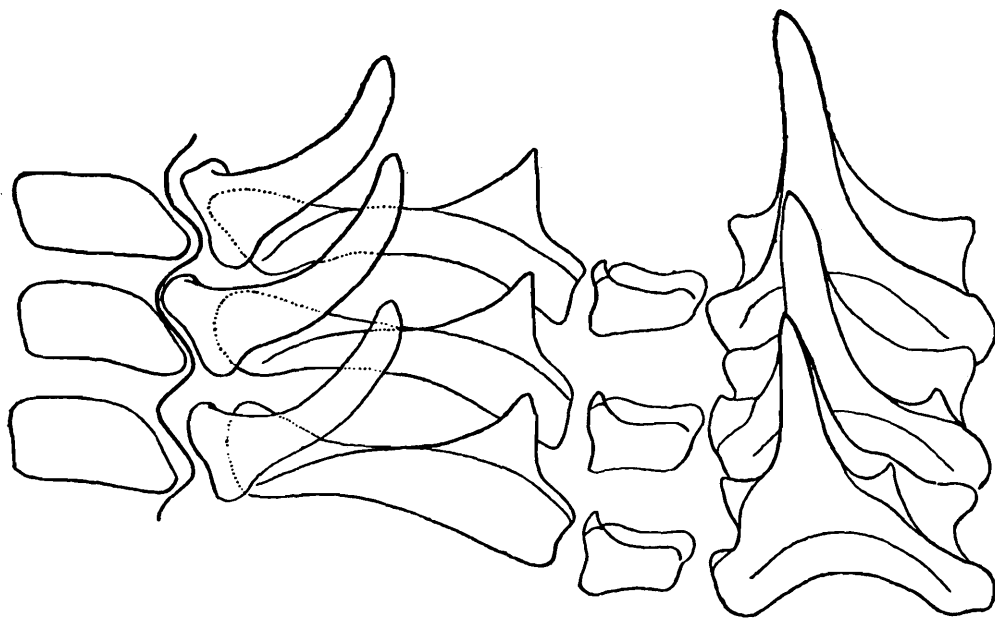
1851. *Octopus Defilippi*, Vérany, Moll. Méditerr. I, p. 30, pl. xi, figs. D, F.

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).

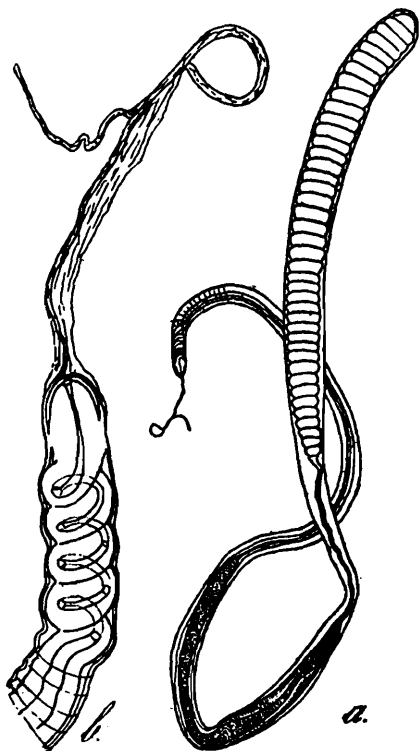
Description.—This specimen has been described in detail by Massy. However, it is desirable to give some complementary information. The web is very shallow, its deepest section measuring only 8.6 per cent. of the longest arm; the formula is D.C.A.=B.E. The penis is long (8 mm.) measuring 25 per cent. 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): $\times 225$.

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. 46a) The spermatophore is shown in text-figure 12.



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

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. 50a, 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).

	<i>a</i>	<i>b</i> ¹	<i>b</i> ²	<i>b</i> 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

	<i>b</i> ⁴	<i>b</i> ⁵	<i>b</i> ⁶	<i>b</i> 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 ^o	b ^o	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 ¹
Sucker-index	11.1	11.1 ¹	—	9.1 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 ¹
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).

	<i>g</i> ^a	<i>h</i> ¹	<i>h</i> ²	<i>h</i> ³	<i>h</i> 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	—	—
<i>Indices:</i>					
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	—

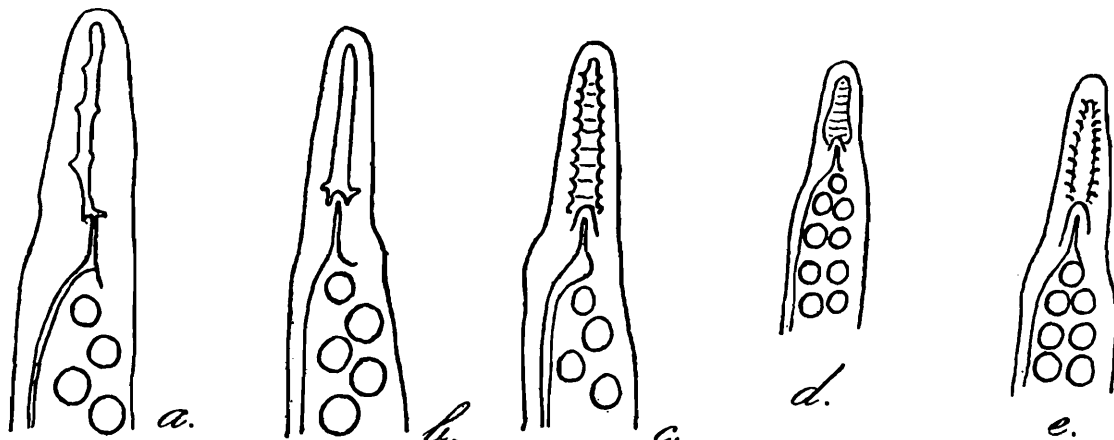
Description—

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 13a.

*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: $\times 8$.

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.

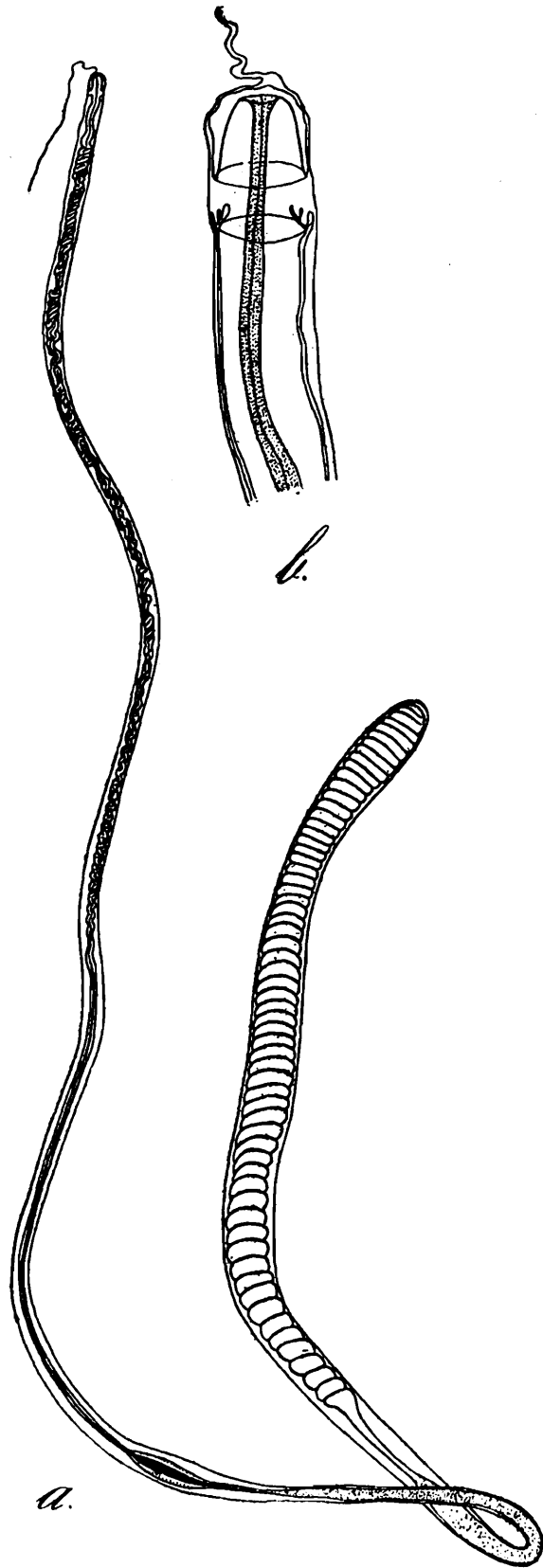
*b*⁹. Bursiform female with badly preserved skin, very large arm-membranes and strongly rolled-up arms.

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

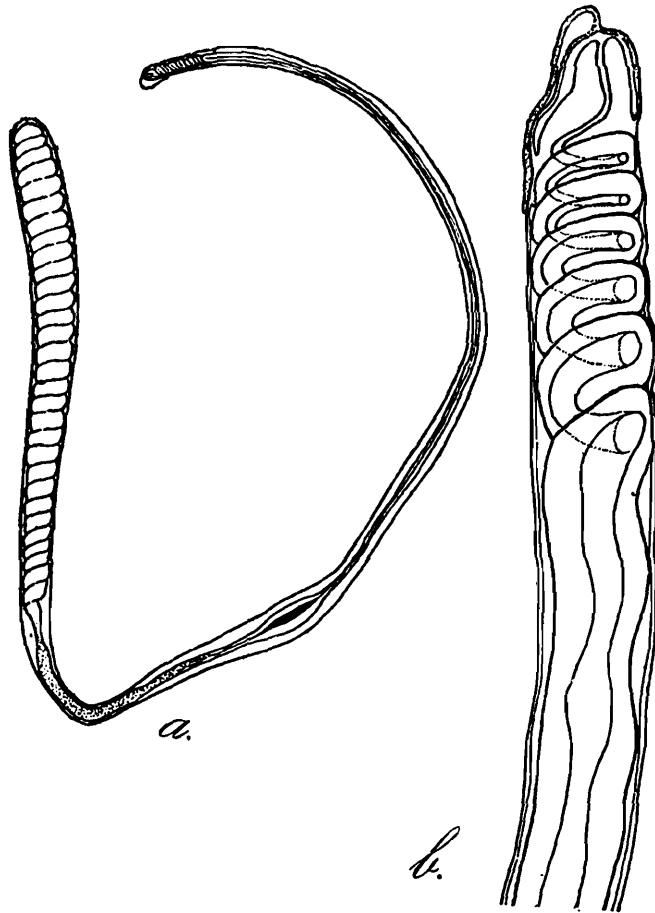
delicate, are well developed, especially along the ventral arm sides, up to the arm tips. The funnel is free for about $\frac{1}{3}$ of its length. The



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

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. 13d) with the ligula distinctly transversely striated. The spermatophore (text-fig. 15) is not so long



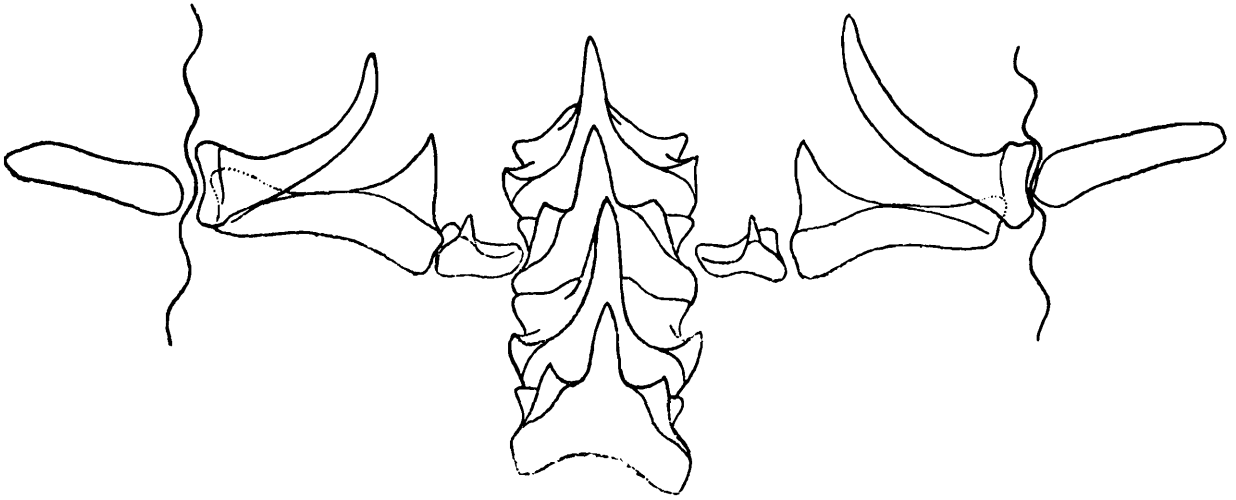
TEXT-FIG. 15.—*Octopus niveus* Lesson. Spermatophore, (No. M 381/1).
a. $\times 20$; b. $\times 90$.

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. 50a). 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 13e; 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): $\times 97$.

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.

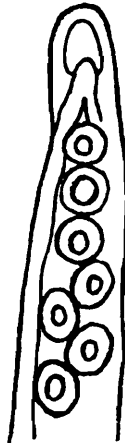
I have come to the conclusion that the principal difference between the two species is the characteristic colour-pattern of *O. horridus*. But, as Robson himself states that "This feature is sometimes obscured by a general darkening of the ground colour, which in these circumstances tends to pass into 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 hec-



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

tocotylus 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

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, $11\frac{1}{2}$ miles S. 83° W. of Colombo Lt., 26 $\frac{1}{2}$ fathoms, 12.xii. 1893: 1♀.

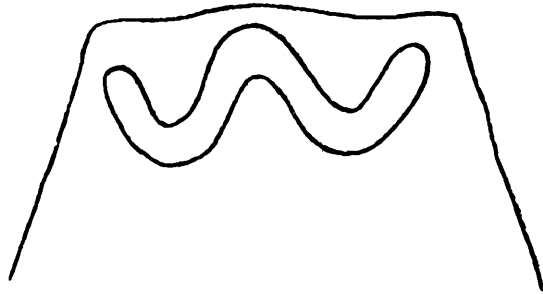
Description.—This specimen already well described by Massy is a female with strongly developed nidamental glands. The gill has about 10 filaments in each demibranch. The funnel-organ resembles that of *Octopus elegans* Brock figured by Robson (1929, fig. 62).

? *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.

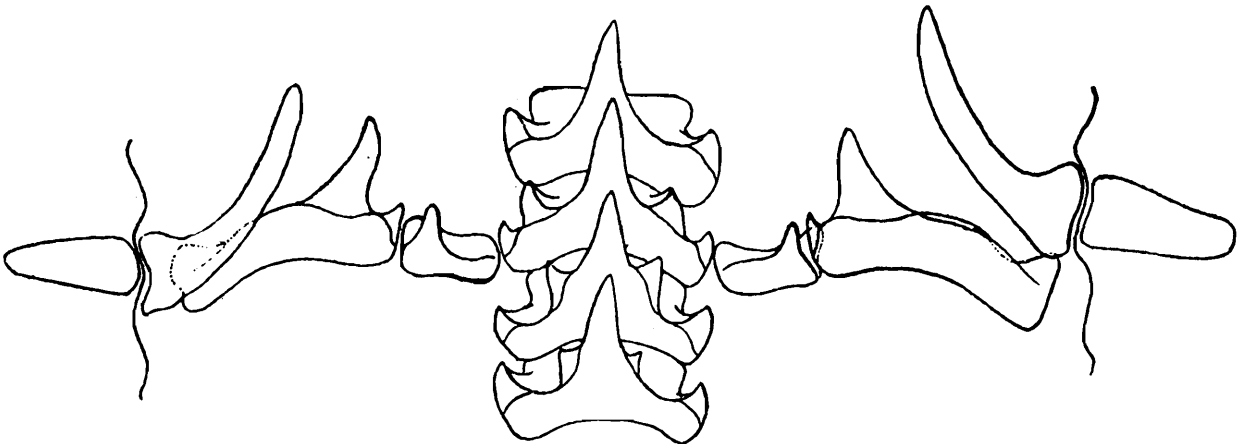
Specimen examined.—"Investigator" station 465, S. of Ceylon, 5°56' N., 81°22' E., 109-132 fathoms, 22. iv. 1912: 1♀ (No. M 8147/1).

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): $\times 47$.

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. döfleini* Wülker and *O. apollyon* Berry under name *Polypus döfleini* 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.

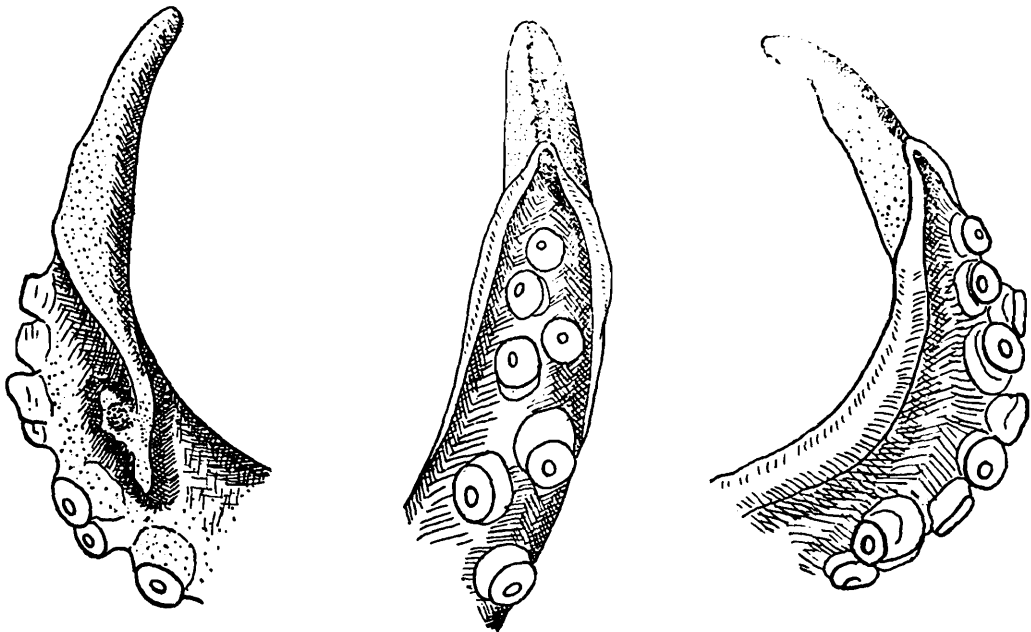
1929. *Hapalochlaena maculosa*, Robson (*pars*), *Monograph* I, p. 211.

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
<i>Indices :</i>				
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: $\times 7$.

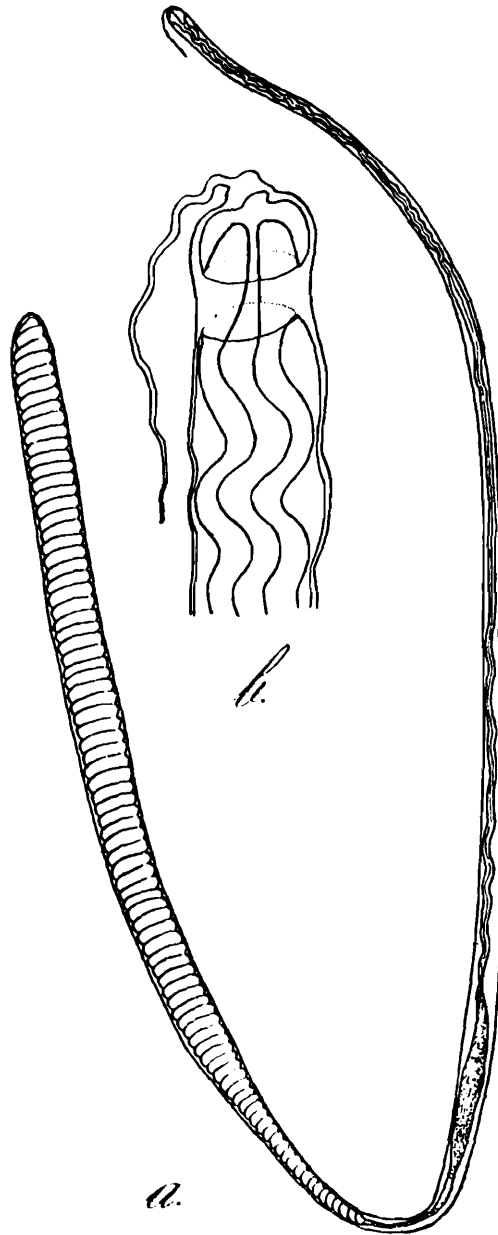
The hectocotylus (text-fig. 20) is rather small. The ligula is rounded and has only a very rudimentary median groove with some weak transverse grooves. The calamus is very well developed. On the ventral side it continues as the large seminal channel, on the dorsal side it forms also a well developed 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. $\times 18$; b. $\times 170$.

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.

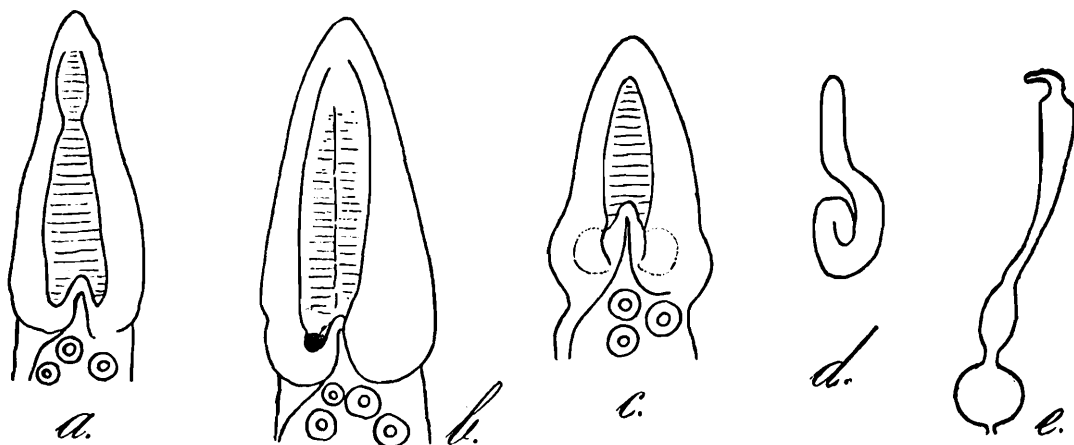
1916. *Polypus hoylei*, Massy, *Rec. Ind. Mus.* XII, p. 207.

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: $\times 5$; b. Hectocotylus of No. M 8125/1: $\times 5$; c. Hectocotylus of No. 8126/1: $\times 5$; d. Penis of No. 8125/1: $\times 1.6$; e. Oviducal gland and oviduct of No. M 8144/1: $\times 1.5$.

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. 22a) 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. 22d) and contains a large spermatophore. The hectocotylus (text-fig. 22b) 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. 22c) is long (11·1 per cent.) and has well developed basal cheeks



TEXT-FIG. 23.—*Berrya hoylei* (Berry). Radula of No. M 8126/1, $\times 58$.

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 22e. 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).

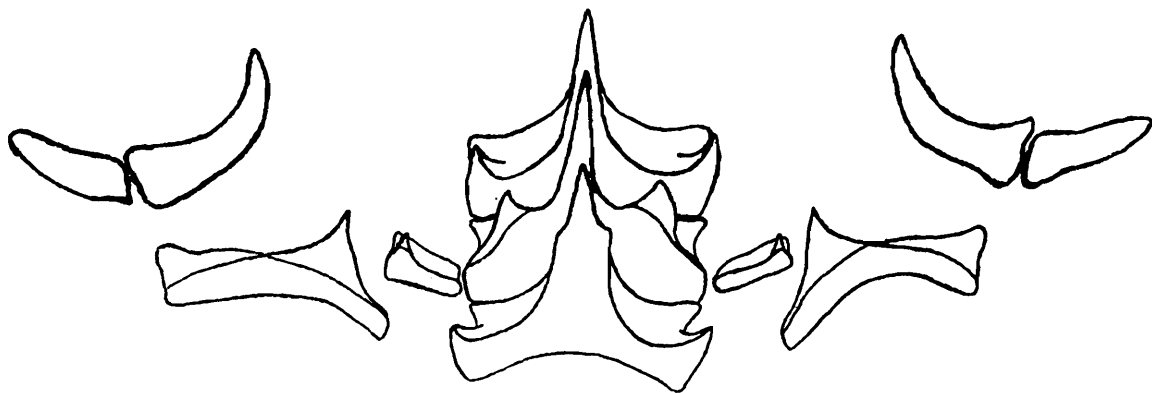
Measurements (in millimetres).

					<i>a</i>	<i>b</i>
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.
<i>Indices :</i>						
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): $\times 100$.

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 difficult 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.

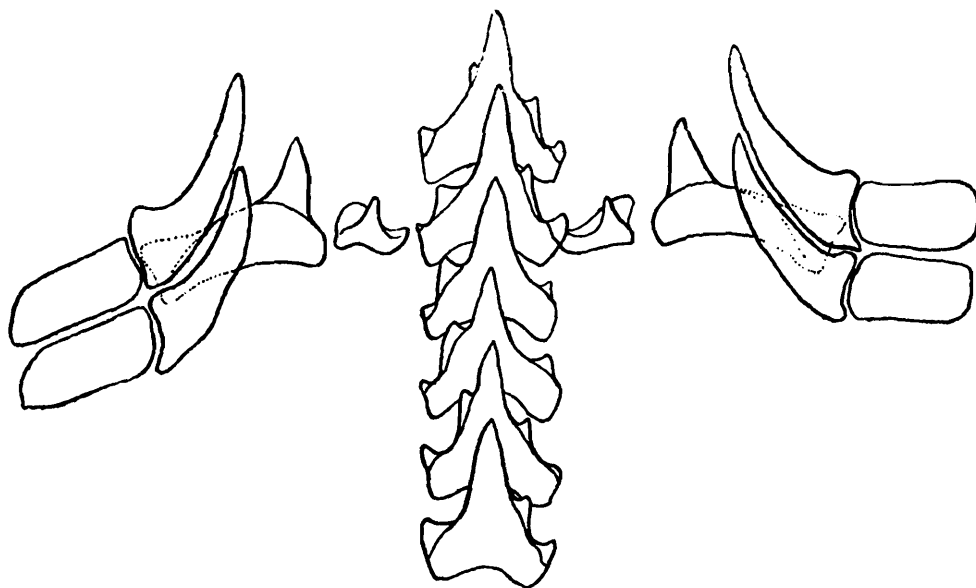
Octopus prashadi shows several abyssal characters, but as the male is not known it is not possible to discuss its exact generic or sub-generic position.

***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): $\times 23$.

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

Octopus sp.

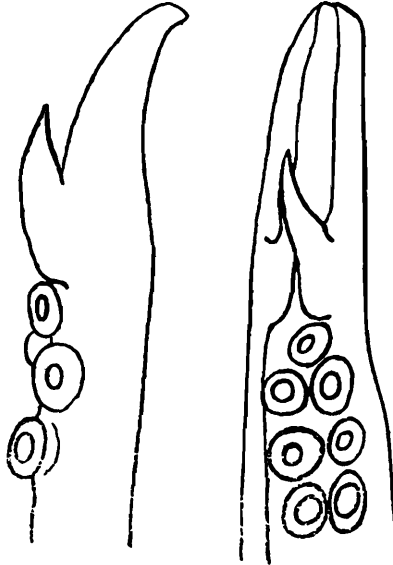
1916. *Octopus hongkongensis*, Massy (non Hoyle) (*pars*), *Rec. Ind. Mus.* XII, p. 197.

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
<i>Indices :</i>					
Width-index	..	..	..	..	75
Interocular-index	..	..	..	..	56
Web-index ..	..	..	..	..	14
Sucker-index	..	..	..	..	8
Hectocotylus-index	..	..	..	..	8.4

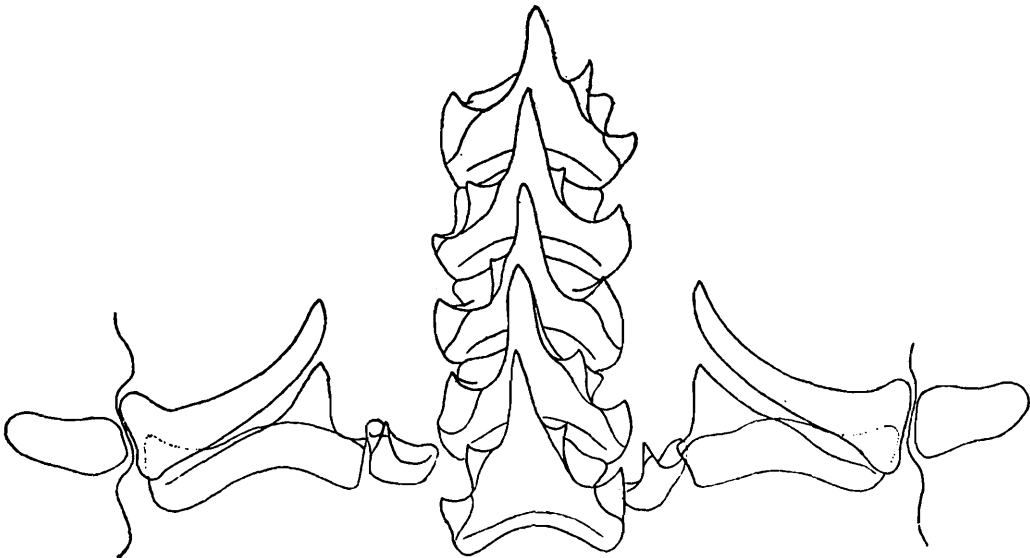
Description.—This male specimen was identified as *Polypus hongkongensis* by Massy, but it certainly does not belong to this species. The body is saccular. The head is much smaller than the mantle. The arms attain about five times the dorsal mantle-length. The hectocotylized arm is very short, about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



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

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): $\times 138$.

(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.

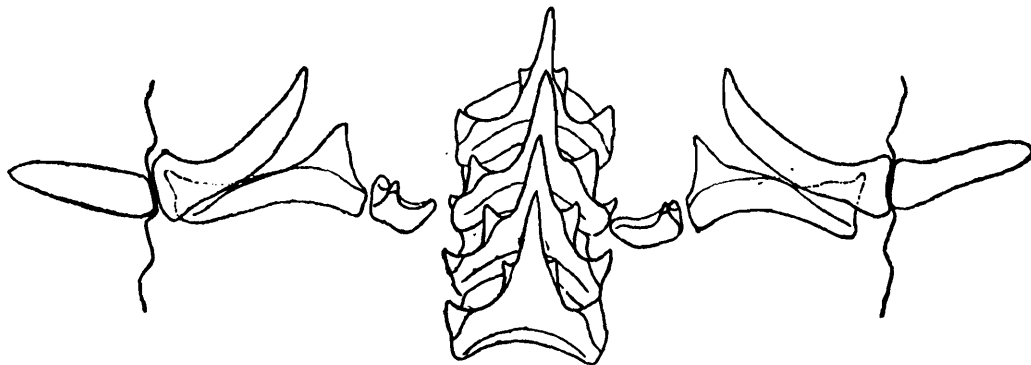
Octopus sp.

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): $\times 73$.

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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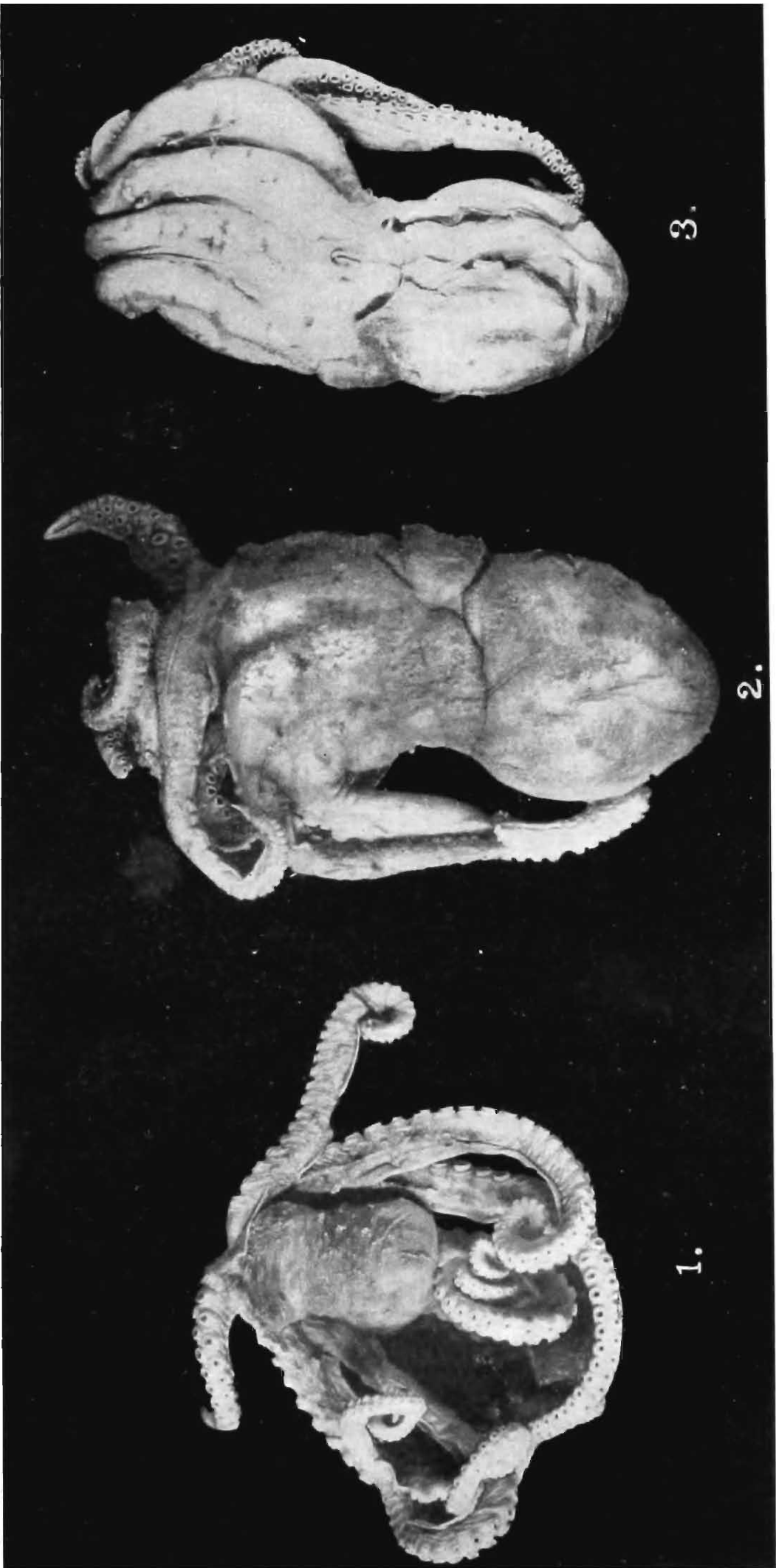
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EXPLANATION OF PLATE I.

FIG. 1.—*Octopus (Octopus) niveus* Lesson, $\times 2$; (No. M 380/1).

FIG. 2.—*Berrya hoylei* (Berry), slightly enlarged; (No. M 8123/1), dorsal view.

FIG. 3.—*Berrya hoylei* (Berry), natural size; (No. M 8123/1), ventral view.



Octopus niveus Lesson, and *Berrya hoylei* (Berry).

EXPLANATION OF PLATE II.

FIG. 1.—*Octopus prashadi*, sp. nov., type-specimen, slightly enlarged ;
(No. M 4768/1).

FIGS. 2 & 3.—*Octopus prashadi*, sp. nov., slightly enlarged ; (No. 361/1),
ventral view.



Octopus prashadi, sp. nov