

UEBER EINIGE ISOPODA AUS SÜD-INDIEN¹.

Von DR. K. W. VERHOEFF, *Pasing bei München.*

(Tafel IV.)

Bereits zweimal hatte ich Gelegenheit mich mit indisch-australischen Isopoden zu beschäftigen, zuerst 1926 in meinen Isopoda terr. von Neu Caledonien und den Loyalty Inseln², und dann 1928 in meinem 39. Isop.-Aufsatz über Formosa³.

In dem Neu-Caledonien Aufsatz habe ich auf S. 323 einen Schlüssel für 9 australische Onisciden-Gattungen gegeben und zwei weitere neue Gattungen dieser Familie brachte die Publication über Formosa.

1931 erschien über Land-Isopoden von den Sunda-Inseln eine Arbeit von W. Herold⁴ in welcher man auf S. 363 ebenfalls einen Schlüssel der Onisciden-Gattungen findet und zwar 5 Gattungen, von welchen drei neue aufgestellt wurden. Schon der Umstand, dass von meinen 11 Onisciden-Gattungen und den 5 Herold's nur eine eizige (*Pseudophiloscia*) gemeinsam ist, zeigt deutlich genug, wie viel Formen hier noch der Entdeckung harren.

ONISCIDAE.

Dekanoscia, gen. nov.

Diese neue Onisciden-Gattung ist sowohl durch die Kiefferfüsse (Tl. iv, Abb. 1 und 2) als auch durch die männlichen Characterere auffallend genug ausgezeichnet (Tl. iv, Abb. 6, 9 und 10).

Durch den Besitz von nur einfachen Zahnstäben an den Aussen ästen der 1. Maxillen (Tl. iv, Abb. 3) nimmt *Dekanoscia* auf meinen Schlüssel der Onisciden-Gattungen S. 323 in der Neu-Caledonien-Arbeit bezogen eine Stelle unter *C* ein, ist aber von *Oroscia* Verh. durch den einfachen Hinterrand des 1.-3. Pereion-Tergites sowie den Mangel einer Stirnleiste leicht zu unterscheiden. Am nächsten steht *Dekanoscia* der Gattung *Pseudophiloscia*, doch sind bei ihr die Pleonepimeren noch stärker ange-drückt und von oben kaum sichtbar, auch scheinen Zähnchen, deren am Innenlappen der Kiefferfüsse aussen bei *Dekanoscia* 4 vorkommen, bei *Pseudophiloscia* zu fehlen. Das 1. und 3. Glied der Antennengeißel sind bei letzterer Gattung ungefähr gleich lang, bei *Dekanoscia* dagegen ist das 1. Geißelglied doppelt so lang wie das 3. Auf die *Pseudophiloscia sundaica* Herold's bezogen, unterscheidet sich *Dekanoscia* ferner durch das hinten an den Seiten eingebuchtete Telson (Tl. iv, Abb. 7) sowie die noch zu besprechenden Merkmale des Männchens.

¹ 56. Isopoden-Aufsatz.

² Sarasin u. Roux. *Nova Caledonia*, IV, Zoologio (München, 1926).

³ *Mitteil. Zool. Mus. Berlin*, XIV, Ht. 2, S. 201-226.

⁴ *Archiv Hydrobiol. Suppl.* Bd. IX, S. 306-393.

Dekanoscia longicornis, sp. nov.

♂ 8 mm. lang. Chokoladenbraun, mit grauweisslichen Flecken gesprenkelt, deren grösste sich an der Basis der Pereiontergite befinden, während die Hinterzipfel der 5.-7. Epimeren orangegeb.

Antennen recht lang, die Geissel so lang wie das 5. Glied das 4. doppelt so lang wie das 3. das 5., etwa $1\frac{3}{5}$ mal länger als das 4. Das 1. Geisselglied $2\frac{1}{2}$ mal länger als das 3., das 2. Glied $1\frac{2}{3}$ mal länger als das 3.

Ocellen in ziemlich grossen, stark pigmentirten Haufen, daher schwer unterscheidbar, die Cornealinsen flach.

Linke Mandibel am Ende 3 zahnig, der braune Vorzahn breit, am Ende eingebuchtet, vor ihm ein glasiger gefaseter Buckel und vor diesem eine gefiederte Krummborste. Rechte Mandibel auch 3 zahnig, der Vorzahn glasig, nach innen in spitzen Zapfen ausgezogen, vor ihm ein gefaseter Knoten, auf dem eine nach endwärts verbreiterte, in Faserkamm zerschlitzte Borste. Vor dem Knoten zwei gewimperte Faser-Krummborsten, die proximale bedeutend grösser als die andere.

Aussenäste der 1. Maxillen mit 6+3 Zahnstäben (Tl. iv, Abb. 3) von den innern und äussern je einer viel kürzer als die anderen, alle ohne Nebenzähnen. Von den zwei Endzapfen der Innenäste (Tl. iv, Abb. 4) welche sehr dicht behaart, ist der innere schlanker und gebogen, der äussere dicker und gerade.

2. Maxillen (Tl. iv, Abb. 5) mit einem schrägen Endlappen, welcher dicht mit dünnen Sinneshaaren besetzt.

Die Innenlappen der Kiefferfüsse (Tl. iv, Abb. 1 und 2) tragen innen ein kleines behaartes *Zäpfchen* und ragen ausserdem neben diesem noch *eckig* vor, während sie aussen mit vier Zähnen bewehrt sind. Die Endwölbung des Endlappens ist äusserst fein behaart und diese Härchen stehen in feinen, queren Bogenlinien. Die Taster sind dreigliedrig, indem sie ausserdem gewöhnlichen Grundgliede in ein längliches Mittelglied und ein viel schmäleres und halb so langes Endglied zerfallen. Beide tragen am Ende ein Haarbüschel, das Mittelglied ausserdem innen vor dem Ende auf Vorsprung noch 2 Haare. Kopf ohne Stirnleiste.

Rücken weder mit Wärrchenstruktur noch mit Schuppen, nur an den Rändern der Epimeren (Tl. iv, Abb. 8) sah ich sehr blasse Schüppchen vorragen. Hinterecken des 1.-4. Pereiontergit abgerundet, Hinterränder quer streichend. Eine zerstreute Beborstung findet sich mehr oder minder am ganzen Rücken, wenn sie auch nicht überall auffällt, da sie leicht abgestossen wird. An den Telsonrändern der Hinterhälfte des Tergit ragen z. B. jederseits 7 ziemlich lange Borsten heraus. Der dreieckige Vorsprung des Telsons hinten (Tl. iv, Abb. 7) bildet eine fast rechtwinkelige Ecke und seine Seiten sind deutlich eingebuchtet. Im ganzen ist das Pleon deutlicher beborstet als das Pereion. Die Epimeren des Pleon sind so klein und so stark angedrückt an die Seiten dass sie von oben her fast unsichtbar sind. Der glänzende Rücken des Pereion ist weitläufig zerstreut punktiert.

Epimerendrüsensporen sind schwer erkennbar. Wenige hinter einander (Tl. iv, Abb. 8) beobachtete ich nur hinter den Vorderecken des 1. und 2. Pereiontergites.

1. Beinpaar mit Putzapparat, der aus längeren Kämmchen am Carpopodit und einer kurzen Wimperbürste am Propodit besteht, hinter der letztern 5 Stacheln, Carpopodit vor dem Kämmchen mit 6, von welchen der terminale viel länger als die übrigen.

2. Beinpaar am Carpopodit mit 6, am Propodit mit 8 Stacheln.

7. Beinpaar des ♂ am Basopodit unten eingebuchtet, am Ende unten gegen die Basis des Ischipodit mit Lappen (Tl. iv, Abb. 6) vorragend, der eine gebogene Spitzchenreihe trägt, vor welcher ein Stachel absteht, Meropodit unten leicht eingebuchtet, Carpopodit am Endrand mit dichter Stäbchensäge.

1. Pleopoden-Endopodite des ♂ (Tl. iv, Abb. 9) vor der Mitte stark eingeschnürt, hinten einfach und spitz auslaufend. Die quer ovalen 1. Exopodite (Tl. iv, Abb. 10) besitzen eine ungewöhnliche Auszeichnung insofern, als die abgerundeten Fortsatzlappen, in welche sie nach hinten vorragen, etwas unregelmässig gerunzelt sind. Die 2. Pleopoden-Endopodite des ♂ sind ausserordentlich lang und in einen haarfeinen, langen Faden ausgezogen. Die übrigen Exopodite bieten nichts Besonderes.

Im Habitus erinnert *Dekanoscia* an die Heroldien, aber sie unterscheidet sich von diesen leicht:

1. durch die Zahl und die Einfachheit der Zahnstäbchen der 1. Maxillen,
2. durch die Innenlappen der Kieferfüsse, die bei *Heroldia* keine Zähnen besitzen, überhaupt einfacher gebaut sind, (anscheinend sind auch die Taster bei *Dekanoscia* schlanker gestaltet),
3. durch die männlichen Auszeichnungen.

Vorkommen.—Diese und die beiden folgenden Arten verdanke ich Herrn S. Jones (Madras) und zwar erbeutete er das einzige ♂ dieser Form in 3500 Fuss Höhe auf den Ponmudi Hills (Travancore) im Südwesten Vorderindiens.

Nagara B. L.

Auf die nahen Beziehungen von *Nagara B. L.* und *Protracheoniscus* Verh. habe ich bereits in meinen Isopoden Neu-Caledoniens hingewiesen. Im Ganzen ist die Gattung *Nagara* ziemlich arm an diagnostischen Merkmalen, aber es scheint auch als wenn ein Teil derselben bisher noch nicht gebührend verwertet wäre, so z. B. die Struktur der Tergite. Die Stellung der vorliegenden neuen Art ergibt sich am deutlichsten aus dem folgenden Schlüssel:

- A. Hinterrand des 1.-7. Pereiontergit eingebuchtet Untergattung *Nagaroides* Wahr.
(Mehrere Arten bei Wahrberg und Herold).
- B. Hinterrand des 1.-2. Pereiontergit einfach gerundet Untergattung *Nagara* B. L.

Untergattung *Nagara* B. L. (s. str.)

- I. Die Stirnleiste ist in der Mitte durch eine Kerbe oder einen Spalt in zwei Hälften geteilt (Es sind nur ♀ bekannt.)

- A. Die Stirn ist in der Mitte eingekerbt. Der Hinterrand des 1. Pereiontergit bildet einen flachen, stumpfen Winkel

1. *N. modesta* Dollé.

B. Die Stirn ist in der Mitte tief eingeschnitten.
Der Hinterrand des 1. Tergit völlig abgerundet

2. *N. incisa* Verh.

II. Die Stirnleiste (soweit sie nicht undeutlich ist) erfährt in der Mitte keine Unterbrechung.

A. Die Stirn ist aufgebläht und gebogen, besitzt aber keine eigentliche Leiste.

a. Die 1. Pleopoden-Exopodite des ♂ sind breiter als lang, hinten innen breit abgerundet, aber in keinen Zipfel nach hinten ausgezogen. 3. Tergit hinten einfach abgerundet

3. *N. insularum* Verh.

b. Die 1. Pleopoden-Exopodite des ♂ sind länger als breit, hinten innen sehr abgeschragt und am Hinterrande in einen dreieckigen Zipfel ausgezogen, der vorwiegend gerade Rande des Trachealfeldes ist fein gezähnt, des Trachealfeld läuft hinten schmal aus. 3. Tergit hinten gerade streichend

4. *N. teretifrons* Her.

B. Die Stirn besitzt eine deutliche, gebogene Leiste, welche jedoch die Seitenlappen nicht verbindet, sondern jederseits oberhalb derselben endet

a. Hinterecken des 3. Pereiontergit treten eckig, zahnartig nach hinten vor. Die 1. Pleopoden-Exopodite des ♂ ähneln zwar im Ganzen denen von *N. teretifrons* (Abb. 12) aber das Trachealfeld ist viel breiter, sein Rand stark gebogen und ganz glatt

5. *N. travancoria*, sp. nov.

b. Hinterecken des 3. Tergit rechtwinkelig. Die 1. Pleopoden-Exopodite sind kurz quer-oval und überall völlig abgerundet, besitzen also keine Spur eines vorragenden Zipfels

6. *N. formosana* Verh.

Nagara (Nagara) travancoria, sp. nov.

♂ 4½-5 mm. ♀ 4½-6 mm. lang. Einfarbig hellbraun, Körper hoch gewölbt, am den Seiten unter etwa 45° abgedacht. Rücken reichlich beschuppt, zwischen den Schuppen mit Massen von feinen, runden bis ovalen Würzchen. Drüsenporen habe ich nicht bemerkt.

Seitenlappen des Kopfes vorn gebogen, aussen fast gerade abgeschnitten. Ocellen in rundlichen Häuflein. Höckerung des Kopfes grob in vier ziemlich regelmässigen Reihen angeordnet, in der 1. Reihe 6 kräftige Querwülste, von welchen die beiden paramedianen gegen die andern weiter zurückstehen, in der 4. Reihe jederseits 5-6 quer ovale Höcker. Diese 4. Reihe ein gut Stück vor dem Hinterrand.

Auch das 1. Tergit mit kräftiger Höckerung, die aber verworren zerstreut und nur hinten eine regelmässige Querreihe bildet, vom Hinterrand noch weiter entfernt wie die des Kopfes. Vom 2. Tergit an nimmt die Stärke der Höckerung nach hinten schnell ab, am 2. Tergit vor der Mitte eine kräftige Querreihe, vor dieser aber nur noch schwache Knötchen. 3. und 4. Tergit nur mit einer Querreihe, am 3. noch kräftig, am 4. fein. 5.-7. Tergit nur noch mit feinen Knötchen, die unregelmässig zerstreut sind. Die Epimeren bleiben fast ganz frei von Höckern und Knötchen. Pleon ganz ohne Körnelung. Rücken matt.

Hinterecke des 1. Tergit abgerundet, des 2. stumpfwinkelig, vom 3. an ragt eine Zahnecke nach hinten vor und zugleich treten die Epimeren immer stärker nach hinten vor. Telson hinten abgerundet und fast rechtwinkelig, die Seiten kräftig eingebuchtet. Der Hinterrand der Uropoden-Propodite ragt etwas über das Telson hinaus, die hintersten Epimeren ragen fast so weit heraus wie das Telson-Hinterende.

2. Geisselglied der Antennen 3 mal länger als das 1., die Schaftglieder mit dichter Schuppenstruktur. 1. Maxillen-Aussenäste mit 4+5 Zahnstäbchen, von den 4 äusseren eines und den 5 innern 3 beträchtlich verkürzt. Kieferfüsse am Innenlappen innen eckig, nur mit einer starken Borste, am Endrand mit 3 sehr zarten, dreieckigen schuppenartigen Vorsprüngen, 1 innen, 2 aussen.

Beine unten am Mero- und Carpopodit reichlich mit langen Stachelborsten besetzt. Uropoden-Propodite am Ende aussen etwas fortsatzartig ausgezogen, die Exopodite länger als die Propodite, die Endopodite nicht bis zur Mitte der Exopodite reichend.

1. Pleopoden-Endopodite des ♂ fast gerade nach hinten gerichtet, in einfache Spitze auslaufend. Die 1. Exopodite des ♂ (Tl. iv, Abb. 12) wurden schon oben im Schlüssel besprochen, ihr Trachealfeld ist verhältnissmässig gross. An allen 5 Exopoditen zeigen sich zahlreiche porenartige Gebilde verschiedener Grösse in den Trachealfeldern, die an den 5. Exopoditen am kleinsten sind (Tl. iv, Abb. 13). Am 7. Beinpaar des ♂ (Tl. iv, Abb. 11) ist das Ischiopodit (*Isch.*) unten schwach eingebuchtet, das Meropodit (*Me.*) springt unter beiden terminalen Stacheln etwas eckig vor und ist oben gegen die Basis eingeschnürt. 2. Endopodite in sehr feine schlanke Spiesse auslaufend, 2. Exopodite hinten weit eingebuchtet mit 3 kurzen Borsten.

Vorkommen.—Wurde von Herrn S. Jones in Anzahl bei Kovalam (Travancore) erbeutet, nicht weit von der Küste, 7 Meilen von Trivandrum südlich, im äussersten Südwesten von Dekan.

ARMADILLIDAE.

Nesodillo jonesii, sp. nov.

Die Gattung *Nesodillo* gehört zu den in indisch-australischen Ländern weit verbreiteten, wie man auch aus den schon erwähnten Aufsätzen von mir und Herold ersehen kann. In meiner Arbeit über Neu-Caledonien führt uns *N. jonesii* auf die 8. Art *medius* Verh. (im *Nesodillo*-Schlüssel S. 277). Aber dieser *medius* hat "feine Querzüge von Körnchen in den Seiten des Rückens der Pereiontergite", von welchen bei *jonesii* nur eine Andeutung zu sehen ist, ferner ist der Innenlappen der 2. Epimeren "mit dem Epimerenrand hufeisenförmig verbunden", hier aber entschieden von ihm *abgerückt*, wie man aus Abb. 14 ersieht, daher liegt auch der Innenrand des Innenlappens der 2. Epimeren nicht mit diesen "fast in derselben Höhe", sondern bleibt *weit* dahinter zurück.

Von dem weit verbreiteten *murinus* B. L. ist *jonesii* schon durch die Rückensculptur leicht zu unterscheiden, indem der Autor sagt: "*trunci annuli utrimque manifesto tuberculati*", auch wird das Telson des

murinus als doppelt so breit wie lang beschrieben, während es bei *jonesii* nur $1\frac{1}{2}$ mal breiter als lang. Am nächsten steht die neue Art unter den bekannten dem *schellenbergi* Verh. von Formosa, aber die Wülste des Scheitels, welche bei diesem 2 quere Dreiecke andeuten, sind bei *jonesii* bis auf schwache Spuren verschwunden, auch von den seitlichen "Gruppen von Längswülsten" des Pereion sind hier Andeutungen zu sehen. Der auffallendste Unterschied besteht darin, dass der Hinter- rand des 1. und 2. Pereiontergites bei *schellenbergi* stumpfwinkelig eingebuchtet ist, bei *jonesii* dagegen nur im *Bogen*. Die Innenlappen der Epimeren stimmen bei beiden fast überein, doch sind sie bei *schellenbergi* vom Epimerenrande noch etwas weiter abgerückt. An den Uropoden sind die Exopodite bei *schellenbergi* etwas länger als der Abstan bis zum Endrand des Propodite, bei *jonesii* (Tl. iv, Abb. 16) dagegen deutlich *kürzer*.

An den Pleopoden-Exopoditen des ♂ (Tl. iv, Abb. 15) fehlt "aussen am Rande in der Mitte die tiefe, grubige Einsenkung", vielmehr streicht der Aussenrand beinahe gerade.

In uebrigen stimmen *schellenbergi* und *jonesii* so weitgehend mit einander überein, dass ich auf die Beschreibung und Abbildungen des erstern verweisen muss (*Mitteil. Zool. Mus. Berlin*, 1928, XIV, Ht. 2, S. 212).

Vorkommen.—♂ 8 mm. ♀ (grösstes) $12\frac{1}{2}$ mm. lang mit Marsupium. Lebt zusammen mit *Nagara travancorica* bei Kovalam im südwestlichsten Indien.

ERKLÄRUNG DER TAFEL IV

Dekanoscia longicornis, gen. et sp. nov.

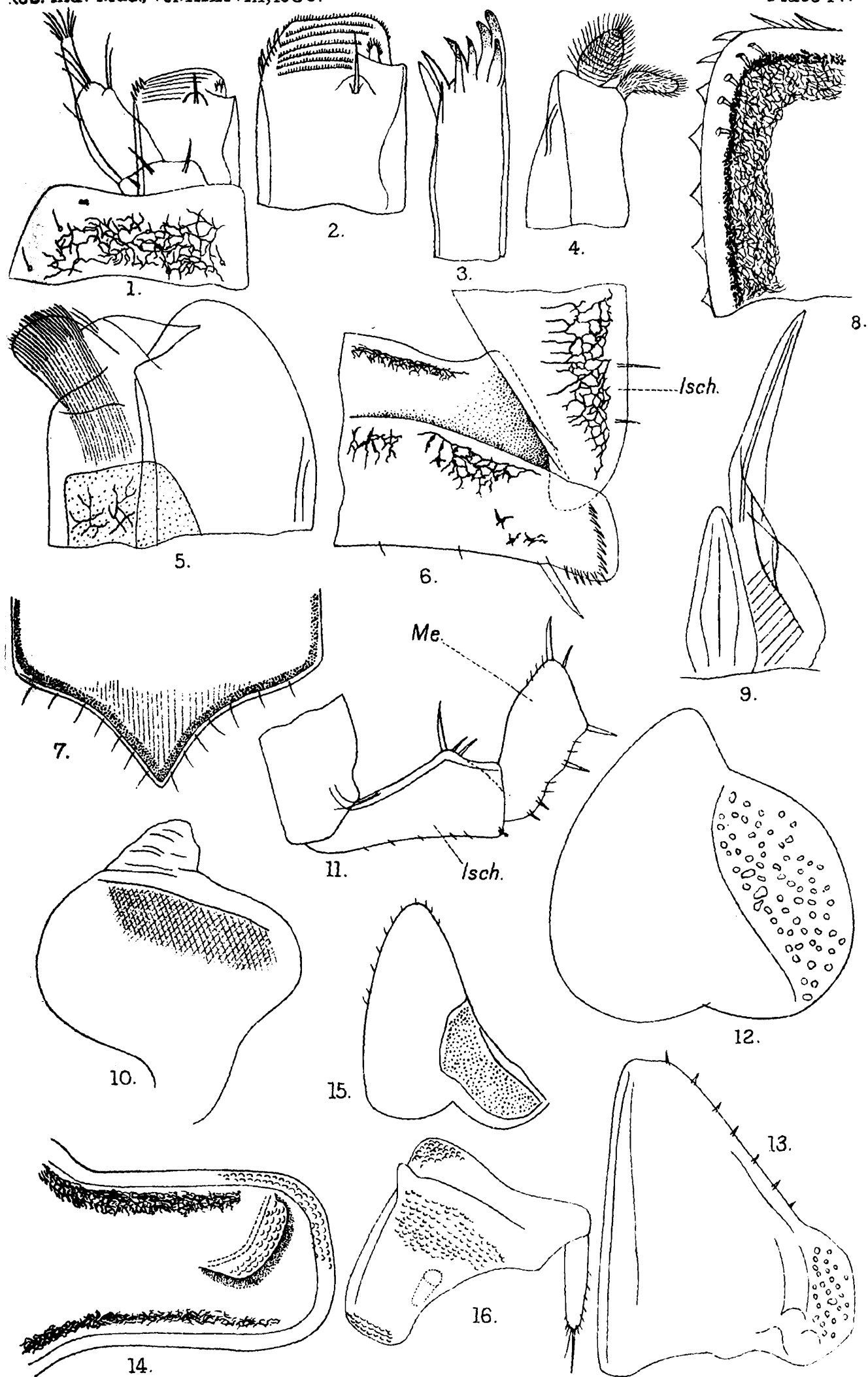
- Abb. 1.—Endteile eines Kieferfusses, Ansicht von unten. $\times 125$.
Abb. 2.—Innenlappen eines Kieferfusses. $\times 220$.
Abb. 3.—Endhälfte eines Aussenastes der 1. Maxillen. $\times 125$.
Abb. 4.—Endteile eines Innenastes der 1. Maxillen. $\times 220$.
Abb. 5.—Endteile einer 2. Maxille. $\times 220$.
Abb. 6.—Endgebiet des Basopodit und Grundgebiet des Ischiopodit (*Isch.*) aus dem 7. Beinpaar des ♂. $\times 125$.
Abb. 7.—Telsonspitze von oben gesehen. $\times 56$.
Abb. 8.—Stück an der Vorderecke der linken Epimere des 1. Pereiontergit mit 5 Drüsenporen, Ansicht von oben. $\times 220$.
Abb. 9.—Penis und rechtes 1. Pleopoden-Endopodit des ♂. $\times 56$.
Abb. 10.—Ein 1. Pleopoden-Exopodit des ♂. $\times 56$.

Nagara travancoria, sp. nov.

- Abb. 11.—Ischio—(*Isch.*) und Meropodit (*Me*) aus dem 7. Beinpaar des ♂ in Seitenansicht. $\times 56$.
Abb. 12.—Rechtes 1. Pleopoden-Exopodit des ♂. $\times 125$.
Abb. 13.—Rechtes 5. Pleopoden-Exopodit des ♂. $\times 125$.

Nesodillo jonesii, sp. nov.

- Abb. 14.—Epimere des 2. Pereionsegmentes von unten gesehen. $\times 56$.
Abb. 15.—Rechtes 1. Pleopoden-Exopodit des ♂. $\times 56$.
Abb. 16.—Rechter Uropod, Ansicht von unten. $\times 56$.



UEBER EINIGE INDISCHE CHILOGNATHEN GESAMMELT VON
HERRN S. JONES, MADRAS.¹

Von DR. K. W. VERHOEFF, *Pasing bei München.*

(Tafel V-VIII.)

HARPAGOPHORIDAE.

Organognathus, gen. nov.

Die beiden Familien Spirostreptidae und Harpagophoridae kommen zwar in der aethiopischen Region vor, aber in der Hauptsache schliessen sie sich doch geographisch aus, indem die ersteren hauptsächlich in Africa und America, die letzteren aber in den indisch-australischen Gebieten vertreten sind. Da die hier zu besprechende neue Gattung einen sehr starken Telsonfortsatz besitzt und am Ende der Gonopoden einen breiten Lappen mit Borstenkamm, da sie ferner aus Südindien stammt, so besitzt sie die drei hervorragendsten Eigenschaften der Harpagophoridae, ohne dass ich damit erklären will, dass sich für die Unterscheidung beider Familien nicht noch eine bessere Basis finden liesse. Dass dieselbe nämlich nicht sehr kräftig begründet ist, geht schon daraus hervor, dass der geographische Gegensatz in Africa überbrückt wird, dass die Gatt. *Anurostreptus* keinen Telsonfortsatz besitzt, obwohl sie nach den Gonopoden zu den Harpagophoriden gestellt wird und dass ein Merkmal wie der Borstenkamm des Tarsus zu fein ist, um sehr stark bewertet werden zu können, indem solche Merkmale, besonders bei kleineren Arten, in deren Körperbau das Sparsamkeitsprinzip zur Geltung kommt, leicht der Verwischung verfallen, was ja auch bekanntlich bei der Gatt. *Stenurostreptus* Carl verwirklicht ist. Somit sind alle die drei genannten Hauptmerkmale der Harpagophoriden durch Ausnahmen abgeschwächt und wir kennen kein einziges, welches ganz und gar durchgreifend wäre.

Was die Definitionen der Harpagophoriden-Gattungen betrifft, so stehen auch diese meist auf schwachen Füßen und es ist notwendig hier auf diese Gattungen einzugehen um die Berechtigung der neuen Gattung zu begründen. Ganz besonders übel steht es gerade mit der bei weiten artenreichsten Gattung, nämlich *Thyropygus*, als deren sehr vager Charakter die stark in die Quere gezogenen Stigmen genannt werden. Kürzlich hat sich Attems in seinen "Myriapoden von Java, Sumatra und Bali"² auf S. 157 durch einen Schlüssel der *Thyropygus*-Arten verdient gemacht, den ich besonders deshalb erwähne, weil sich nach ihm *Organognathus* leicht von allen *Thyropygus*-Arten unterscheiden lässt. Nach Attems sind nämlich die Prozonite nur bei *Th. amphelictus* Chamb. glatt, bei allen andern Arten dagegen mit einem "Netzwerk von punktierten Furchen" versehen, während sie bei *Organognathus* vorn und in der Mitte parallele, quere Linien besitzen, nur hinten feine Punkte oder Striche, während ein "Netzwerk" gänzlich

¹ 144. Diplopoden-Aufsatz.

² *Archiv f. Hydrobiol.* Suppl. Bd. VIII, S. 115-192 (1931).

fehlt. Es muss auch darauf hingewiesen werden, dass Attems einige Arten, welche "am Knie des Gonopodenpraefemur keinen Dorn" besitzen von den meisten andern unterscheidet, denen "am Knie des Gonopodenfemur 1 oder 2 Dornen" zukommen. Dieser Gegensatz wird hier also für Arten innerhalb *Thyropygus* gemacht, während sonst ausserhalb *Thyropygus* mit demselben Gegensatze Gattungen unterschieden werden, ein erstaunlicher Widerspruch.

Was nun die übrigen Gattungen betrifft, so ist *Organognathus* von *Ktenostreptus* leicht durch den glatten Rücken der Metazonite zu unterscheiden, von *Drepanopus* durch bezahntes Labrum und sehr abweichenden Telsonfortsatz, von *Stenurostreptus* durch den Spitzenkamm am Ende der Gonopoden (Tl. v, Abb. 3 und 5) von *Phyllogonostreptus* durch sehr viel grösseren Telsonfortsatz, viel stärker gewulstete Ränder der Analklappen, aber auch durch die Gonopoden, doch ist deren Beschreibung durch Carl¹ viel zu ungenau, um einen zuverlässigen Vergleich zu ermöglichen, Seine Fig. 4 zeigt an den Coxiten der Gonopoden einen grossen, stiefelförmigen mit "ap" bezeichneten Fortsatz, welcher offenbar dem Teil *ab* meiner Abb. 1 (Tl. v) homolog ist, aber sehr abweichend gestaltet, seine Fig. 5 giebt vom Tibiotarsus kein ausreichendes Bild, auch bleibt man hinsichtlich des Gonocöls ganz im Dunkeln.

Vor der grossen Schleife des Gonopoden—Resttelopodits kommen bei *Harpagophora* zwei Dornen vor, während sie bei *Organognathus* fehlen, ferner ist der Telsonfortsatz bei der ersteren Gattung nach oben, bei der letzteren nach unten gebogen. Uebrigens sind die Abbildungen, welche Attems z. B. in seinen Myriapoden Südafrikas 1929 von den Gonopoden lieferte, nicht ausreichend, um sich ein klares Bild von denselben zu machen, was doch unbedingt notwendig ist, wenn in den Beschreibungen fast allein von ihnen die Rede ist.

Unter den letzten noch nicht erwähnten Gattungen ist *Anurostreptus* durch Fehlen des Telsonfortsatzes, *Eremobolus* durch Depression desselben leicht von *Organognathus* zu unterscheiden, *Rhynchoproctus* durch Auftreten von Polstern der männlichen Beinpaare nur an der Tibia, während sie bei *Poratophilus* und *Organognathus* an Postfemur und Tibia vorkommen (Tl. vi, Abb. 7, *Prf* und *Ti*). Was nun diese letzte, aethiopische Gattung *Poratophilus* betrifft, welche Attems in seinen Myriapoden Südafrikas besonders durch Taf. XIV erläutert hat, so sind ihre Gonopoden—Telopodite durch einen langen spitzen Fortsatz ausgezeichnet, welchen Attems als femoralen Dorn ("femoralspine") bezeichnet hat und der bei *Organognathus* fehlt. Der Tibiotarsus zeigt dagegen eine gewisse Aehnlichkeit, wenigstens sind die vom mir als *Tibia* und *Tarsus* unterschiedenen Aeste (Tl. v, Abb. 3-5) in beiden Gattungen deutlich unterscheidbar. Attems (und nach ihm Carl) hat die Tibia als "Dornast" von dem Tarsus als "Kammblatt" unterschieden und einen Fortsatz des letzteren "Hakenblatt" genannt. Statt dieses Hakenanhangs besitzt der Tarsus neben den Kammteil bei *Organognathus* einen starken Stachelfortsatz, (Tl. v, Abb. 5) während der Tibialteil (Tl. v, Abb. 4) viel komplicirter gebaut ist, Der Telsonfortsatz scheint bei *Poratophilus* meist nach oben gebogen zu sein.

¹ "Miscellanea Diplopodologica"—*Revue Suisse de Zoologie*, Bd. XXVI, N. 13, S. 426 (1918).

Organognathus multidentatus, sp. nov.

♂ 60 mm. mit 58 Rumpfringen, ♀ 68 mm. mit 64 R.

Körper braun, Rückenmitte mit einem bald mehr bald weniger deutlichen, hellen, Längsstreifen, der an jedem Ring in 2 Fleckchen abgesetzt sein kann. *Antennen* mit 4 Sinneskegeln, ganz in das 2. Glied eingesenkt, 5. und 6. Glied oben mit einer Gruppe kleiner Sinnestäbchen im erweiterten Endrand. 6. Glied weinglasförmig, am Ende mehr als $1\frac{1}{2}$ mal breiter wie am Grunde. 5. Glied keulig, am Ende doppelt so breit wie am Grunde, am Endrand oben stark erweitert, unten schräg abgeschnitten, 5. Glied oben und unten fast gerade, 7. Glied in das 6. teilweise eingesenkt, der vorragende Teil 3 mal breiter als lang.

Labrum mit 6 Grübchen und drei Zähnen.

Ocellen convex, von unten nach oben in 7 gebogenen Reihen.

Die Gestalt der Taster ersieht man aus Abb. 6 (Tl. vi), an den flach endenden Innentastern sind nur äusserst schwache Sinnesstäbchen zu erkennen. Eine Besonderheit betrifft das Vordergebiet der Stämme des Gnathochilariums, indem sich beim ♂ hinter den Aussentastern (*At*) ein kurzer, dicker *Zapfen* (*O*) mit nach vorn gerichteter Spitze zeigt, der in einer ovalen Grube sitzt. Das ♀ besitzt an derselben Stelle nur eine einfache Borste. Collum mit breit abgerundeten, *vorn vorragenden Seitenlappen*, welche wulstig verdickt und oben, innen im Bogen grubig ausgehöhlt. Poren der Wehrdrüsen *weit hinter* der Naht gelegen, vom Hinterrand doppelt so weit wie von der Naht entfernt, also Verhältnis 1 : 2.

Hier und da sieht man in der Umgebung der Poren eine schwarze lackartige Masse als eingetrocknetes Secret.

Die Furchung der Metazonite ist ziemlich weitläufig und nur *unterhalb* der Poren ausgebildet. Die Nähte sind überall tiefeingegraben. Metazonite oberhalb der Poren mit feiner Punktirung und hier und da auch mit sehr feinen, abgekürzten Längsstricheln.

Die parallele, quere Streifung der Prozonite wurde schon oben erwähnt. Sehr auffallend gestaltet ist der grosse, hornartige *Telsonfortsatz*, welcher so stark herabgebogen, dass er im Profil etwa bis in die Richtung der Mitte der Analklappen reicht, er endet spitz. Am Rücken des Präanalsegmentes bildet der Fortsatz noch vor der Mitte des Rückens beginnend eine hohe, wulstige, abgerundete *Rippe*. Der Fortsatz ist also *nicht dachig*, sondern er hat einen *runden Querschnitt*. Er liegt ferner nicht dicht über den Analklappen, sondern zwischen ihm und jenen befindet sich ein *Abstand*, fast so breit wie der Durchmesser des Fortsatzes. Dieser selbst ist glänzend, das Präanalsegment sonst matt fein punktirt und gerunzelt. Analklappen mit wulstigem Endrand, vor ihm mit breiter, deutlich gerunzelter Querrinne.

Ueber die vorderen Beinpaare beider Geschlechter ist bei den Spirostreptoidea ganz allgemein so wenig bekannt, dass ich etwas näher auf dieselben eingehen will.

Vom 1. Beinpaar des ♀ schreibt Attems auf S. 20 seiner Monographie¹ wie folgt: "Beim ♀ ist das Praefemur ("Trochanter") innig mit der

¹ *Zoologica*, XXV, S. 20 (1914).

Hüfte verbunden und bildet mit ihr zusammen einen Kegelstumpf. Es macht den Eindruck, als ob sich ein Verschmelzen dieser beiden Glieder vorbereite." Diese Auffassung wird durch meine Beobachtung widerlegt, denn einerseits giebt es zwischen Coxa und Praefemur gut entwickelte Gelenkknöpfe und andererseits treten Muskeln auf, welche durch die Grenze zwischen diesen beiden Gliedern ebenfalls begrenzt werden.

Das 2. Beinpaar des ♀ (Tl. vi, Abb. 9) weicht bedeutend ab von dem der *Xystopyge lineata*, für welche Attems a.a. 0, auf S. 21 seine Abb. 29 gegeben hat. Hinsichtlich des Sternit lässt uns dieselbe ganz im Unklaren.

Bei *Organognathus* (Tl. vi, Abb. 9) sind die Hüften am 2. B. ♀ zwar in der Mediane durch Naht deutlich geschieden, hängen aber doch fest zusammen. Sie zerfallen auffallend genug in zwei Abschnitte, die aussen durch einen tiefen, fast rechten Winkel gegen einander abgesetzt sind. Die terminalen und schmalen Abschnitte sind *Telopoditträger*, während die basalen 3-4 mal breiteren Abschnitte die Verbindung mit dem Rumpf herstellen. Hierbei ist das Sternit anscheinend in zwei Abschnitte auseinandergedrängt worden, nämlich einen kleinen vorderen (*Vv*) welcher einen die Stützen verbindenden *Querbalken* herstellt und einen grösseren hinteren (*Vh*) den ich nur deshalb als sternal betrachte weil sich zwischen ihm und dem Hüften eine *Quernaht* (*x*) zeigt, die nach aussen übrigens verschwindet. Mit dem 3. Beinpaar des ♀ beginnen die einheitlichen, stigmenführenden Sternite. Die Hüften des 3. sind lang, schlank, kantig.

Ein besonderes Interesse bietet das 1. Beinpaar des ♂ und sein Sternit (Tl. vi, Abb. 10 und 11). Von ihm schrieb Attems auf S. 20 seiner Monographie wie folgt:

"Am 1. B. tritt immer eine mehr oder minder vollständige Verwachsung von Sternit und Hüften ein. Das Sternit ist im Vergleich mit den enorm vergrösserten Hüften sehr klein. Es legt sich an den oralen Rand der Hüften an und verwachst fast immer in der Mediane mit den hier verschmolzenen beiden Hüften. Lateral ist oft noch die Naht zwischen Sternit und Hüften sichtbar. In dieser Beziehung verhalten sich ♀ und ♂ derselben Art manchmal verschieden. So sieht man z. B. beim ♂ von *Xystopyge lineata* nichts mehr von einer Naht zwischen Sternit und Hüften, beim ♀ dagegen ist sie wenigstens teilweise sichtbar.

Beide Hüften sind median zum grossen Teil verwachsen, doch bleibt distal noch ein Schlitz übrig; sehr kurz z. B. bei *Xystopyge lineata*. Die Tracheentaschen setzen sich an den unteren, oralen Rand der Hüften an, ohne mit ihnen zu verwachsen.

Das Präfemur ("Trochanter") hat beim ♂ auf der Oralseite einen grossen, breitlappigen, quer abstehenden oder basal gerichteten Fortsatz mit teilweise schuppiger Oberfläche."

Diese Mitteilungen welche ich grosstenteils bestätigen kann, bedürfen noch einer beträchtlichen Ergänzung. Bei *Organognathus* ♂ besitzt das 1. Beinpaarsegment auch ein ausgesprochenes *Coxosternum*, aber obwohl die Grenze zwischen beiden Gebilden fast ganz erloschen ist, lässt sie sich doch noch deutlich feststellen. In der Mediane werden beide verwachsenen Hüften durch Naht und Einschnürung getrennt.

Wo aber basal diese Naht aufhört (*x*, Abb. 10 und 11, Tl. vi) liegt das morphologische, terminale Ende des Sternit. Die Praefemora sind vorn (Tl. vi, Abb. 10) tief in die Coxite eingesenkt und diese Einsenkung wird in einigem Abstände von einer gebogenen Linie (*Y*) umgeben, welche hinten auch basal ausgeprägt ist (Tl. vi, Abb. 11) und hier einen Teil der Grenze zwischen Coxit und Sternit bildet. Besonders wichtig für diese Grenze ist aber die Tatsache, dass von ihr aus *Muskeln* ausgehen, welche die Praefemora durchsetzend sich an der Basis der Femora als Flexor und Extensor ansetzen. Vorn ist noch eine feine *Grenzlinie* zwischen Sternit und Coxiten erhalten und ganz aussen steht an ihr jederseits eine Gruppe von 8 Tastborsten. Somit ist die Lage der Grenze zwischen Coxiten und Sternit, trotz ihrer Verwachsung, in ihrer ganzen Länge deutlich festgestellt.

Die am Sternit sitzenden Stützen(*S*) bilden gegen es vorn ein deutliches Gelenk. Was nun die merkwürdig gelegenen *Präfemora* betrifft, so sind sie schräg gestellt, fast eiförmig und *in ihrer Basalhälfte in einen grossen, zurückgebogenen Lappen ausgestülpt*, dessen physiologische Bedeutung bei der Copula offenbar eine ähnliche ist, wie die des Uncus an den Hakenbeinen der Juliden. Vorn bemerkt man ungefähr in der Mitte der Präfemora einen queren, nach aussen verschwindenden Eindruck mit feinen Wälzchen (*A*, Abb. 1, Tl. v) durch welchen der Lappen gegen das übrige Präfemur abgesetzt ist. Die *Einsenkung* der Präfemora in die Coxite und der Abstand des Lappens von der genannten Bogenlinie (*Y*) ist eine *Anpassung* an die Notwendigkeit ihrer verschiedenen Einstellung in sagittaler Richtung, je nachdem die präfemorale Lappen vorragen sollen oder nicht. Auch die freien Enden der Lappen zeigen eine feine Wälzchenstruktur und auch zerstreute Drüsenporen (Tl. vi, Abb. 10).

Systematisch ist das 1. Beinpaar des ♂ durchaus nicht bedeutungslos. Ich will erwähnen, dass z. B. bei *Drepanopus enslini* Verh.¹ eine ganze Reihe von Differenzen gegenüber vorliegender Form gegeben sind, wie die folgende Gegenüberstellung beweist :

<i>Drepanopus enslini.</i>	<i>Organognathus multidentatus.</i>
Am 1. B. ♂ das Präfemur nur <i>halb</i> so hoch wie das Coxosternum darunter, fast die Hälfte ragt über das Coxosternum hinaus, Präfemora fast überall von zahlreichen Poren durchsetzt und nicht breiter als lang, am Lappen ohne Warzen. Das basale Ende der syncoxalen Naht reicht <i>weit über die Lappentangente hinaus</i> .	Am 1. B. ♂ das Präfemur ungefähr <i>ebenso</i> hoch wie das Coxosternum darunter, nur $\frac{1}{3}$ des Präfemur über das Coxosternum hinausragend, Präfemora nur mit spärlichen zerstreuten Poren (Tl. vi, Abb. 10) viel breiter als lang, am Lappen mit Warzenstruktur. Das basale Ende der syncoxalen Naht (<i>x</i> , Abb. 10 und 11, Tl. vi) erreicht kaum die Lappentangente ² .
Am 2. B. ♂ sind die Hüften im Bereich der coxopräfemorale Naht am Ende innen mit <i>dreieckigem Fortsatz</i> gegen das Präfemur vorgezogen.	Am 2. B. ♂ verläuft die coxopräfemorale Grenze einfach quer, die Hüften sind also am Ende innen <i>nicht</i> vorgezogen.

¹ Zool. Anzeiger, Bd. LXXXIX, H. 7/10, S. 193-210 (1930).

² Unter Lappentangente verstehe ich eine Linie, welche die proximalsten Punkte der praefemorale Lappen in der Querichtung verbindet.

Einige Beispiele für verschiedenen Bau des 1. Beinpaarsegmentes des ♂ hat auch Attems a.a. O, auf S. 21 beigebracht. Die grossen *Unterschiede zwischen ♂ und ♀* in dieser Hinsicht sind aber noch nicht angemessen betont worden.

Sie liegen nicht lediglich darin (wie Attems erwähnt) dass die Präfemora am 1. Beinpaar des ♂ in die besprochenen Lappen ausgezogen sind, welche beim ♀ vollständig fehlen, sondern sie kommen vor allem in dem Umstande zum Ausdruck, dass die *Präfemora* beim ♀ gegen die Coxite vorn verschoben und in sie eingesenkt sind, während sie beim ♀ eine ganz normale Stellung einnehmen. Daher kann man bei diesem vorn auch die bekannten Gelenkknöpfe beobachten, während von solchen beim ♂ gar nichts zu sehen ist. Dass beim ♂ die Präfemora von den Hüften stark umfasst werden, beim ♀ dagegen nicht, ist lediglich eine Folge des Vorigen.

Das 2. B. des ♂ von *Organognathus* wurde soeben schon erwähnt, es gleicht grösstenteils dem des ♀ (Tl. vi, Abb. 9) besonders auch in den basalen Teilen. Mit dem 3. B. des ♂ beginnt nicht nur der normale Bau der Laufbeine, sondern hier treten auch zuerst *Polster* auf und zwar an Postfemur und Tibia (Tl. vi, Abb. 7). Diese Polster sind am Ende in einen nach endwärts herausragenden Zipfel ausgezogen. Hüften des 3. B. keulig, aussen vor dem Ende plötzlich stumpfwinkelig eingebuchtet und eingeschnürt.

Mit den *Gonopoden*, von welchen oben bereits die Rede gewesen ist und zwar mit Rücksicht auf die bekannten Gattungen der Harpagophoriden komme ich zu den weitaus schwierigsten Organen dieser Diplopoden, wobei ich voraus bemerken muss, dass ich dieselben zwar eingehend behandelt habe, aber doch noch nicht ganz so wie ich es gewünscht hätte, weil mir nur ein *einziges* ♂ zur Untersuchung vorgelegen hat. Tafel v, Abb. 1 zeigt nur ein isolirtes Coxit und zwar so ausgebreitet, dass man das Gonocöl möglichst vollständig überblicken kann, wozu ich noch bemerken muss, dass es bei dieser Form nicht wenig Mühe kostete, die Telopodite aus den Höhlungen der Coxite herauszupräparieren. Das Gonocöl wird flankirt aussen von einem es der Länge nach begleitenden umgeschlagenen Rande (*Lt*) und innen ebenso, aber von einem kürzeren Rande, der ausserdem in der Mitte mit einem halbkreisförmigen Lappen (*La*) vorragt. Der terminale Teil der Coxite ist nicht einfach sondern *in zwei breite Fortsätze geteilt*, von welchen der äussere dreieckige in zwei Ecken (*C* und *D*) vorspringt und einen stumpfen Zahn trägt, während der innere aussen durch einen breiten Lappen, innen aber durch zwei spitze schwärzliche Zähne (*A* und *B*) ausgezeichnet ist. Vor dem basal zurückgebogenen Zahn *A* springt das Coxit auch noch lappenartig vor, so dass eine tiefe und enge Bucht gebildet wird. Die Endhälfte der Coxite ist also im Vergleich mit *Drepanopus* und *Ktenostreptus*¹ viel mehr ausgestaltet.

Durch einen kräftigen schrägen Strang (Tl. v, Abb. 2, *Vb*) und einen schrägen Muskel (*M* 2) ist die Basis des Coxit mit dem als Präfemur zu betrachtenden, starken Basalstück des Telopodit (*Prf*) verbunden. Aussen basal besitzt dieses Präfemur eine auffallende Bucht (*y*) durch

¹ Man vergleiche meinen Aufsatz im Zool. Anzeiger, Bd. LXXXIX, S. 193-210 (1930).

welche eine gelenkige Verbindung mit der Stütze vermittelt wird (Diese wurde aus Rummangel in Abb. 2 nicht eingezeichnet). An das Prä-femur¹ schliesst sich, teilweise ins Gonocöl gedrängt, ein am Ende schief abgeschnittener Femurabschnitt (*Fe*, Abb. 2, Tl. v) an, neben dem sich aussen die Basis des dünnen Telopoditstieles befindet, gegen welche ein vom Grund des Präfemurs kommender Muskel ausläuft (*M* 1). Die Abschnitte Präfemur und Femur bei *Organognathus* weichen ebenso wie die Coxite ganz beträchtlich ab von den homologen Teilen bei *Ktenostreptus* und *Drepanopus*.

Ueber den Telopoditstiel, d.h. den verdünnten, schlauchartigen Teil zwischen Femur und Tibiotarsus, habe ich kein ganz klares Bild gewinnen können, namentlich bin ich nicht ganz sicher ob die dreieckige Erweiterung an seinem Ende, in Abb. 3 mit *Psf* bezeichnet (Postfemur) richtig von mir dargestellt wurde.

Das Ende des Telopodit teilt sich in zwei Aeste (Tl. v, Abb. 3, *Ti*, und *Ta*) den tibialen und tarsalen und es ist nicht schwer festzustellen, dass der im Stiel entlang ziehende *Spermakanal* (*K*) in den tarsalen Ast eintritt und an seinem Ende mündet. Dieser *tarsale* Ast (Tl. v, Abb. 5) bleibt fast gleich breit, ist am Ende ein wenig umgerollt und trägt hier ein Kämmchen von Spitzen verschiedener Gestalt und Grösse, am inneren Rande etwas vor der Endbiegung des Spermakanals einen starken Stachelfortsatz. Der tibiale Ast (Tl. v, Abb. 4) ist schwer zu beschreiben. Im ganzen erscheint er fast sichelartig, ist aber durch eine Furche in zwei abgerundete Buckel (*B* 1, *B* 2) geteilt, während neben denselben eine sehr zarte Lamelle (*Lm*) sich gegen die gemeinsame Basis von Tibia und Tarsus erstreckt. Das Ende ist geteilt und läuft aussen in ein kleines Häkchen (*H*) innen in einen zahnartigen, spitzen Fortsatz (*D*) aus, vor dem sich noch Vorsprung mit einem Häkchen zeigt. Wie man aus Abb. 3 ersieht springt die Basis der Tibia in der dem Tarsus entgegen gesetzten Richtung in eine zahnartige Ecke vor.

Schliesslich noch einige Worte über die in Abb. 8 dargestellten hinter dem 2. B. sitzenden Penes (*P*) Sie werden von einem queren Wall (*W*) umgeben, den ich als ein umgewandeltes Sternit betrachte. An ihrer inneren Basis hängen beide Penes in einem verdickten Knopf (*K*) zusammen, an welchen Retractoren angreifen. Die von den Vasa deferentia (*Vd*) durchsetzten Penes sind nackt, besitzen eine terminale Oeffnung und vor dem Ende eine Einschürung, auch einige Kerbungen am inneren Rande.

Vorkommen: Mehrere Stücke, unter denen sich leider nur ein ♂ befindet, verdanke ich Herrn S. Jones (Madras) welcher dieselben bei Kovalam, nicht weit von der Küste erbeutete, 7 Meilen südlich von Trivandrum, der Hauptstadt von Travancore, im Südwesten von Dekan.

¹ Im meinem Aufsatz über *Ceylon—Chilognathen* [Zool. Anzeiger, Bd. LXXXIX, (1930)] habe ich in Abb. 1 für *Drepanopus enslini* die der Stelle y Abb. 2 anbei entsprechende Stelle mit "g" bezeichnet und als Gelenk zwischen "s" (Stütze) und "to 1" (Präefemur) aufgefasst. Dies muss ich berichtigen, denn ich konnte inzwischen feststellen, dass die wahre Stütze bei *Drepanopus* sich aussen von g befindet, also in meiner Abb. 1 nicht vorkommt. Es sind vielmehr beide Teile s+to 1 als Präefemur zu betrachten, homolog prf meiner Abb. 2 von *Organognathus*.

ZUR KENNTNISS DER PRIONOPELTIDAE.

Wie schon in einem früheren Aufsätze erwähnt, betrachte ich diejenigen Gattungen der Strongylosomidae, bei welchen die Seitenflügel des 2. Rumpfringes nicht tiefer stehen wie ihre Nachbarn sondern sich mit ihnen ungefähr in derselben Höhe befinden, als Familie Prionopeltidae. Es scheint, dass alle hierhin gehörigen Gattungen zugleich durch kräftige Seitenflügel ausgezeichnet sind.

Zur Uebersicht und vorläufigen Orientirung über zwei neue Gattungen gebe ich den folgenden Schlüssel :

- | | |
|--|--|
| a. Präanaler Fortsatz breit, schaufelartig, Metatergite ohne Querfurche | 1. <i>Aphelidesmus</i> Brol. |
| b. Präanaler Fortsatz kegelig, also schmal endend, Metatergite mehr oder minder stark quer gefurcht | c, d. |
| c. Gonopoden nur in ein Solänomerit auslaufend, während ein Tibiotarsus vollständig fehlt | 2. <i>Brochopeltis</i> Verh. |
| d. Gonopoden ausser dem Solänomerit auch mit Tibiotarsus | e, f. |
| e. Seiten der Seitenflügel <i>wulstig dick</i> , abgerundet, ohne Randschärfung. An den Mundungen der Poren keine Einbuchtungen. Nähte deutlich gekerbt. 19. Rumpfring, statt der Seitenflügel nur mit kleinen Höckerchen, Laufbeine <i>gedrungen</i> , Femur am 8. Beinpaar so lang wie Coxa+Praefemur. Der Tibiotarsus der Gonopoden (Tl. vii, Abb. 18 und 19) ist am Ende einfach, ohne Nebenlappen, das Femur gerade und nicht länger als Praefemur, der postfemorale Ast ist in zwei Fortsätze geteilt (<i>H1, H2</i>) | 3. <i>Jonespeltis</i> , gen. nov. |
| f. Seiten der Seitenflügel nicht wulstig verdickt, wenigstens an den drüsenlosen Ringen mehr oder minder <i>kantig geschärft</i> , während an den drüsenführenden durch die Drüsen mindestens eine kleine Einbuchtung entsteht. Nähte ohne Kerbung. 19. Rumpfring mit kleinen aber deutlichen, dreieckigen Seitenflügeln | g, h. |
| g. Der Rücken der Metatergite ist flach und liegt daher nicht höher, eher etwas tiefer als die Seitenflügel. Querfurche der Metatergite seicht, Hinterränder aller Metatergite <i>beborstet</i> . Beine sehr <i>schlank</i> , Femur am 8. B. $1\frac{1}{2}$ mal länger als Coxa+Praefemur. Der Tibiotarsus der Gonopoden bildet ein hufeisenförmig gebogenes Solänophor (Tl. vii, Abb. 12-15) besitzt am Ende einen Nebenlappen (<i>B</i> , Abb. 15, Tl. vii) und an der Basis einen grösseren, gegen das Femur zurückgebogenen Haken (<i>H</i>) Das Femur ist am Ende innen wulstig abgesetzt (<i>A</i> , Abb. 12, Tl. vii) gerade und kaum so lang wie das Praefemur | 4. <i>Polydesmopeltis</i> , gen. nov. |
| h. Der Rücken der Metazonite ist gewölbt und liegt höher als die Seitenflügel. Querfurche der Metazonite tief, Hinterränder aller oder der meisten Metatergite unbeborstet, Tibiotarsus der Gonopoden sichelförmig (Tl. vii, Abb. 16 und 17) ohne Nebenlappen, der postfemorale Fortsatz zweiästig, Femur säbelig gebogen, am Ende innen ohne wulstige Absetzung, länger als das Femur | 5. <i>Anoplodesmus</i> und
<i>Prionopeltis</i> Poc. |

Polydesmopeltis, gen. nov. (= *Prionopeltis* e.p.)

Wie in einigen andern Gruppen der Polydesmoidea, so sind auch bei *Prionopeltis* und Verwandten bisher zu ausschliesslich die Gonopoden allein zur Beurteilung der Gattungen verwendet worden. Bei den Prionopeltiden haben wir es aber mit so beträchtlichen Unterschieden in andern Organen zu tun, dass diese unmöglich bei der Beurteilung der verwandtschaftlichen Beziehungen unberücksichtigt bleiben dürfen, um so mehr, als die Unterschiede im Bau der Gonopoden hier einerseits keine sehr beträchtlichen sind, andererseits aber auch zum Teil nicht richtig erkannt wurden. Diese Verhältnisse enthalten die Gründe welche mich zur Aufstellung der Gattung *Polydesmopeltis* veranlasst haben.

Die typischen Arten dieser Gattung *kelaarti* Humb. und *xanthotrichus* Att. sind schon von Attems 1898 im I. Bd. seiner Polydesmoidea Monographie S. 358 und 359 als *Prionopeltis*—Arten aufgeführt worden, zusammen mit *saussurei* Humb. dessen Gonopoden ich anbei in Tafel vii, Abb. 16 und 17 erneut zur Anschauung gebracht habe. Als Vertreter von *Prionopeltis* s. str. 1914, dagegen hat Attems in seinen indisch-australischen Myriapoden,¹ die Arten *kelaarti*, *xanthotrichus*, *saussurei*, auch *anthracinus* Poc. u. a. als *Anoplodesmus* Poc. aufgeführt.

In Kükenthals *Handbuch der Zoologie* 4. Bd. hat Attems diese beiden Gattungen wie folgt auf S. 144 unterschieden :

37a. "Gonopodentarsus 3 spitzig, mit einem grossen zweispitzigen Blattanhang oder zweiastig, mit basal gerichtetem Arm. *Prionopeltis* Poc.

37b. Gonopodentarsus schmal, einfach, nur am Ende in 2 kleine Spitzchen geteilt *Anoplodesmus* Poc."

Diese Gegenüberstellung genügt uns nicht zur Unterscheidung zweier Gattungen und zwar um so weniger als sie (man vergleiche meine Tafel vii, Abb. 13, 15 und 17 für *kelaarti*, *xanthotrichus* und *saussurei*) auf keine dieser angeblichen *Anoplodesmus*—Arten passt, denn bei *kelaarti* und *xanthotrichus* endigt der Tibiotarsus mit einem Stachelfortsatz (*C*, Abb. 13, Tl. vii) und zwei Lappen (*B* und *E*) so dass also ein Zustand gegeben ist, welcher eher auf Attems Satz 37a, also eher auf *Prionopeltis* passt. Aber auch auf *saussurei* (Tl. vii, Abb. 16 und 17) passt seine Charakteristik nicht, dem hier endet der Tibiotarsus völlig einfach. 1932 hat sich auch J. Carl in seinen "Diplopoden aus Sudindien und Ceylon, Polydesmoidea"² auf S. 460 mit *Anoplodesmus* beschäftigt und zwar hauptsächlich mit *kelaarti*, von welchem er nicht nur ein grosses Material selbst sammelte, sondern auch eine Unterart *valpareiensis*, welcher u. a. der in meiner Abb. 13 mit *C* bezeichnete Stachel fehlt. Vergleicht man die Abbildungen der *kelaarti* Gonopoden von Attems, Carl und mir, dann ist die wesentliche Uebereinstimmung nicht zweifelhaft, aber auch Unterschiede sind nicht zu übersehen, und dieser Umstand veranlasste mich zur Aufstellung einer Unterart *longipes*. Carl hat sich auf S. 463 auch über die Variabilität des *kelaarti* ausgesprochen, aber es ist zweifelhaft, ob er seine Objekte gründlich genug

¹ *Archiv f. Naturgesch.* T. LXXX, Abt. A, S. 205.

² *Revue Suisse de Zoologie*, T. XXXIX, N. 17.

untersucht hat. Soviel ist sicher, dass Carl's Abb. 62 nicht unbeträchtlich abweicht von den Gonopoden—Darstellungen, die von Attems und mir gegeben wurden, Carl sagt auf S. 465: "Problematisch bleibt die von Attems für seinen *kelaarti* angegebene und abgebildete schlanke Form der einer *Einschnürung* entbehrenden Tibia. Die Tiefe der Einschnürung wechselt jedoch sehr nach dem Winkel, unter welchem man das Organ betrachtet." Das Letztere ist zwar an sich richtig und gilt für die Beobachtung der meisten Organe. Da wir jedoch die Gonopoden in Präparate einbetten und sie hier, wenn sie intakt sind, eine ganz bestimmte Lage einnehmen, so fällt dieses Bedenken fort. Zweifellos sind die Gonopoden meines *kelaarti* denen von Attems viel ähnlicher als denen Carls. Für die *Unterarten* von *kelaarti* gebe ich folgenden Schlüssel: (Gonopoden)

- a. Der Stachel neben der Mündung des Solänomerit fehlt *kelaarti, valparaiensis* Carl.
- b. Dieser Stachel ist vorhanden (C, Abb. 13, Tl. vii) *c, d.*
- c. Femur aussen tief *eingebuchtet*. Postfemorale Fortsatz aussen nicht eingeschnürt, am Ende mit Spitze zurückgebogen. Neben dem Stachel bei der Solänomerit—Mündung ein "fächerförmiges" Lappchen, vor ihm keine Lamelle *kelaarti, carli* m. (= *kelaarti* Carl).
- d. Femur aussen höchstens mit Andeutung einer Einbuchtung.
- I. Der postfemorale Fortsatz bildet einen einfachen Haken. Ende des Tibiotarsus weder vor noch hinter dem Stachel mit einer Lamelle (Nach Attems Abb. 100 in seiner Monographie wird das Ende des Tibiotarsus nur von Gebilden eingenommen, welche dem Stachel und dem Lappen e meiner Abb. 13 entsprechen) *kelaarti* Att. (*genuinus*).
- II. Der postfemorale Fortsatz (H, Abb. 12, Tl. vii) ist durch Bucht und Einschnürung in zwei Lappen abgesetzt. Das Ende des Tibiotarsus besteht nicht nur aus Stachel und gezählter Lamelle (E) sondern auch noch aus einer zarten Lamelle (L) vor dem Stachel und einer derberen, fast halbkreisförmigen (B) hinter demselben *kelaarti, longipes*, subsp. nov.

Hinsichtlich der Gonopoden von *Polydesmopeltis* will ich noch Folgendes zur Erklärung bemerken:

Der Tibiotarsus, soweit er nicht verkümmert ist, bildet bei allen Prionopeltiden ein *Solänophor*, d. h. eine Führung für das Solänomerit, über deren Bedeutung ich mich bereits 1933 in meinem Aufsatz über *Sven Hedins* chinesische Myriapoden¹ näher ausgesprochen habe. Das spitze und feine Ende des Solänomerits ist häufig, wie z. B. in Tafel vii, Abb. 13, nicht sichtbar. In andern Fällen ragt diese Spitze aber vor, so in Tafel vii, Abb. 16-19. In Tafel vii, Abb. 15 bei D ist gerade eben das äusserste Ende der Solänomeritspitze noch sichtbar, *Polydesmopeltis kelaarti* ist aber dadurch besonders bemerkenswert, dass die Stelle, an welcher normaler Weise das Ende des Solänomerit, welches bei der Copula als ein Stimulationsorgan wirkt, hervorgestossen wird, sich

¹ Arkiv f. Zoologi, Stockholm, Bd. XXVIA, N. 10.

dicht neben der Basis des Stachelfortsatzes (G) befindet, auch ist bei kelaarti noch ein kleiner, zarter Fortsatz (D) zu sehen, durch welchen die Führung der Solänomerit Spitze noch verbessert wird.

Der Tibiotarsus zusammen mit dem postfemorale Fortsatz haben eine gemeinsame, verhältnissmäßig *schmale Basis*, deren physiologische Bedeutung zweifellos darin liegt, dass beide einem Druck besonders leicht und zwar *federnd* nachgeben und dass hierdurch die Beweglichkeit von Solänomerit und Tibiotarsus gegen einander erheblich erleichtert wird.

Die stimulierende Wirkung des Solänomerit wird offenbar durch den Stachelfortsatz neben der Spitzenmündung verstärkt. Die Rinne welche den Tibiotarsus zum Solänophor macht, ist bei den durch Tafel vii, Abb. 12-19 erläuterten Formen an Länge und Tiefe verschieden ausgeprägt, bei allen aber deutlich erkennbar. *Polydesmopeltis kelaarti, longipes m.* betrifft Tiere von etwa 40 mm. Länge, deren ganzer Körper sehr borstig und warzig ist, oben dunkelbraun, unten und die Beine gelbbraun zwischen den Hüften des 4. Beinpaars des ♂ eine dicke, trapezische, nach vorn geneigte Platte, am Ende breit, quer abgestutzt, die Hüften weit überragend.

Vorkommen: Herr S. Jones (Madras) dem ich diese Form verdanke, sammelte dieselbe in 3500 Fuss Höhe auf einem Bergzuge Ponmudi hills, 35 km. östlich von Trivandrum, im Südwesten Dekans.

UNTERGATTUNGEN VON *Polydesmopeltis*.

Die beiden mir vorliegenden Arten dieser Gattung (*kelaarti* und *xanthotrichus*) besitzen zwar recht ähnlich gebaute Gonopoden (Tl. vii, Abb. 12-15) aber sie sind sonst in verschiedener Hinsicht einander so unähnlich, dass ich für sie die beiden folgenden Untergattungen aufstelle, zumal, dadurch die Charakteristik der wahrscheinlich noch zahlreichen unbekannten Arten erleichtert werden wird.

<i>Polydesmopeltis s. str.</i>	<i>Ceylonpeltis</i> , subgen. nov.
Seitenflügel sehr breit, ungefähr 2/3 der Breite der Pleuralzylinder erreichend. Querfurchen der Metatergite seicht. Knötchen des Rückens alle fein, daher keine Zähnenreihen ausgebildet. Am 6. 8. 11. und 14. Diplosomit besitzen die scharfen Seitenränder nur im hintersten Viertel eine schwache Furche.	Seitenflügel sehr schmal, nur etwa ein Viertel der Breite der Pleuralzylinder erreichend. Querfurchen der Metatergite tief. Knötchen des Rückens so kräftig, dass sie an den Hinterrändern eine <i>Zähnenreihe</i> bilden. Am 6. 8. 11. und 14. Diplosomit besitzen die Seitenränder <i>fast in der ganzen Länge</i> eine Furche, die wenig schwächer ist als an den drüsenführenden.
Antennen lang, das 6. etwa 4 mal länger als das 7. Am Collum ausser den zahlreichen kleinen noch 3 Reihen borstentragender wenig grösserer Knötchen, Seitenflügel des Collum noch etwas <i>breiter</i> wie der tergale Teil. (Typische Art <i>kelaarti</i> Humb.)	Antennen ziemlich kurz, das 6. Glied nur 2½ mal länger als breit und nur dreimal länger als das 7. Am Collum ausser den zahlreichen kleinen noch 3 Reihen borstentragender, erheblich 'grösserer Knötchen, Seitenflügel nur etwa 3/5 so breit wie der tergale Teil des Collums. (Typische Art <i>xanthotrichus</i> Att.)

Polydesmopeltis (Ceylonpeltis) xanthotrichus, hirsutus, subsp. nov.

17½-18½ mm. lg. hellbraun bis braunschwarz mit gelben Seitenflügeln.

Die zahlreichen, vorwiegend unregelmässig zerstreuten Knötchen der Metatergite von sehr verschiedener Grösse, im durchfallenden Licht als helle, runde bis ovale Fensterchen erscheinend umgeben von dunklem Ring. Von den an den Hinterrändern stehenden Höckern, die etwas nach hinten varragen, sind die 2 äussersten jederseits die grössten und ragen innen von den Seitenflügeln als kleine, stumpfe Zähnnchen vor, Seitenrand der Seitenflügel vorn vor der Randfurche mit stumpfem Zähnnchen, sonst nur einmal gekerbt, mit 3 Borsten. Auch die Flanken unter den Seitenflügeln mit Höckerchen. Die eine einfache Linie bildenden Nähte scheiden die dichte Mosaikstruktur der Prozonite von einem glatten Ring zwischen Naht und höckerfühndem Metazonit.

Von den starken Borsten am Hinterrand der Metatergite giebt es 9-11, dem entsprechen auch die grösseren Hinterrand-Höckerchen, deren es z. B. am 6. Tergit 9 giebt.

Die dreieckigen, spitzen Hinterzipfel der Seitenflügel sind viel kräftiger ausgebildet als bei *kelaarti* und springen schon am 2-4. Diplosomit stark nach hinten vor (bei *kelaarti* ganz schwach).

Zwischen den Hüften des 4. Beinpaares des ♂ mit einer breiten, nach unten über die Hüften vorragenden Platte, welche am Endrand in der Mitte etwas eingeschnitten ist und aussen eckig vorragt, 1-3. Beinpaar ♂ ohne Fortsätze, aber am 6. und 7. B. das *Femur* unten mit dreieckigem Buckel. Sternit am 6. B. eingebuchtet, am 7. B. ♂ mit zwei kleinen, weit getrennten Buckeln.

Wenn man die vielen Erfahrungen in Betracht zieht, welche wir unter den Polydesmoidea sonst bei Formen, welche so bedeutend wie *kelaarti* und *xanthotrichus* in Gestalt und Skulptur von einander abweichen, hinsichtlich der Verschiedenheit der Gonopoden gemacht haben, dann muss man geradezu erstaunt sein, wie gering die Unterschiede im Bau der Gonopoden bei diesen beiden Formen sind, d. h. mit andern Worten, man hätte nach der übrigen Organisation derselben viel grössere Unterschiede im Bau dieser Organe erwarten sollen (Tl. vii, Abb. 12-15).

Mit den mir vorliegenden *xanthotrichus* steht es ähnlich wie mit den oben besprochenen *kelaarti*, denn auch hier (Tl. vii, Abb. 14 und 15) ist die grosse Aehnlichkeit mit den von Attems beschriebenen Gonopoden (Abb. 115 auf Taf. V im I. Bd. der Polydesmoidea—Monographie 1898) zwar unverkennbar, aber die Endteile des Tibiotarsus weichen so erheblich von einander ab, dass ich mich zur Aufstellung einer Unterart veranlasst sehe. Vor allem ist der in Tafel vii, Abb. 15 mit *e* bezeichnete Fortsatz bei *hirsutus* m. in zwei Läppchen und eine Endspitze abgesetzt, während ihn Attems für *xanthotrichus* als einfach halbkreisförmig angegeben hat.

Ausserdem ist zu erwähnen, dass Attems die Auszeichnung zwischen den Hüften des 4. B. ♂ als "einen wenig auffälligen, am Ende zweihöckerigen Knopf" beschrieben hat und femorale Buckel am 6. und 7. Beinpaar nicht erwähnt. Was er von den Seitenflügeln sagt: "Seitenrand rinnenartig ausgehöhlt, aber nicht so deutlich wie bei *kelaarti* auf den porenlosen Segmenten", stimmt mit meinem *hirsutus*

ebenfalls nicht überein, da bei diesem die Randrinnen im Gegenteil (wie oben angegeben) stärker entwickelt sind als bei *kelaarti*.

Vorkommen des hirsutus: Von Herrn S. Jones in 3,000 Fuss Höhe bei Demodera auf Ceylon gesammelt.

Jonespeltis, gen. nov.

Die verwandtschaftlichen Beziehungen dieser Gattung, welche Herrn S. Jones (Madras) in Dankbarkeit gewidmet ist, sind bereits oben durch einen Schlüssel der Prionopeltiden—Gattungen zum Ausdruck gebracht worden.

Abweichend von *Prionopeltis* und *Polydesmopeltis* liegen die Poren der Wehrdrüsen *nicht* in Furchen oder Gruben der Seitenränder, sondern ihre Umgebung ist wie die ganzen Seitenwülste der Seitenflügel *gewölbt*, ohne jede Spur einer Seitenrandung. Nach hinten vortretende Fortsätze der Seitenflügel giebt es *nur am 16.-18.* Diplosomit. Die Seitenflügel sind ziemlich kurz und erreichen nur etwa ein Viertel des Durchmessers der Pleuralzylinder. Antennen wie bei *Prionopeltis*. Rücken hoch gewölbt, viel höher als die Seitenflügel, die des Collum schräg herabgebogen, wie bei *Prionopeltis*. Im Habitus sehr an manche Fontariiden erinnernd.

Jonespeltis splendidus, sp. nov.

32-34 mm. lg. braunschwarz mit gelben Seitenflügeln. Poren am 5. 7. 9. 10. 12. 13. 15.-18. (19.) Diplosomit. Der 19. Rumpfring statt der Seitenflügel nur mit kleinen Höckern. Der ganze Rücken glänzend, nur hier und da mit sehr feiner Runzelung. Seitenflügel des Collum abgerundet-dreieckig, in Abstand vom Seitenrand mit gebogener Furche. Querfurchen der Metatergite ziemlich tief. Seitenwülste der Seitenflügel innen von *tiefer Furche* begleitet, welche vorn nach innen gebogen die Naht nicht ganz erreicht. Seitenflügel von oben gesehen gerundet, nach vorn mehr als nach hinten verengt. Flanken unter den Seitenflügeln gerunzelt und wenig glänzend. Telson wie bei *Prionopeltis*.

1.-3. B. des ♂ einfach, ohne Fortsätze. Zwischen den Hüften des 4. B. eine quere, trapezische, am Ende breit abgestutzte Platte, welche nach unten ragt, aber die Hüften nicht überragt. Femur am 5.-7. B. ♂ gebogen, unten hinter der Basis *buckelig aufgetrieben* und mit Haarbüschel, am stärksten sind diese Auszeichnungen am 7. B.

Die Gonopoden (Tl. vii, Abb. 18 und 19) erinnern am meisten an diejenigen von *Prionopeltis*, aber an dem postfemorale Fortsatz ist der basale Arm (*H 2*) so klein, dass man ihn leicht übersehen kann, ferner liegt die Basis des terminalen Armes (*H 1*) am postfemorale Fortsatz etwas vor der Mitte des Tibiotarsus (*x*, Abb. 19, Tl. vii) nicht neben dessen Grund (wie es bei *Prionopeltis* Tl. vii, Abb. 16 der Fall ist). Der Tibiotarsus bildet eine mit ganz einfacher Spitze auslaufende Solänophor-Sichel, in welcher die Rinne für das Solänomerit durch einen Längsstreifen (*x*, Abb. 19, Tl. vii) angezeigt wird. Der Femurabschnitt verläuft gerade und besitzt am Ende innen keinen Wulst.

Vorkommen: Mehrere Männchen verdanke ich Herrn S. Jones (Madras) welcher dieselben im südwestlichsten Vorderindien bei Kovalam sammelte, nicht weit von der Küste und 7 Meilen südlich von Trivandrum

(Travancore). Einige Larven mit 19 Rumpfringen sind kleiner und bedeutend heller als die Erwachsenen.

Anmerkung: Ausdrücklich will ich hier noch betonen, dass die Gattung *Jonespeltis* zu keiner der von Carl 1932 aus Südindien neu beschriebenen Gattungen der Polydesmoidea in irgend einer näheren Beziehung steht.

ZUR KENNTNISS DER STYLODESMIDAE.

Prosopodesmus jakobsoni, Silv.

Zuerst beschrieben wurde diese merkwürdige Form von F. Silvestri¹. Silvestri's Fig. 6 zeigt eine so auffallende Kopfbildung, dass ich es nicht unterlassen will dazu Stellung zu nehmen. In der Hauptsache kann ich Silvestri's Angaben *bestätigen*, so namentlich die ungewöhlichen supraantennalen Leisten, sowie das interantennale Feld, welches seitlich und unten scharf begrenzt ist, auch die sich daran nach aussen ansetzenden clypealen Querleisten. Die Frons dagegen besitzt nicht 4 Wülste in einer Querreihe, sondern 2+2 hinter einander. Allerdings findet sich aussen neben den hinteren Wülsten noch ein kleiner Nebenvulst, sodass also im Ganzen 2+4 Wülste vorkommen. Die Kopfkapsel ist fast überall mit einer dichten Wärzchenstruktur besetzt und der Scheitel springt jederseits in eine warzige *Spitze* heraus, in der zugleich die supraantennalen Leisten enden.

Dass mir trotz des weit abliegenden Fundortes wirklich *dieselbe* Art vorliegt wie Silvestri, ergibt sich aus der *völligen Übereinstimmung der Gonopoden*, wenigstens was die Telopodite betrifft. Die Coxite hat Silvestri allerdings nur schematisch angedeutet. Dieselben besitzen in Wirklichkeit eine tiefe, reichlich mit Wärzchen bekleidete und innen von breitem Lappen überragte *Grube*, in welche die Telopodite zum *Schutze* zurückgebogen werden können.

Auch das Auftreten der Drüsen am 5. und 7.-18. Ringe (19.) kann ich bestätigen. Hinsichtlich der Struktur der Diplosomite bedarf Silvestri's Beschreibung sehr der Ergänzung. Wenn er nämlich schreibt: "Segmentorum dorsum tuberculis subrotundatis parum elevatis instructum", so ist das zwar richtig, aber es fehlen alle Angaben über Zahl und Verteilung dieser Höcker.

Bis zum 18. Rumpfring sind die Wehrdrüsen und mit ihnen die Drüsenfortsätze, wie sie in Abb. 21 und 22 *df* angegeben wurden, gut entwickelt. Im 19. R. scheinen noch schwache Drüsen vorzukommen, aber Drüsenfortsätze fehlen. *Das Telson liegt nicht nur vollkommen frei*, sondern erscheint auch von oben gesehen *ebenso lang wie das 19.* Die meisten Metatergite mit vier queren Höckerreihen, in jeder Reihe meist 10 Höcker (Tl. viii, Abb. 21) Die Seitenränder der Seitenflügel vor den zapfenartigen Drüsenfortsätzen 1-2 mal leicht eingekerbt, (Tl. viii, Abb. 22) hinter ihnen an den meisten Diplosomiten noch ein besonderes Lappchen. Stärkere Höcker kommen nicht vor, auch nicht am 19. und 20. R. Die Oberfläche der Metatergite mit einem unregelmässigen Belag feiner Fremdkörperchen (In Tl. viii, Abb. 20 sind sie nur oben rechts

¹ Zool. Anzeiger., Bd. XXXV, N. 12-13, S. 360 (1910).

eingezeichnet). Collum am Vorderrand 12 mal schwach gelappt, (Tl. viii, Abb. 20) sonst mit 5 etwas unregelmässigen Höckerreihen.

Die Seitenflügel des 2. Ringes sind vorn stark erweitert und fast doppelt so lang wie die des 3., die meisten Seitenflügel entschieden länger als breit (Tl. viii, Abb. 22) abso verhältnisslich kurz.

Borsten und Haare treten am Rücken nirgends auf. Die Höcker zeigen im durchfallenden Lichte (Tl. viii, Abb. 20) einen hellen Kern und einen etwas dunkleren, dicken Ring. Die Fremdkörper scheinen durch ein Gerinnsel verklebt zu werden.

Was die vergleichend morphologische Natur der schon oben besprochenen Gonopoden betrifft, so ist das Merkwürdigste darin zu sehen, dass ihnen *ein eigentliches Solänomerit ganz fehlt*. Sie bestehen vielmehr aus beborstetem Praefemur, einem in grosse Platte vorragenden Femur, während ich den Abschnitt bis zur Mündung des Spermaganges als Postfemur und den dahinter als Tibiotarsus betrachte, der in drei Zähne vorragt.

Körper graugelblich, beim ♂ $4\frac{1}{3}$ -6 mm. lang.

Vorkommen: Herr S. Jones (Madras) erbeutete diese Form auch bei Kovalam (Travancore) im Südwesten Dekans, doch weiss ich nichts über das nähere Vorkommen.

Da die Tiere Silvestri's aus einem Ameisennest Javas stammen, ist es erstaunlich, dass bei der für *Diplopoden* doch schon recht grossen Entfernung beider Vorkommnisse dennoch eine völlige Uebereinstimmung zu verzeichnen ist. Nach Attems kommt eine Unterart von *Proso-podesmus jakobsomi* auf Sanzibar vor.

Untergattungen von *Urodesmus*.

Die von C. V. Porat aus Kamerun beschriebene Gattung *Urodesmus* ist ausgezeichnet durch das Vorkommen von je zwei grossen Höckern auf den Metatergiten der Rumpfringe, durch das vom 19. Metatergit bedeckte Telson und das Vorkommen von Drüsenzapfen am 5. 7. 9. 10. 12. 13. 15. und 16. Diplosomit. Nach Attems Schlüssel in Kükenthal *Handbuch der Zoologie* 4 Bd., S. 127 unterscheidet sich *Urodesmus* von der sonst ähnlichen Gattung *Stylodesmus* Cook's dadurch, dass letztere auch noch am 17.-19. Diplosomit Wehrdrüsen besitzt. Dieser Unterschied ist jedoch hinfällig, nachdem F. Silvestri¹) in einem hübschen Aufsätze über aethiopische *Stylodesmiden* erwiesen hat, dass diese Drüsen des 17.-19. Diplosomit in Wahrheit *beiden* Gattungen zukommen, doch sind die Mündungen derselben an diesen Ringen nicht in Drüsenzapfen gelegen, sondern in der Fläche der Seitenflügel, die Drüsen selbst anscheinend auch schwächer entwickelt.

Als wirklichen Unterschied von *Stylodesmus* gegenüber *Urodesmus* giebt Silvestri an, dass bei ersterer Gattung die Seitenflügel am Rande tief eingeschnitten und am 19. Diplosomit die Seitenflügel von oben her sichtbar sind. Der hinsichtlich der Gonopoden angegebene Unterschied bedarf noch der Nachprüfung, zumal Silvestri's Abbildungen derselben zu klein und daher zu unklar sind.

¹ *Bolletino d. Labor. di Zoologia gener. e agraria di Portici*, Vol. XX, S. 282-323 (1927).

Bisher ist die Gattung *Urodesmus* (in 2-3 Arten) nur aus dem westlichen Africa bekannt geworden und deshalb war es für mich eine Überraschung eine hierhin gehörige Form aus Ceylon zu erhalten. Die genauere Untersuchung hat jedoch gezeigt, dass es sich um eine zwar mit *Urodesmus* nahe verwandte, aber doch abweichende Gattung handelt. Da mir leider nur das ♀ derselben bekannt ist, führe ich sie vorläufig als Untergattung von *Urodesmus* auf. Die Unterschiede sind folgende:—

- a. Die beiden paramedianen Rippen der Rumpfringe stehen fast *senkrecht*, der Rücken ist sehr hoch, daher fallen die Seiten desselben sehr steil ab und an ihnen steht am 2.-18. Diplosomit jederseits eine Längsreihe von drei kleinen, runden Höckern (Tl. viii, Abb. 23). Die nach hinten übergeneigten Fortsätze am 18. Rumpfring bleiben mit ihren Ende *weit zurück* hinter dem Ende der Fortsätze des 19. R. zugleich stehen diese *hinter* ihnen. Die Seitenflügel des 19. R. von oben her vollständig sichtbar.

Untergatt. *Attemsocyphus*¹
subgen. nov. (für *serratus*, sp. nov.).

- b. Die beiden paramedianen Rippen (Fortsätze) der Rumpfringe sind *schräg* nach aussen herübergeneigt, der Rücken ist weniger hoch, in den Seiten stehen *keine* Höckerreihen. Die nach hinten übergeneigten Fortsätze des 18. Ringes sind nur wenig kürzer als die des 19. oder überragen dieselben noch und zugleich *umfassen* sie dieselben stehen also *ausser* von ihnen. Die Seitenflügel des 19. R. werden von oben her *verdeckt* durch die beiden Rippenfortsätze des 18.

Untergatt. *Urodesmus* s.
str. (für *erinaceus* Por.
und *simplex* Silv.).

***Urodesmus (Attemsocyphus) serratus*, sp. nov.**

♀ 8½ mm. lg. der Rücken braunschwarz und stark mit Humus-Staub incrustirt, aus welchem nur die Drüsenzapfen frei herausragen. Die grossen hellen Medianflecke, welche in Abb. 23 zu sehen sind, bemerkt man nur an isolirten Diplosomiten im durchfallenden Lichte. Die beiden Längsrippen in Tafel viii, Abb. 23 sind schematisirt, um ihre Dreitheiligkeit deutlicher hervortreten zu lassen. Das was ich oben über die Drüsenporen und Drüsenzapfen von *Urodesmus* gesagt habe, gilt durchaus auch für diesen *serratus*.

Der Name entspricht dem Umstande, dass die Rippen der Metatergite durch zwei Einschnitte in drei Teile abgesetzt sind und so dem Rücken entlang zwei Sägen bilden (Tl. viii, Abb. 23).

Während die meisten Rippen in Profil stumpf dreizählig erscheinen, von oben gesehen dreihöckerig, sind die des 2.-4. Ringes nur in zwei Teile abgesetzt. Collum mit zwei grossen, schräg nach vorn gestellten Fortsätzen, an welchen man einen breiteren inneren und einen schmälern äusseren Höcker unterscheiden kann. Auch die Rippen des 2.-5. Ringes sind nach vorn geneigt, die des 6.-15. gerade nach oben, während die des 16. etwas und des 17. und 18. stark schräg nach hinten gebogen sind und zugleich im Profil mit dreieckigen Spitzen weit nach hinten

¹ Benannt nach meinem verehrten Kollegen Dr. C. Attems in Wien.

vortreten. Die Fortsätze des 19. Ringes sind horizontal nach hinten gerichtet und parallel, das Telson ist von oben nicht sichtbar.

Vorderrand des Collum in der bekannten Weise gelappt. Rand der Seitenflügel des 2. Ringes dreilappig, auch sind diese Seitenflügel $1\frac{1}{2}$ mal länger als die 3.

Vom 3. Ringe an die Ränder der Seitenflügel mehr oder minder zwei lappig, abgesehen von den Drüsenzapfen, doch ist zu berücksichtigen, dass die Zweilappigkeit offenbar stärker ausgeprägt ist als es in Tafel viii, Abb. 23 erscheint, weil die Bucht zwischen den beiden Lappen mehr oder minder durch Fremdkörper verklebt wird, was ich durch Punktbogen angedeutet habe.

An den seitlichen Abdachungen des Rückens kommen ausser den drei rundlichen Höckerchen jedes Metatergites noch einige andere, schwächere Höckerchen vor, namentlich 2 hinter dem Vorderrand aussen von den Höckerchen-Längsreihen.

Bei der gewöhnlichen Haltung dieser Tiere also bei dicht an einander liegenden Diplosomiten ist der ganze Rücken dunkel inkrustiert. Schiebt man aber die Ringe etwas auseinander, dann zeigen sich die gelblich weissen Pleuralzylinder, welche völlig frei von Inkrustation bleiben müssen, damit die Bewegungen der Ringe gegen einander nicht behindert werden. Die Pleuralzylinder besitzen eine sehr dichte und feine Wärrchenstruktur, welche sich auch noch auf einem schmalen Ring hinter der Naht zeigt. An der Unterfläche reicht die Inkrustation kaum über die Seitenflügel hinaus, sonst zeigt sich fast überall dichteste Wärrchenstruktur.

Die Hinterränder der Diplosomite werden überragt von einer dichten Reihe zarter, hinten abgestutzter Blättchen. Dadurch dass deren Ränder seitlich etwas über einander greifen, wird der Schein erweckt, als wenn zwischen den Blättchen Borsten ständen.

Prä femur und Femur der Laufbeine ungefähr gleich lang.

Durch die in der *sagittalen* Richtung sich haltenden Rippen und Rippenfortsätze des Rückens unterscheidet sich *Attemsocyphus* sowohl von *Stylodesmus* als auch von *Urodesmus*.

Vorkommen: Das einzige mir vorliegende ♀ dieser Form verdanke ich Herrn S. Jones (Madras) welcher es in 3,000 Fuss Höhe bei Demodera auf Ceylon erbeutete.

Anmerkung 1: Wenn man in Silvestri's Stylodesmiden-Aufsatz a. a. O. 1927, die Abbildungen der hintersten Segmente vergleicht, so bedarf es erst einer genauen Untersuchung, um festzustellen, welche Zahlen den dargestellten Diplosomiten zukommen und auf welche die verschiedenen Fortsätze zu beziehen sind, da Silvestri selbst keine Zahlen beige-setzt hat. Von *Stylodesmus* erklärt er auf S. 284: "Genus hoc ad *Urodesmus* Porat perproximum est, sed carinis profunde lobatis, processibus dorsalibus segmenti penultimi brevioribus. . . distinctum est." Was den Unterschied hinsichtlich der Länge der Fortsätze des 19. Diplosomites betrifft, so ist er unhaltbar, wie ein Vergleich von Silvestri's eigenen Figuren beweist, man betrachte Fig. 1, N. 8 und Fig. IV, N. 2. Aber es giebt einen andern, viel brauchbareren und oben schon von mir erwähnten Unterschied, indem die Seitenflügel des 19. Ringes bei *Stylodesmus* (übereinstimmend mit *Attemsocyphus*) von oben her vollkommen sichtbar

sind, bei *Urodesmus* dagegen völlig unsichtbar, indem sie durch die hier auch viel grösseren und viel weiter nach aussen greifenden Fortsätze des 18. Ringes ganz verdeckt werden.

Anmerkung 2: In seinen Polydesmoidea aus Süd-Indien¹ hat J. Carl auch einige neue Stylodesmiden Gattungen beschrieben. Daher möchte ich bemerken, dass keine derselben in einem näheren Verhältnis zu *Urodesmus* und *Attemsocyphus* steht.

Styloceylonius, gen. nov.

Wehrdrüsen treten auf am 5. 7. 9. 10. 12. 13. 15.-18. Diplosomit.

Die Metatergite besitzen vier Längsreihen von Höckern, das Telson wird vom 19. Ring fast vollständig von oben her bedeckt (Tl. viii, Abb. 25 und 27). Der Rücken zeigt keinen Haarfilz. Nächst verwandt mit *Lophoscytus* Attems (Ueber *Lophoscytus lobulatus* Att. vergl. man seine javanischen Myriapoden²). Während bei *Styloceylonius* die Metatergite nur 4 Höckerreihen besitzen, sind sie bei *Lophoscytus* so dicht angeordnet, dass 5-6 Reihen jederseits neben einander stehen. Während das 18. und 19. Diplosomit hier (Tl. viii, Abb. 27) nur je zwei Höcker hinten tragen, sind beide bei *Lophoscytus* ganz dicht mit Höckern besetzt. Während hier von unten gesehen (Tl. viii, Abb. 28) der 19. R. über den 20. nicht vorragt, springt er bei *Lophoscytus* weit vor und während hier von oben gesehen die Seitenflügel des 19. R. nach den Seiten weit ausgreifen (Tl. viii, Abb. 27) sind sie dort nur wenig vorgestreckt. Im uebrigen weichen die Gonopoden von *Lophoscytus* durch ein flagellumartiges Solänomerit ab, sind aber sonst in ihrem Bau nicht genügend aufgeklärt.

Styloceylonius lobatus, sp. nov.

♂ 6½ mm. lg. mit 20 R.

Körper lehmgelb, der Rücken hoch gewölbt (Tl. viii, Abb. 24) Seitenflügel des 2. R. doppelt so lang wie die des 3. und etwas weiter als dieser und das Collum nach unten reichend.

Der vom Collum völlig bedeckte Kopf dicht mit Wärzchen besetzt. Unterhalb und aussen von den Antennengruben springt nach aussen ein *dreieckigeer Höcker* vor, dessen eckiges Ende nach aussen ungefähr so weit reicht wie das Ende des 2. Antennengliedes. Die Hinterstirn (Frons posterior) oberhalb der Antennengruben bildet ein *queres Kissen*, welches aussen mit bogiger Kante schroff abfällt, an den Kanten mit einigen feinen Zähnchen. Backen, des ♂ vorn mit 2 kleinen Spitzen, 6. Antennenglied $\frac{2}{3}$ so lang wie das bedeutend breitere 5., beide aussen am Ende mit dichter Gruppe von Sinneszäpfchen.

Zentralläppchen quer, nierenförmig, vorn eingebuchtet. Aussen-taster mit 5, Mitteltaster mit 7 Sinnesstiften.

Collum vorn mit 10 Lappen, die aber am Vorderrand kaum gegen einander abgesetzt sind. Seiten bogig eingebuchtet, die Wölbung mit 4+4 rundlichen getrennten Buckeln in zwei Querreihen, ausserhalb derselben noch ein einzelner Seitenbuckel.

¹ *Revue Suisse de Zool.* (1932).

² *Mitt. Naturh. Museums Hamburg*, Bd. XXIV, (1907).

Metatergite der meisten Ringe mit vier in 2-3 Höcker bald mehr bald weniger abgesetzte Längsbuckel (Tl. viii, Abb. 24 und 25).

Der Seitenrand der Seitenflügel an den meisten Ringen *vierlappig* (Tl. viii, Abb. 24 und 25) wobei an den drüsenführenden Ringen der 3. Lappen die Drüsenmündung enthält und somit einen Drüsenzapfen vorstellt, indem er etwas über die andern Lappen hinausragt. So verhält es sich bis zum 15. Ring. Am 16. und 17. finden wir wieder den vierlappigen Seitenrand, doch tritt der 3. der Drüsenlappen *nicht* mehr über die andern hinaus, aber der hinterste der 4. Lappen ist noch deutlich. Auch am 18. Ring (Tl. viii, Abb. 27) sind noch Drüsen vorhanden, aber die Seitenränder sind nur noch 3 lappig, indem der hinterste (4) erloschen ist. Am 19. R. fehlen die Drüsen ganz. Den eigentlichen Drüsenporus sah ich nirgends ganz deutlich, aber seine Lage am Ende der Drüsenlappen folgt aus dem dahin streichenden Drüsenkanal (Tl. viii, Abb. 25).

Am 18. Ring tritt hinten nur noch ein breiter Doppelhöcker auf, welcher nach hinten über den Hinterrand vorragt. Am 19. Ring (Tl. viii, Abb. 27) springt nach hinten ein grosser, am Ende tief eingesattelter Fortsatz heraus. Das Telson ist von oben her nur wenig sichtbar (Tl. viii, Abb. 27). Das Präanalsegment (Tl. viii, Abb. 28) bildet hinten ebenfalls einen breiten, am Ende etwas eingebuchteten Fortsatz und springt jederseits mit zwei (3) Lappen vor. Unter dem Endfortsatz sitzt ein mit 4 Borsten besetzter Wulst versteckt. Das Analsegment ist ringsum sehr scharf, ringartig gegen das Präanalsegment abgegrenzt und besitzt nur auf der Subanalplatte 2 Borsten.

Die Beborstung auch der vorderen Beinpaare des ♂ ist einfach, es zeigen sich keinerlei auffallende Besonderheiten.

Im Vergleich mit *Attemsocyphus* besitzt der Rücken dieser Form nicht nur bedeutend weniger Gerinnsel und keine Incrustationen¹ sondern es sind auch die Pleuralcylinder verhältnissmässig grösser und daher stehen die Seitenflügel viel weiter von einander ab. Ausserdem *fehlen* aber (man vergleiche Tafel viii, Abb. 23 und 25) *die tiefen Buchten*, welche bei *Attemsocyphus* hinten an der Basis der Seitenflügel auftreten und denen Vorbiegungen am Vorderrand entsprechen. Beide Auszeichnungen zusammen sind der Ausdruck von *Vorbiegungen der Basen der Seitenflügel*, durch welche eine verstärkte Ineinanderschiebung der Diplosomite bewirkt wird, um einen noch geschlosseneren und mehr einheitlichen Rücken zu erzeugen.

Ueber die Gonopoden der Stylodesmiden sind wir bisher erst recht mangelhaft unterrichtet, namentlich fehlt noch vollständig eine vergleichende Morphologie derselben. In der schon genannten Arbeit von Silvestri sind sie viel zu sehr verkleinert worden. Viel besser sind die Abbildungen Carl's 1932, aus denen man, namentlich bei *Propyrgodesmus* und *Scolodesmus* erkennt, dass sie im wesentlichen wie bei der vorliegenden Gattung gebaut sind.

Die Gonopoden von *Styloceylonius lobatus* sind durch ihren *extrem gedrungenen Bau* ausgezeichnet (Tl. viii, Abb. 26). Die Coxite (Co) sind schüsselartig gestaltet und können die Telopodite fast wie eine

¹ Verboeff, K. W.—*Die Diplopoden in Bronn's Klassen und Ordnungen des Tierreichs*, 2 Buch, 13 Lief. 44 Kapitel (Leipzig, 1932).

Glocke *schützend* umfassen. Es ist mir keine andere Polydesmoideen—Form bekannt, bei welcher die Telopodite so wie hier mitten in die Coxite eingesenkt sind.

Der Präfemurabschnitt, auch hier der einzige welcher Tastborsten trägt, erscheint von innen als ein zweizipfliger Höcker. An ihm erkennt man besonders auffallend die ausserordentliche Verkürzung der Telopodite, wie auch aus einem Vergleich mit den in Abb. 12, 14, 16 und 18 dargestellten Gonopoden der Prionopeltiden in sehr deutlicher Weise erkannt wird. Das Präfemur erscheint überhaupt nur noch als ein einseitig angelegter Abschnitt. An dem übrigen Telopodit kann man hauptsächlich Solänomerit und Tibiotarsus unterscheiden. Das Solänomerit reckt sich als ein hornartiger, am Ende etwas verbreiteter und umgebogener Fortsatz empor (*Sl*) aber seine verbreiterte und lappenartig vorgezogene Basis entspricht dem Femurabschnitt. Der Tibiotarsus, teilweise sehr fein gestreift, bildet eine breite Lamelle (*Tt*) welche gegen das Solänomerit stark umgebogen ist.

Vorkommen : Von dieser Form hat mir nur ein ♂ vorgelegen, welches ebenfalls von Herrn S. Jones auf Ceylon in 3,000 Fuss Höhe bei Demodera erbeutet wurde.

DIE STYLODESMIDEN ALS EIN SCHUTZTYPUS TROPISCHER URWÄLDER.

Die Stylodesmiden sind rings um unsere Erde verbreitet, leben aber nur in tropischen und subtropischen Ländern. Schon in meinem Diplopoden Werk¹⁾ habe ich auf S. 2036 erklärt, dass bei den Polydesmoidea über "deren primär tropischen Character kein Zweifel möglich ist, angesichts der Tatsache, dass die meisten Familien tropisch sind" Ich habe ausserdem die Ansicht vertreten, dass der *Ursprung* der ganzen Ordnung der Polydesmoidea als einer durchgehends augenlosen im Dunkel der dichten tropischen Urwälder zu suchen ist.

Gegenüber den meisten andern Familien der Polydesmoidea zeigen die Stylodesmiden einen entschiedenen Schutztypus, dessen oekologische Bedeutung darin liegt, dass er diesen Diplopoden eine erhöhte Sicherheit gegen die Angriffe anderer räuberischer Bodenkerfe, vor allem der Ameisen und Termiten bietet.

Der Schutztypus kommt aber zum Ausdruck :

1. in den dicht an den Boden sich anschmiegenden Seitenflügeln des Rumpfes (Tafel viii, Abb. 24).
2. in der Verkürzung der Beine, welche nach aussen über die Seitenränder nicht vorragen, sondern ganz unter dem Rumpfe versteckt liegen.
3. in der Verbergung des *Kopfes* unter ein vergrössertes Collum.
4. ist bei einem Teil der Cryptodesmiden auch das Telson auf die Bauchfläche geschoben worden, wobei am Hinterende Fortsätze herausragen.
5. ist der ganze Rücken, soweit er bei gewöhnlicher Haltung von oben her sichtbar ist, mit einem bald schwächeren, bald stärkeren *Gerinnsel* bedeckt, welches in schwächerer oder stärkerer Weise mit Partikelchen von Humus *verklebt*, wodurch diese Tiere ihrer Umgebung sich anpassen und selbst Brocken von Humus vortäuschen.

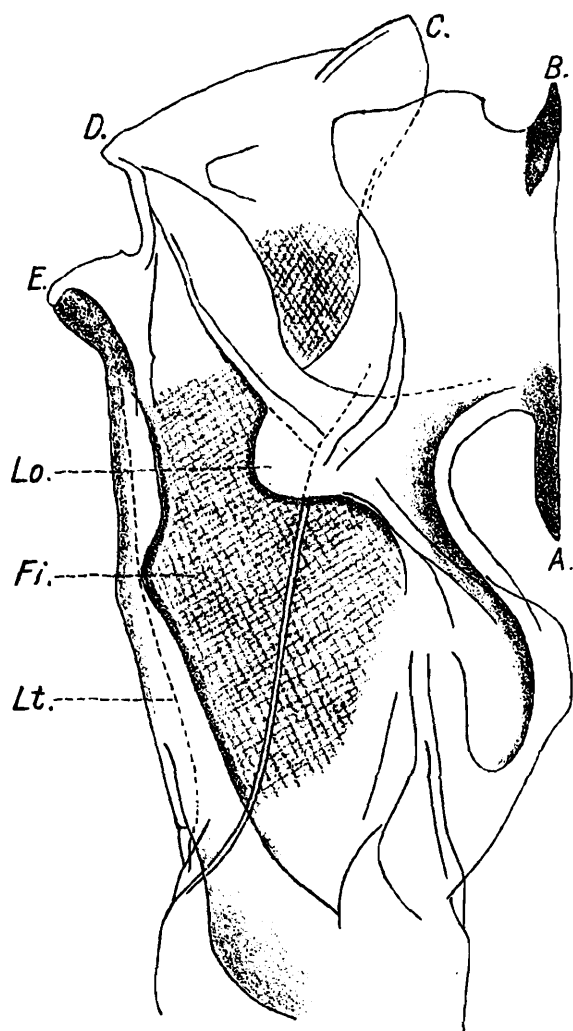
6. sind auch die Gonopoden durch die Tendenz, den Körper möglichst an den Boden anzuschmiegen, stark beeinflusst und *verkürzt* worden, was bei *Styloceylonius* in besonders auffälliger Weise zum Ausdruck kommt, indem die kurzen Telopodite durch die breiten Coxite geschützt werden.

7. Dass durch Verkürzung der Pleuralzylinder und Krümmung der Seitenflügel auch noch eine grössere Vereinheitlichung und damit Versteifung des ganzen Körpers bewirkt werden kann, ist oben hinsichtlich *Attemsocyphus* besprochen worden.

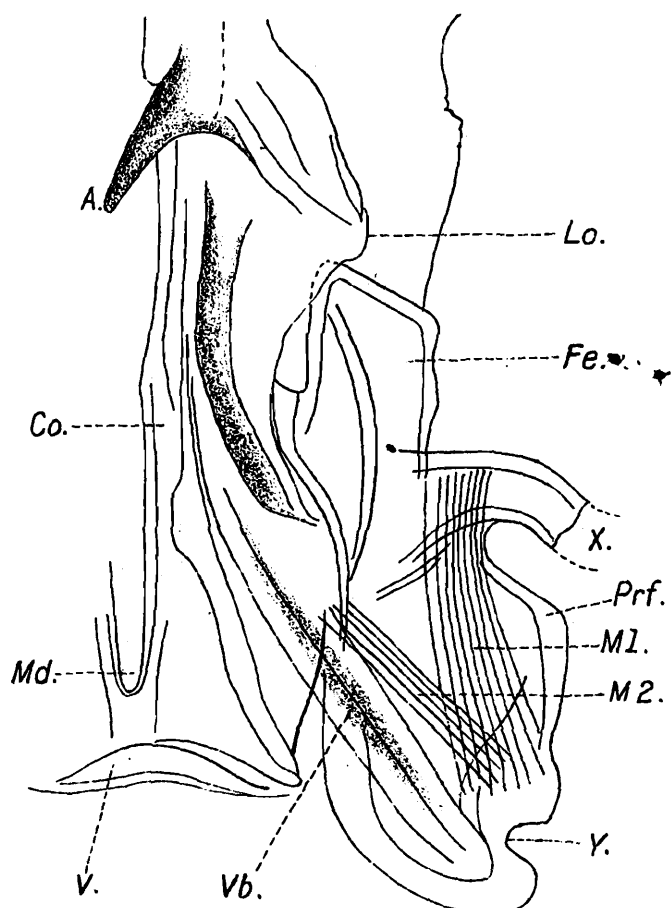
ERKLÄRUNG DER TAFEL V

Organognathus multidentatus, gen. et. sp. nov.

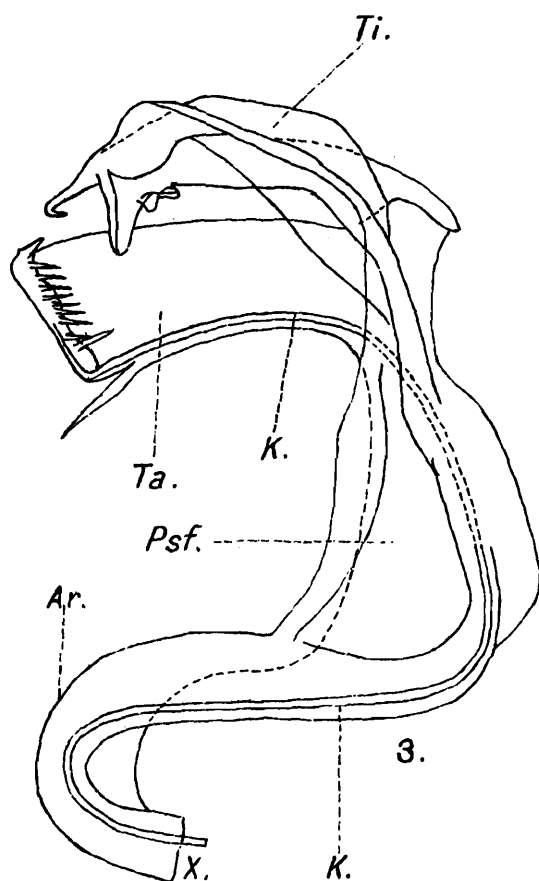
- ABB. 1.—Coxit der Gonopoden von aussen gesehen, *Fi.* das Gonocöl, eine tiefe Einsenkung zur Aufnahme eines Teiles des Telopodit; *Lo.* innerer; *Lt.* äusserer Rand des Gonocöl. $\times 56$.
- ABB. 2.—Coxit eines Gonopod ohne die Endteile, aber an der medianen Basis (*Md*) in Verbindung mit dem Coxit des andern Gonopod; *Vb.* Strang welcher das Coxit mit der Basis des Telopodit verbindet. Vom Telopodit sind nur der Präefemur-Abschnitt (*Prf*), der Femur-Abschnitt (*Fe*) und ein Stück des Stieles des Resttelopodit eingezeichnet. *x* ist eine Abbruchstelle des Telopodit-Stieles, welche man an *x* der Abb. 3 angesetzt sich zu denken hat; *V* Sternit. $\times 56$.
- ABB. 3.—Das bei *x* von der eben genannten Stelle der Abb. 2 abgebrochene Resttelopodit der Gonopoden, *Psf* postfemorale, *Ti.* tibialer, *Ta.* tarsaler Abschnitt; *K.* der Spermakanal. $\times 56$.
- ABB. 4.—Der Tibialabschnitt— }
ABB. 5.—Der Tarsalabschnitt— } der Gonopoden. $\times 125$.



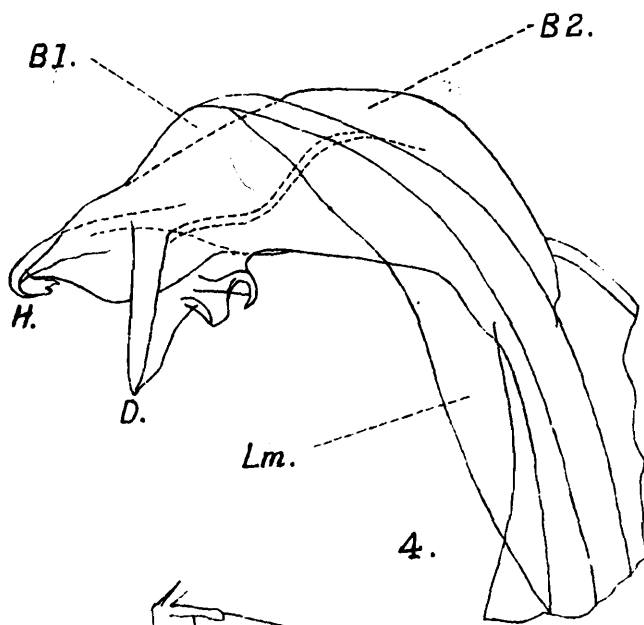
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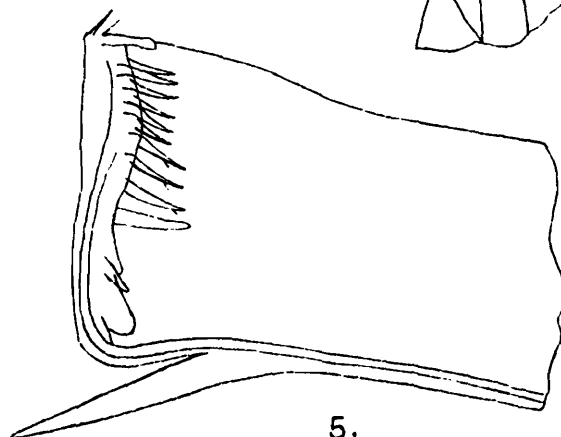
2.



3.



4.

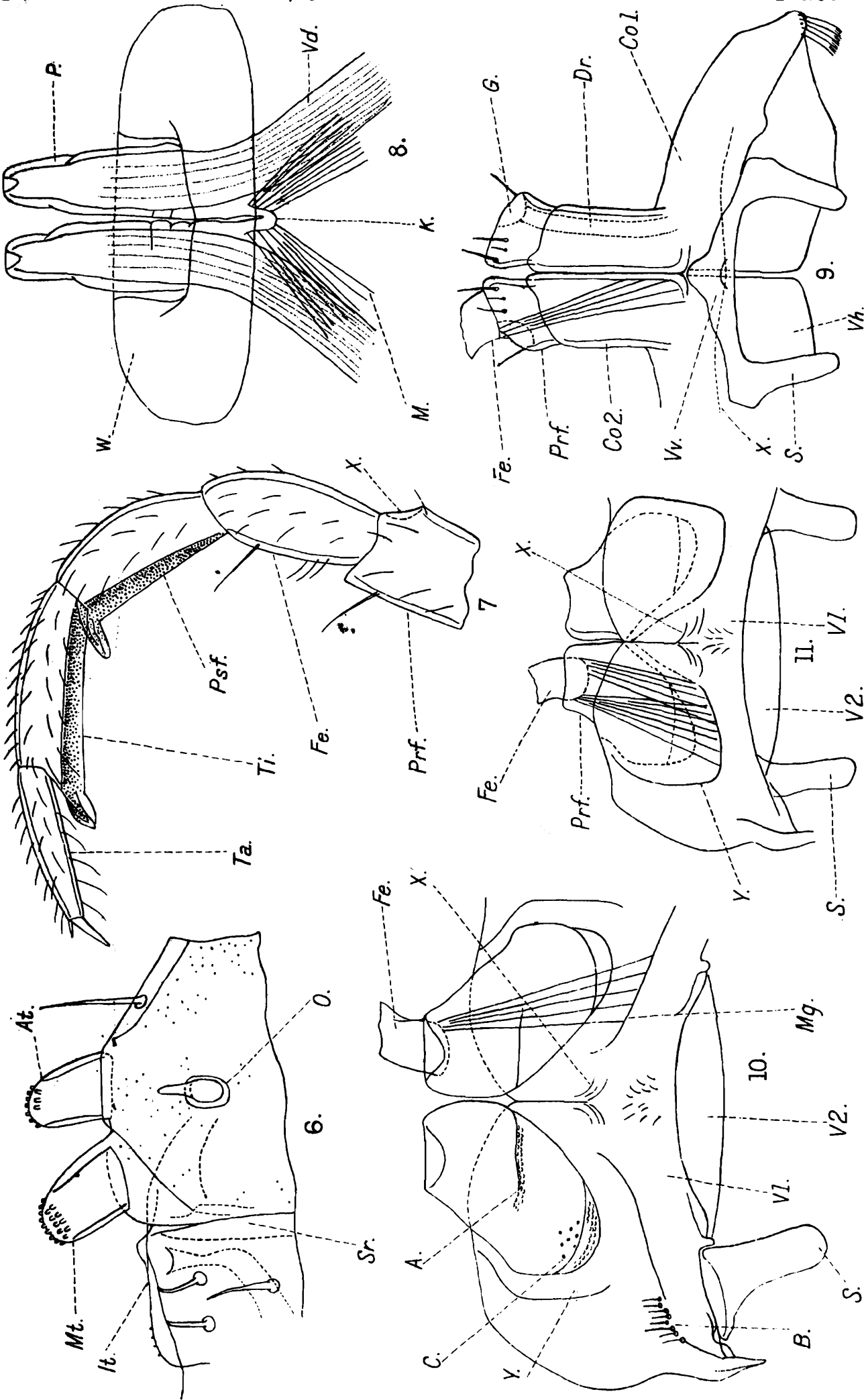


5.

EVKLÄRUNG DER TAFEL VI.

Organognathus multidentatus, gen. et. sp. nov.

- ABB. 6.—Stück vom vorderen Teil des Gnathochilariums des ♂ mit Aussen—(*At*) Mittel—(*Mt*) und Innentaster (*It*); *Sr.* die Speichelrinne; *O.* ungewöhnlichen (dem ♀ fehlender) Zapfen. × 125.
- ABB. 7.—Ein 5. Bein des ♂, ohne das basale Viertel. × 56.
- ABB. 8.—Die beiden Penes, welche in einem Ringwall (*W*) sitzen, mit Muskelzapfen (*K*) und vasa deferentia (*Vd*). × 56.
- ABB. 9.—Hüften (*CO1*, *CO2*) und Präfemora (*Prf*) vom 2. Beinpaar des ♀ nebst Sternit und Stützen (*S*); *G.* Grübchen; *Dr.* Drüse. Ansicht von vorn. × 45.
- ABB. 10.—Coxosternum vom 1. Beinpaarsegment des ♂ Ansicht von vorn. *V* 1, *V* 2, sternale; *Y* coxale Abschnitte; *A.* Präfemora; *Fe.* Stück eines Femur; *x.* Grenzstelle zwischen Sternit und Coxiten. × 56.
- ABB. 11.—Coxosternum vom 1. B. S. ♂, Ansicht von hinten. *Prf.* Präfemora, welche nur mit dem Ende vorragen. × 45.



ERKLÄRUNG DER TAFEL VII.

Polydesmopeltis kelaarti longipes, Verh.

ABB. 12.—Gonopod von innen gesehen (die Coxa nur halb eingezeichnet)
Coa. Coxalhorn; *A.* Endwulst des Femur; *Sl.* Solänomerit; *Tt.* Tibiotarsus; *H.* postfemorale Fortsatz; *R.* Spermagang. $\times 56$.

ABB. 13.—Tibiotarsus (*Tt*) und Solänomerit, Ansicht von aussen.
 $\times 125$.

ABB. 14.—Gonopod von innen gesehen. $\times 56$.

ABB. 15.—Tibiotarsus und Solänomerit, Ansicht von aussen. $\times 220$.

Prionopeltis saussurei (Humb.) Att.

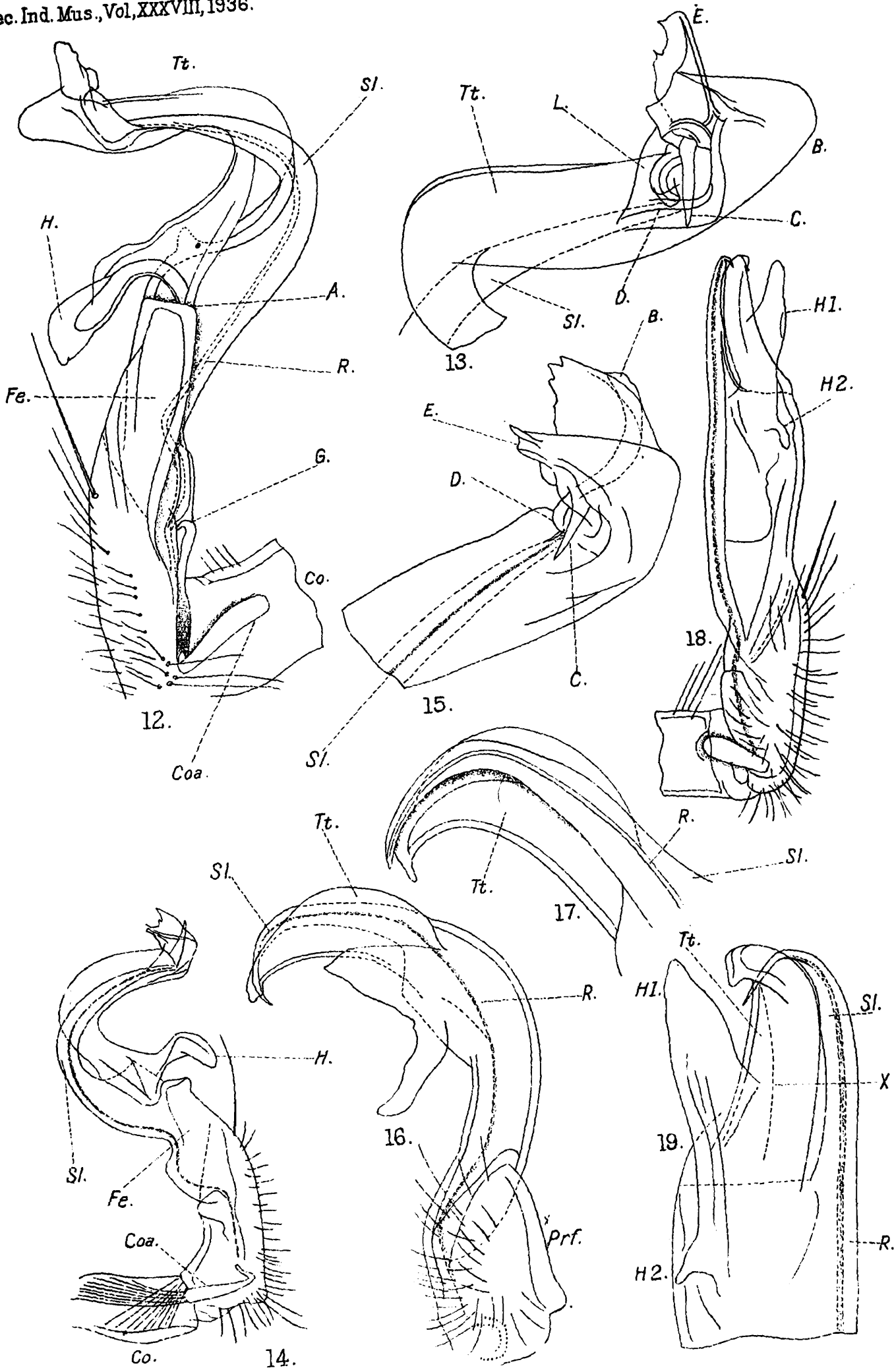
ABB. 16.—Gonopoden Telopodit von aussen betrachtet. *H.* zweiästiger postfemorale Fortsatz; *Tt.* Tibiotarsus; *Prf* Präfemur.
 $\times 56$.

ABB. 17.—Solänomerit (*Sl.*) mit seinem Ende aus dem als Solänophor wirkenden Tibiotarsus hervorschauend. $\times 125$.

Jonespeltis splendidus, gen. et sp. nov.

ABB. 18.—Gonopod ohne die Basalhälfte der Coxa von innen gesehen,
H1, *H2*, zweiästiger postfemorale Fortsatz. $\times 56$.

ABB. 19.—Endteile des Telopodit. *Tt.* Tibiotarsus; *Sl.* Solänomerit.
 $\times 125$.



ERKLÄRUNG DER TAFEL VIII.

Prosopodesmus jakobsoni Silv.

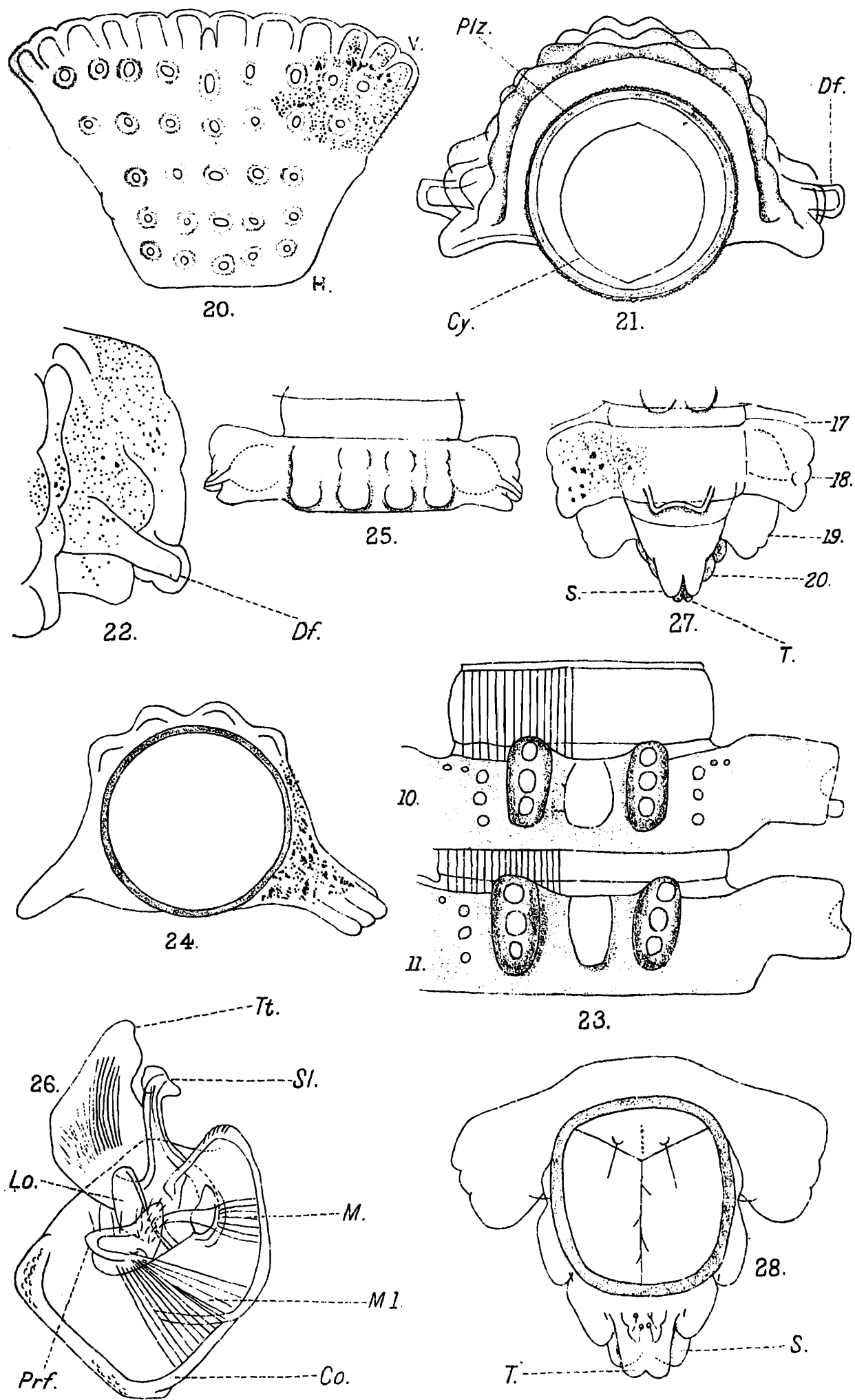
- ABB. 20.—Collum von oben und vorn. *V* Vorder, *H*. Hinterrand.
×125.
ABB. 21.—Der 5. Rumpfring von vorn gesehen. *Plz.* Pleuralzylinder;
Cy. Cyclophragma; *Df.* Drüsenfortsatz. ×125.
ABB. 22.—Der rechte Seitenflügel des 15. Diplosomites. *Df* Drüsen-
fortsatz. ×220.

Urodesmus (Attemsocyphus) serratus, sp. nov.

- ABB. 23.—Der 10. und 11. Rumpfring, Ansicht von oben. ×56.
(Die Metazonite sind durch Erd-Inkrustation verdunkelt,
die Prozonite nicht).

Styloceylonius lobatus, gen. et sp. nov.

- ABB. 24.—Der 8. Rumpfring, Ansicht von vorn. ×56.
ABB. 25.—Ansicht des 10. Rumpfringes von oben. ×56.
ABB. 26.—Vollständiger Gonopod von innen gesehen. *Co.* Coxit; *Prf.*
Prä femur; *Sl.* Solänomerit; *Tt.* Tibiotarsus. ×220.
ABB. 27.—Hinterende des Rumpfes von oben gesehen. *S.* Doppel-
höcker des 19. Ringes; *T* Doppelhöcker des Telson. ×56.
ABB. 28.—Hinterende des Rumpfes von unten gesehen. ×125.



CHALCIDS (PARASITIC HYMENOPTERA) FROM INDIA.

By M. S. MANI.

(From the Laboratories of the Zoological Survey of India, Indian Museum, Calcutta.)

Family TORYMIDAE.

***Lioterphus orissaensis*, sp. nov.**

Female.—Length exclusive of ovipositor and antennae 3.5 mm. Ovipositor 4 mm. long. Body black to very dark green in colour, densely clothed with moderately long pubescence. Head metallic green, without a distinct sculpture and with an obliquely broad, hairless line touching the postero-lateral aspect of the inferior border of the eyes and extending narrowly upwards both in front and behind. Mandibles dark blood red in colour. Antennae dark brown; scape lighter coloured than the other segments; pedicel about one third the length of scape; ring joint minute; first segment of funicle somewhat broader than long, but very much shorter and narrower than the other segments of funicle; second segment longest; succeeding segments a little shorter than second; last segment of funicle somewhat shorter than the one immediately preceding; club large, short, triarticulate and about one half the length of scape. Thorax greenish black. Femurs brownish violet. Hind coxae concolourous with thorax. Tibiae and tarsi brown. Abdomen black and about half the length of body. Submarginal and marginal veins brown; stigma black and subsessile.

Type.—One female on pin (with one antenna and one hind leg on slides), No. 907/H 3. In the collections of the Zoological Survey of India, Indian Museum, Calcutta.

Type-locality.—Puri, Orissa; Mus. Coll., 20-21.i.1908.

This is the first record of a species of *Lioterphus* Thoms. from India.

***Monodontomerus trichiophthalmus* (Cameron).**

1913. *Paroligosthenus trichiophthalmus*, Cameron, *Ind. For. Rec.*, IV, p. 95.

1922. *Monodontomerus trichiophthalmus*, Waterston, *Ind. For. Rec.*, IX, p. 52.

This species was first described by Cameron, who erected a new genus *Paroligosthenus* for it. I agree with Waterston in considering *Paroligosthenus*, a synonym of *Monodontomerus* Westw. and include Cameron's species under that genus.

Cameron recorded the species on *sal* (*Shorea robusta*) from Dehra Dun. Waterston recorded it as parasitic on a leaf-cutting bee from Dehra Dun. I have before me one female received from the Government Entomologist, Agricultural College, Lyallpur, bearing the label: "Coll. U. Bahadur, in laboratory 4-v-1923, 1423-5. 1B" In the Lyallpur specimen the ovipositor is much longer than in the type, being about two thirds the length of body. The pubescence on the head is neither so

long nor so dense as that on thorax ; that on the eyes is much shorter than elsewhere. The specimen further differs from the type in that the first segment of flagellum is not obscure green above.

***Pachytomus mantisiphagus*, sp. nov.**

This is the first record of a species of *Pachytomus* Westw. outside Egypt, whence the genus was originally described.

Male.—Length 4 mm. General colour of head and thorax dark green. Abdomen brownish honey coloured, except towards the apex where it is reddish brown. Fore and mid legs honey brown. Hind coxa concolourous with thorax. Hind femur testaceous black, pubescent and with indications of oblique transverse striae ; first tooth small; second longer and sharper ; third somewhat longer, broader, bluntly pointed and with two minute carinae ; fourth tooth broad, short and blunt. Head with indications of very fine transverse striations behind. Eyes red. Mandibles coppery red. Pedicel of antennae one third the length of scape ; first funicular segment short, narrowed abruptly at the base, less than half the length of pedicel ; second funicular segment somewhat longer than the rest, which are subequal, except the apical two which are short. Club large, two thirds the length of scape and indistinctly triarticulate.

Type.—One male on pin with the antennae on slide, No. 908/H 3. In the collections of the Zoological Survey of India, Indian Museum, Calcutta.

Type-locality.—Barkuda Island, Chilka Lake. Coll. N. Annandale, 25.vii-4.viii.1917 ; “ Bred from eggs of mantid ”

Family CHALCIDIDAE.

Genus ***Anacryptus*** Kirby.

1862. *Epitranus*, (*partim*), Walker, *Trans. Entomol. Soc. London*, (3), I, p. 348.

1883. *Anacryptus*, Kirby, *Journ. Linn. Soc. London*, (Zool.), XVII, p. 56.

1904. *Anacryptus*, Ashmead, *Mem. Carnegie Mus.*, I, (4), p. 254.

1909. *Anacryptus*, Schmiedeknecht, *Gen. Ins.*, fas. 97, p. 48.

In 1883, Kirby transferred Walker's species *impulsator* from the genus *Epitranus* to his new genus *Anacryptus*. Since then six more species of the genus have been described ; *ferrugineus* from Australia by Girault¹, *insidiosus* from Seychelles, *rufinus*, *kankauensis* and *anpingius* from Formosa by Masi² ; and *sudanensis* from Sudan by Ruschka³. No member of the genus has so far been recorded from India.

The genus is easily distinguished from the closely allied genera *Neoanacryptus* Gir. and *Paranacryptus* Gir. by its 13-jointed antennae (though it appears probable that the antenna is not really 13-jointed, the club being solid, with a reddish transverse band but no suture),

¹ Girault, *Mem. Queensland Mus.*, IV, p. 349, (1915).

² Masi, *Nov. Zool.*, XXIV, p. 123, (1917) ; *Konowia*, XII, pp. 11-15, (1933).

³ Ruschka, in Alfken *Denks. Akad. Wiss. Wien*, XCIX, p. 99, (1924).

basal tooth followed by fine serrations on hind femur and the basal outer tooth of hind tibia.

***Anacryptus chilkaensis*, sp. nov.**

This species differs from all the other species of the genus described so far in having the antennae only 12-jointed (club solid and not bi-articulate as it would appear), the general black colour of body and in the 14 uniform serrations following the large basal tooth on hind femur.

Male.—Length 4.5 mm. General colour of body black. Head black, as broad as thorax; antennal fovea transversely striate; without a distinct sculpture above and behind; sides flat, longitudinally striate, strongly carinate behind and above, where the carina touches the eyes postero-laterally; there is also a slight carina below the eye running obliquely fronto-lateral. Eyes dark reddish brown. Antennae a little less than half the length of body, segments 12 inclusive of one ring joint; scape half the length of antenna, with a slight lateral expansion especially towards the apex; pedicel somewhat longer than the first segment of funicle; ring joint minute, very much wider than long but not as wide as the funicle; first segment of funicle shorter than all the rest and less than half the second, somewhat stouter apically than basally; second segment longest of all funicular segments, of almost uniform thickness throughout; rest of the segments of the funicle subequal, the third being somewhat stouter apically than basally and the last two subquadrate; club almost twice the length of the last funicular segment, reduced towards the apex, with a reddish transverse band in the middle but without a real suture, *i.e.*, the club is solid and not biarticulate as it would appear to be. Thorax black, closely sculptured with large rugose punctation; the large punctae being themselves minutely punctulate; sparsely setose; metathorax without a distinct sculpture. Wings hyaline. All legs dark reddish brown. Hind coxa moderately setose, transversely striate; hind femur somewhat darker than the rest of the hind leg, moderately setose, faintly longitudinally striate, with fourteen small, black, blunt teeth, behind a large basal tooth, first somewhat smaller than the rest. Petiole of abdomen as long as the hind coxa, black except at the apex, where it is brownish; distinctly longitudinally corrugated. Abdomen very dark ferrugineous, smooth and with sparse long hairs.

Type.—One male on pin, with its antenna on slide, No. 909/H 3. In the collections of the Zoological Survey of India, Indian Museum, Calcutta.

Type-locality.—Barkuda Island, Chilka Lake. Coll. N. Annandale, 4-ix-1920. "Hymenopteron with predaceous ants (*Camponotus compressus*) and myrmecophilous crickets from nest in box of books in bungalow"

***Paranacryptus sanguineus* Girault.**

1915. *Paranacryptus sanguineus*, Girault, *Mem. Queensland Mus.*, IV, p. 349.

This species was described by Girault from a specimen, which he records as the female. He describes the first segment of the funicle

as the longest of all the funicular segments in the female. I have before me two males and one female, from Port Blair, Andamans, which agree with Girault's description in every respect, except in that the first funicular segment is not the longest in the female but only in the male. It seems likely that Girault's specimen was really a male. The Andaman specimens are also slightly larger than those described by Girault. I add the following notes as a supplement to Girault's description of the species.

Female.—Length 5 mm. General colour of body mostly dark blood red, more or less blurred with black. Head honey brown, umbilicately punctate and sparsely setose; middle of face without the umbilicate punctation, at the most with a few minute punctulae; viewed in front triangular, with a height six seventh the greatest breadth. Antennae dark reddish brown; scape slender; pedicel about one sixth the scape; ring joint large, much wider than long; third (first funicular) segment about half the length of the other funicular segments, somewhat broader than long; fourth to seventh segments subequal, with their lengths equal to their breadths; eighth and ninth segments each equal to the seventh but somewhat broader; club about half the length of scape, solid, black at the tip, with a dark red stripe across it.

Two males and one female on pins, with the antennae of one male and female on slides. Coll. S. W. Kemp, 15.ii-15.iii.1915, Port Blair, Andamans.

Genus *Arretoceroides* Girault.

1915. *Arretoceroides*, Girault, *Proc. Queensland Ent. Soc.*, XXIX, pp. 241-242.

1915. *Arretoceroides*, Girault, *Mem. Queensland Mus.*, IV, p. 351.

Apparently only one species of this genus, the Australian *A. feralis* Gir., has been described so far. I give below the description of a new species from Ceylon under the name *A. ceylonensis*, sp. nov.

Arretoceroides ceylonensis, sp. nov.

This species is somewhat smaller than *A. feralis* Gir., from which it is further distinguished by the short (broader than long) first segment of the funicle and hyaline wings.

Male.—Length 4 mm. General colour of body black. Head somewhat broader than thorax, black, without any distinct sculpture, rather densely and finely pubescent. Antennae about as long as thorax, dark reddish brown; scape slender, about half the length of antenna; pedicel short; one minute ring joint, broader than long but not as wide as the funicle; first segment of the funicle very short, much broader than long; second to eighth segments subequal; second and third segments longer than broad, rest subquadrate; club a little longer than scape, there is a transverse dark reddish band running near its basal fourth but there is no suture in this region; other funicular segments, except the first also bear similar lines. Pronotum, mesonotum and scutellum black, umbilicately punctate, densely setose; punctation on metapleura somewhat larger than in the other regions. Hind coxa

black, sparsely and indistinctly punctate, rather very densely setose beneath ; other coxae reddish brown. Rest of the legs reddish brown except the hind femur, which is somewhat darker. It is also densely punctulate and finely pubescent, with one large basal tooth followed by ten blunt, black, smaller ones ; last three teeth minute. Wings hyaline. Abdomen oval, reddish brown, blurred by black above, very finely and sparsely punctulate. Petiole of abdomen about three fourths the length of hind coxae, moderately thick and longitudinally corrugated.

Type.—One male on pin with one antenna on a slide, No. 911/H 3. In the collection of the Zoological Survey of India, Indian Museum, Calcutta.

Type-locality.—Peradeniya, Ceylon. Mus. Coll. 14-vii-1910.

A NEW ENCYRTID PARASITE (*CHALCIDOIDEA*: *HYMENOPTERA*) OF A COCKROACH FROM INDIA.

By M. S. MANI, *Zoological Survey of India, Indian Museum, Calcutta.*

Only one Chalcid *Tetrastichus asthenogmus* (Waterst.)¹, parasitic in the eggs of *Periplaneta americana* (Linn.), has so far been recorded from India. Recently, however, I bred an Encyrtid parasite from two oothecae of an unidentified species of cockroach found in old tamarind stored in the kitchen of a Calcutta house. About a dozen males emerged from these oothecae, while two females were caught near an electric lamp at night in the same place. The specimens belong to the genus *Solindenia* Cameron.² Cameron describes the eyes as pilose in this genus, but Ashmead³ and Schmiedeknecht⁴ were correct in considering them as non-pilose. The Indian species, which differs in several important respects from *S. picticornis* Cam., is described below as a new species under the name *S. blattiphagus*.

In view of Cameron's description of the genus *Solindenia* being based on a female only, I give below an amended description of the genus :

Head large, transverse, much broader than thorax in both sexes ; face with rather shallow antennal furrows ; front ocellus placed outside the furrow ; vertex not specially narrow ; large non-pilose eyes converging dorsally ; lateral ocelli placed close to eye border. Antennae long, subclavate towards apex, inserted below the lower level of the eyes, segments cylindrical, 13 in both sexes (scape 1, pedicel 1, ring joint 1, funicle joints 7, club joints 3). Fore femur not much swollen. Tibiae of mid legs with lateral spurs. Tarsal joints of mid legs with minute black teeth. Hind tibiae slightly compressed, with only one apical spur. Hind metatarsus not compressed apically. Abdomen depressed in both sexes, more pronounced in male. Ovipositor hidden or slightly exerted. Wings not hyaline, of a cloudy or brown colour, with a transverse white band in middle.

Genotype.—*S. picticornis* Cam.

***Solindenia blattiphagus*, sp. nov.**

Female.—Length about 3.5 mm. Head metallic green to blue with a coppery lustre at certain angles, sparsely pilose. Mandibles very dark red, tridentate. Palpi testaceous. Scape of antennae brown, slender, about a third of the length of flagellum. Pedicel of antennae about one fourth the length of scape, brownish. Ring joint somewhat broader than long. Funicle black ; segments one to three subequal ; fourth segment shorter than third ; fifth shorter than fourth and about three fourths the length of third ; sixth and seventh segments equal,

¹ Waterston, *Bull. Ent. Res.*, V, p. 340, (1914) ; also see Gahan, *Proc. U. S. N. Mus.*, XLVIII, p. 168, (1914).

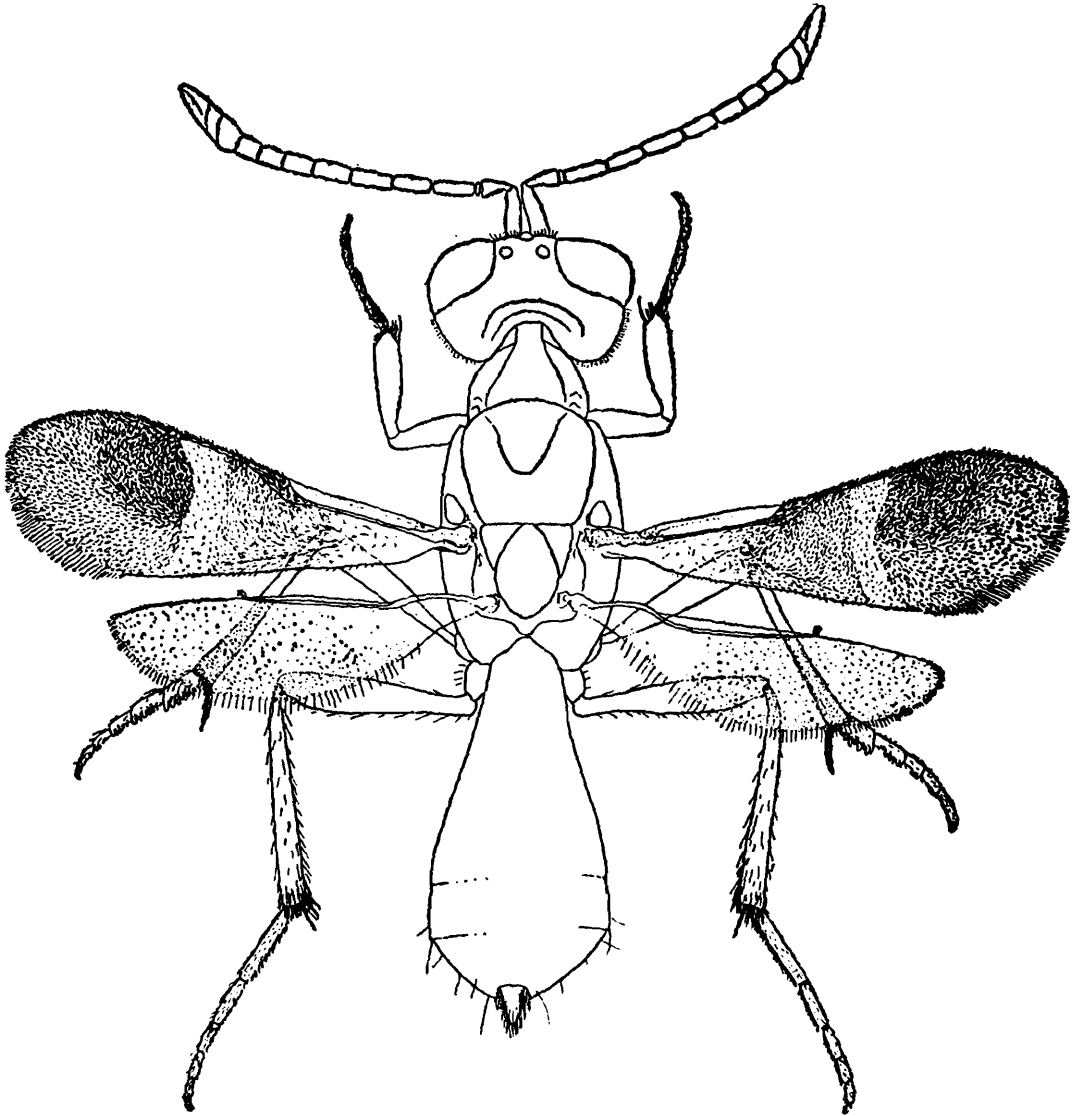
² Cameron, *Trans. Ent. Soc. London*, p. 189, (1883).

³ Ashmead, *Mem. Carnegie Mus.*, I, (4), p. 288, (1904).

⁴ Schmiedeknecht, *Gen. Ins.*, fas. 97, p. 178, (1909).

each a little shorter than fifth and much darker than the rest of the antennae; club about half the length of scape, apical joint longest. Eyes chocolate red. Thorax of a dark honey brown colour. Legs concolourous with thorax. Abdomen black except in the basal one third, which is whitish.

Male.—Length 3 mm. Scape of antennae smoky brown. Scapula black. Legs smoky, mainly testaceous. The whitish colour of the basal part of abdomen is more pronounced than in the female.



Solindenia blattiphagus, sp. nov. Male.

Holotype.—One male in spirit, No. 912/H 3. Emerged from the oothecae of an unidentified species of cockroach found on tamarind stored in the kitchen of a Calcutta house on 26-v-1935. In the collections of the Zoological Survey of India, Indian Museum, Calcutta.

Allotype.—One female in spirit, No. 913/H 3. Caught near an electric lamp at 2 A.M. on 29-x-1935 in the kitchen of a Calcutta house badly infested by cockroaches. In the collections of the Zoological Survey of India, Indian Museum, Calcutta.

Paratypes.—Several males and one female in spirit, No. 914/H 3. In the collection of the Zoological Survey of India, Indian Museum, Calcutta.

FISH OF THE EASTERN DOONS, UNITED PROVINCES.

By SUNDER LAL HORA, D.Sc., F.R.S.E., F.A.S.B., and DEV DEV MUKERJI, M.Sc., Zoological Survey of India, Calcutta.

INTRODUCTION AND REMARKS ON MAHSEER FISHERIES.

During a short tour to the Dehra Dun Hills in September-October 1935, an opportunity was taken to study the ecology and bionomics of the fish fauna of this area. Through the kindness of the officers of the Forest Department and the Dehra Dun Fishing Association we were provided with all facilities for investigating the fish of the Song river and Ray Nadi at Lachhiwala and the Song and Suswa rivers at Satnarain. From the torrential streams in the neighbourhood of Mussoorie specimens of a *Nemachilus* and some young Cyprinid fishes, which cannot be identified, were collected.

The Song and the Suswa are the principal rivers of the Eastern Doons and are fed by a large number of tributary streams, some of which are of considerable dimensions. The rivers flow over broad rocky beds and are characterised by rapids in their courses. With the exception of filamentous algae and aquatic plants in the side pools, the streams are generally devoid of any vegetation. The exposed surfaces of rocks are, however, covered with a brownish, slippery organic growth which provides food for certain types of fish. 20 species of fish were collected from the Song and Suswa rivers and 1 from the Bhatta stream near Mussoorie. In the following table the species are listed; their vernacular names, places of collection in the Eastern Doons and general distribution are also given.

Scientific and Vernacular Names.	LOCALITIES IN THE EASTERN DOONS.		Distribution.
	Lachhiwala : Song and Suswa.	Satnarain : Song and Suswa.	
<i>Amblyceps mangois</i> (Hamilton). <i>Singhi</i> .	×	×	Along the Himalayas to Burma and Siam.
<i>Glyptothorax pectinopterus</i> (McClell.). <i>Patharchatti</i> .	×	..	Simla Hills, Kangra Valley and Dehra Dun Hills.
<i>Danio</i> (<i>Brachydanio</i>) <i>rerio</i> (Hamilton). <i>Salari</i> .	×	×	Throughout India and Burma.
<i>Rasbora daniconius</i> (Hamilton). <i>Bhuri</i> .	×	×	India, Burma, Siam, Ceylon, Andaman Islands to Malay Archipelago.

Scientific and Vernacular Names.	LOCALITIES IN THE EASTERN DOONS.		Distribution.
	Lachhiwala : Song and Suswa.	Satnarain : Song and Suswa.	
<i>Barilius bendelesis</i> var. <i>chedra</i> (Hamilton). <i>Chilwa</i> .	×	×	Simla Hills, along the Himalayas to Assam.
<i>Raiamas bola</i> (Hamilton). <i>Balala</i> or <i>Naulia</i> .	×	..	Punjab, United Provinces, Orissa, Bengal, Assam and Burma.
<i>Barbus ticto</i> (Hamilton). <i>Bhuri</i> or <i>Poto</i> .	×	..	Throughout India, Burma, Siam and Ceylon.
<i>Barbus chagunio</i> (Hamilton). <i>Pathali</i> .	×	×	Dehra Dun Hills, Eastern Himalayas, Assam and Burma.
<i>Barbus tor</i> (Hamilton). <i>Makhni</i> .	×	×	Throughout India, Burma and Ceylon.
<i>Barbus putitora</i> (Hamilton). <i>Mahseer</i> .	×	×	Along the Himalayas to Assam and Burma.
<i>Labeo dero</i> (Hamilton). <i>Moili</i> or <i>Kalabans</i> .	×	×	Sind Hills and along the Himalayas to Assam Burma and Ceylon.
<i>Crossochilus latius</i> (Hamilton).	..	×	Gangetic watershed of the Himalayas.
<i>Garra gotyla</i> (Gray). <i>Dhanaura</i> .	×	×	Southern slopes of the Himalayas.
<i>Lepidocephalichthys guntea</i> (Hamilton). <i>Nauni</i> .	..	×	Throughout Northern India.
<i>Nemachilus botia</i> (Hamilton). <i>Nauni</i> or <i>Ghiwa</i> .	×	×	Throughout Northern India and Burma.
<i>Nemachilus rupecola</i> (McClell.).*	..	..	Simla Hills, along the Himalayas to the Naga Hills.
<i>Nemachilus scaturigina</i> (McClell.).	×	..	Dehra Dun Hills, Eastern Himalayas and Assam.
<i>Nemachilus savona</i> . (Hamilton).	×	..	Dehra Dun Hills, Kosi River, Eastern Himalayas.
<i>Mastacembelus armatus</i> (Lacépède). <i>Bam</i> or <i>Guj</i> .	×	×	Throughout the plains and hills of India, Ceylon and Burma to China.
<i>Xenentodon cancila</i> (Hamilton). <i>Sua</i> .	×	×	Throughout India, Burma and Ceylon.
<i>Ophicephalus gachua</i> Hamilton. <i>Dawla</i> .			Oriental region.

* Specimens of the species were collected from Bhatta Falls, Mussoorie,

It will be seen from the above that there is no endemic species in these waters, but the records of *Amblyceps mangois* (Ham.), *Barbus chagunio* (Ham.), *Garra gotyla* (Gray), *Nemachilus scaturigina* (McClell.) and *N. savona* (Ham.) from this area are of exceptional interest. With the help of this collection and observations made in the field, it has been possible to establish the identity of the 3 species of large-scaled Barbels described by Hamilton from the sub-Himalayan region. The specific limits of *Barbus tor* are defined and it is shown that the correct scientific name for true *Mahseer* is *B. putitora* (Ham.). Reasons are adduced for the adoption of the name *Raiamas bola* (Ham.) for the "Trout" of these parts. Ecological, biological and taxonomic notes on 14 species are added.

Though all fish found in these parts are relished as food, 5 species, viz., *Barbus putitora*, *B. tor*, *B. chagunio*, *Labeo dero* and *Raiamas bola*, are of special economic importance. The anglers are, however, mainly interested in *Mahseers* (*B. putitora* with yellow fins and *B. tor* with red fins) and "Trout" (*R. bola*). Our investigations have shown that these species, though living in a more or less similar environment, do not compete with one another for food. *Labeo dero* feeds on slimy growth converging rocks and stones, and, probably on account of meagre nourishment in this substance, its alimentary canal is 14 to 15 times as long as the total length of the fish. *B. tor* is primarily a vegetable feeder but its menu also consists of insect larvae and young gastropod molluscs; its alimentary canal is 4 to 5 times as long as the total length of the fish. The feeding habits of *B. putitora* are more or less similar to those of *B. tor* but the relative length of its alimentary canal—2.6 times as long as the length of the fish—indicates that more animal food is taken by this species than *B. tor*. *B. chagunio* is primarily carnivorous as its alimentary canal is less than twice the length of the fish. *Raiamas bola* appears to be entirely carnivorous; its alimentary canal is shorter than its length.

In the course of the tour it was brought to our notice by the Secretary of the Dehra Dun Fishing Association that the supply of *Mahseer* in the Association waters is steadily decreasing. This decrease is attributed by the Association to two main causes: (i) "the Canal works on the Ganges and Jumna. Fish run down but cannot get up to the smaller streams again. It is true 'fish ladders' have been provided at places like Bhimgoda and Myapur where the Northern Ganges canals take off but no one believes that fish of any size can come up these ladders." (ii) *Mahseer* "are now crowded out by fish like the *Kalabanse* (*Labeo dero*) and that there is now insufficient food for the *Mahseer* in our rivers." We have indicated above that there is absolutely no competition for food between *Barbus putitora* or *B. tor* and *Labeo dero*. The decrease in the *Mahseer* supply cannot, therefore, be attributed to the preponderance of *L. dero*. Irrigation works, on the other hand, are known to have affected fisheries all over India and in the case of migratory fishes, such as *Mahseer*, their influence would be particularly pronounced. For details reference may be made to Day's "Report on the Fresh Water Fish and Fisheries of India and Burma" (pp. 7-14, 32-33, Calcutta: 1873). We have received a similar complaint from the

Laldacca Fishing and Shooting Association. The decrease in the number of *Mahseer* in the area under this Association is attributed to "the practice of placing semi-permanent weirs across the lower reaches of hill rivers when these fall to their cold weather level, whereby no fish can run down-stream without first evading the traps and nets which are placed in the gaps left for that purpose in the weirs by the khas mahal fishermen, who erect them." Such 'fixed engines' do incalculable harm to fisheries in general, but are particularly harmful in the case of migratory forms such as the *Mahseer*.

In collecting fish we employed the following methods: (i) A small bag-net fixed to a bamboo pole was used for collecting fish from small channels and from the shallower parts of larger streams. (ii) Portions of small streams were dammed both above and below a small area selected for fishing and the bed between the dams was allowed to run dry. From the small pools thus formed and by turning over stones in the dry bed a large number of fish, mostly of small size, were collected. (iii) Cast net was used along the sides of streams and the majority of our specimens over 6 inches in length were collected in this way. We had no appliances to collect fish either from the deeper parts of the streams or from the middle of the streams where the current was flowing very fast. This explains the absence from our collection of the adults of typical hill-stream fishes and the preponderance of young and half-grown specimens.

Judging from our collection as a whole and subject to the limitations stated above, it seems clear that these streams provide suitable nurseries for *Mahseer*, for we found all small channels and sides of larger streams teeming with the young of *Barbus putitora* and *B. tor*. Half-grown specimens of both the species, mostly under one foot in length, were also plentiful at the sides of the streams but anglers, who are interested in larger fish, report that the supply of such fish has decreased considerably during recent years. These apparently contradictory statements may be explained as follows: The *Mahseers*, as is well known, breed in the streams of the sub-Himalayan range to which they ascend during the south-west monsoon period when these streams are flooded. After breeding the parent fishes return to the main rivers but the young apparently spend the first year in the mountainous streams. As a result of obstruction by the irrigation works only very few individuals probably can ascend to their breeding grounds but even these seem to produce sufficient ova for populating the streams with young and half-grown forms. When the adults begin to descend with the fall of water, weirs obstructing the courses of the streams divert them into irrigation canals and here, having descended over one of the vertical falls, they are, in the majority of cases, unable to return to their breeding-grounds. Such effects of the irrigation works, if continued over a period of several years, are sure to impoverish the fisheries. In the Eastern Doons, though the *Mahseers* have admittedly decreased in number, the damage does not appear to be very great, for the number of young ones in the upper streams is fairly large, while the River Ganges at Hardwar, Rishikesh and Lachmanjhula is full of large *Mahseers*, which probably help year after year in the restocking of the upper smaller streams. If, however, the proper

conservation of this fisheries is desired, early steps should be taken to allow a free passage up and down the main river, at certain periods, of the migrating individuals.

We take this opportunity to record our sincere thanks to Mr. J. E. C. Turner, I.F.S., Divisional Forest Officer, Mr. I. N. Sewal, Extra-Assistant Conservator of Forests and Mr. P. S. Quarry, Honorary Secretary, Dehra Dun Fishing Association, for their kind help and invaluable suggestions in the course of our investigations.

SYSTEMATIC ACCOUNT AND BIONOMICS.

***Amblyceps mangois* (Ham.).**

1933. *Amblyceps mangois*, Hora, *Rec. Ind. Mus.*, XXXV, p. 617.

There are 11 young specimens of *Amblyceps mangois* in our collection, the largest being 73 mm. in total length. They were collected from the Song and Suswa rivers by damming streamlets in their beds. The remarkable feature of these specimens is that the caudal fin is deeply forked and the upper lobe is considerably longer than the lower; this form of the fin corresponds with that figured by Hamilton in his manuscript drawing of the species¹.

A. mangois is found along the Himalayas and its range extends to Burma and Siam.

***Glyptothorax pectinopterus* (McClell.).**

1923. *Glyptothorax pectinopterus*, Hora, *Rec. Ind. Mus.*, XXV, p. 18.

Of the 13 young specimens of *Glyptothorax pectinopterus* in our collection, 3 were obtained from a small canal below the Forest Rest House at Lachhiwala, while the others were collected from the Song river. The largest specimen is about 30 mm. in length. It seems probable that the adults live in stronger and deeper currents whence collections could not be made with the appliances available to us.

In the young specimens the outer rays of the paired fins are not striated and the adhesive disc on the chest is more extensive. The specimens from the canal are somewhat lighter in colour, otherwise the colour marks are the same as those of the adult (Hora, *op. cit.*).

G. pectinopterus has hitherto been known from the Simla Hills and the Kangra Valley.

***Barilius bendelisis* var. *chedra* (Ham.).**

1921. *Barilius bendelisis* var. *chedra*, Hora, *Rec. Ind. Mus.*, XXII, p. 189.

Barilius bendelisis var. *chedra* is a very common fish in the larger streams of the Eastern Doons; we collected a large number of young,

¹ Reproduced by Hora in *Mem. Ind. Mus.*, IX, p. 188, fig. 4, pl. xxii, (1929).

half-grown and adult specimens of the species. It prefers a sandy bed. Its paired fins, especially the pectorals, are fan-like and horizontal and are never folded even when the fish moves from place to place. Some of the rays are especially strengthened and it seems likely that they are used either for digging in sand or for holding on to rocks in somewhat rapid waters.

B. chedra feeds on algae and the insects that are found among them. It is used by anglers as a bait for *Raiamas bola* and *Barbus putitora*. It is common in all large streams at the base of the Himalayas and in Assam.

***Raiamas bola* (Ham.).**

1878. *Barilius bola*, Day, *Fish. India*, p. 594, pl. cxlix, fig. 4.

Raiamas bola is the species that is known as "Trout" by anglers in the Dehra Dun District and is very much sought for. It is, however, not so abundant as *Barbus tor*, *B. putitora*, *B. chagunio* and *Labeo dero*. We obtained only 4 specimens from the Song river, the largest being 28.5 cm. in total length.

The colouration varies with age. In young specimens about 13 cm. in length there is a series of 15-17 short bars between the superior angle of the gill-opening and the base of the caudal fin. In between these bars there are indications of a second row alternating with the first. The posterior border and the middle of the lower lobe of the caudal fin is gray. With the growth of the fish the marks become rounded and are distributed in several rows on the body and in our two large specimens they are found on the head also. Judging from the descriptions of colour markings, it seems probable that *Cyprinus bola* of Hamilton¹ is in reality a juvenile form of his *C. goha*.

The alimentary canal is short and the walls of the stomach are greatly folded. The stomach was empty in most of the specimens but remains of a dragon-fly were found in one.

Though Hamilton included his *C. bola* in the *Barilius* group, it has been rightly assigned to a separate genus by Günther² and recent workers. Günther unfortunately proposed for it the generic name *Bola* which had already been used by Hamilton for a group of marine and estuarine fishes with *Bola coitor* Hamilton as the type of the genus. To correct Günther's error, Jordan³ proposed the name *Raiamas* but Chaudhuri,⁴ without looking properly into the contention of Jordan, revived the generic name *Bola* for this species and erroneously considered *C. bola* and *C. goha* as distinct species.

Raiamas bola is confined to the hilly parts of the Punjab, United Provinces, Orissa, Bengal, Assam and Burma.

¹ Hamilton, *Fish Ganges*, pp. 274, 275 (1822).

² Günther, *Cat. Fish. Brit Mus.*, VII, p. 263 (1868).

³ Jordan, *Proc. Acad. Nat. Sci. Philadelphia*, LXX, p. 344 (1919).

⁴ Chaudhuri, *Rec. Ind. Mus.*, XIX, p. 29 (1920).

***Barbus chagunio* (Ham.).**1878. *Barbus chagunio*, Day, *Fish. India*, p. 559, pl. cxxxvi, fig. 1.1933. *Barbus chagunio* Hora & Mukerji, *Journ. & Proc. As. Soc. Bengal* (N. S.), XXVII, pp. 137-139.

We have already indicated that *Cyprinus chagunio* Ham.¹ and *Barbus spilopholus* McClelland² are conspecific and that their distinguishing features are in reality secondary sexual characters. The male specimens of the species (*spilopholus*-type) had hitherto been collected from Assam and the Eastern Himalayas, while the females (*chagunio*-type) were recorded by Day "From Orissa, throughout Bengal, Assam, Behar and N. W. Provinces to the Punjab" In the Eastern Doons this species is very common and both the sexes are represented in our collection. The local fishermen, who are aware of these sex differences, use the same vernacular name for both the sexes. We preserved only 16 specimens, 12 females and 4 males, and did not keep the large number of female specimens that were collected from the Song and Suswa rivers. We have already remarked on the rarity of the male examples in museum collections, and our field experience clearly shows that females predominate in nature.

From an examination of its stomach contents, it appears that the fish feeds on Trichopterous and Chironomid larvae that live in tubes made of sand or gravel particles. Small gastropods are also scraped off the rocks. In two cases the stomach was found to be empty showing that the fish probably feeds intermittently. The length of the intestine is about 1.7 times the total length of the fish ; this also shows that the fish is not herbivorous.

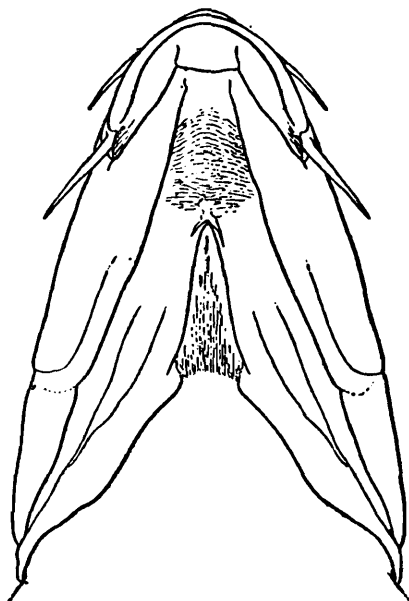
According to a local belief, *B. chagunio* does not migrate over long distances ; its movements are confined within a narrow limit depending upon the quantity of water in the rivers at different seasons.

***Barbus tor* (Ham.).**1822. *Cyprinus tor*, Hamilton, *Fish. Ganges*, pp. 305, 388.1839. *Barbus hexastichus*, McClelland, *As. Res.*, XIX, pp. 269, 333, pl. xxxix, fig. 2.1878. *Barbus hexastichus*, Day, *Fish. India*, p. 565, pl. cxxxvi, fig. 4.

Great confusion prevails regarding the large-scaled Barbels of India and the specific name *tor* appears to have been indiscriminately used for several forms with 4 barbels, large scales and a strong and smooth last undivided ray in the dorsal fin. The vernacular name *Mahseer*, which is commonly applied to these large fishes, has also been responsible for a certain amount of confusion. While the systematic treatment of this group of fishes will form the subject matter of a separate monograph, sufficient material from along the southern slopes of the Himalayas and Assam is now available to discuss the specific limits of Hamilton's

¹ Hamilton, *Fish. Ganges*, p. 295 (1822).² McClelland, *As. Res.*, XIX, pp. 272, 341, pl. xxxix, fig. 4 (1839). It is worthy of remark that McClelland was aware of the close association of his *spilopholus* with *chagunio*, for he regarded the latter as a synonym of the former.

three species with “*squamis maximis*”, viz., *Cyprinus putitora*, *C. tor* and *C. mosal*, which are usually regarded as conspecific.



TEXT-FIG. 1.—*Barbus tor* (Ham.) from Eastern Doons. Ventral surface of head showing nature of lower lip and jaws. Nat. size.

Judging by modern standards Hamilton's descriptions are inadequate and though his figures are usually reliable, apparently he made no drawing of *C. putitora*, the largest of the carps described by him. The drawings of the other two species were published by Gray¹ from Hamilton's collection of manuscript drawings. If all the characters in the descriptions of the three species are tabulated, it is found that *C. putitora* and *C. mosal* have much in common and are abundantly distinct from *C. tor* (text-fig. 1). In *C. putitora* and *C. mosal* the dorsal surface in front of the dorsal fin slopes and forms a sharp ridge, whereas in *C. tor* the surface in front of the dorsal fin has a blunt or convex edge. While examining fresh specimens we could very easily separate the yellow-finned form and the red-finned form, and these colour groups could be further distinguished by certain well marked taxonomic characters. In the specimens with red fins, the length of the head is contained more than 4 times and the depth of the body less than 4 times in the total length without the caudal, whereas in the examples with yellow fins the length of the head is less than 4 times in the total length without the caudal. Among the yellow-finned form there are two types: (i) The lips are fleshy and the lower one is produced backwards into a long fleshy appendage; the snout is blunt. (ii) The lips are of the normal type and the lower lip does not form an appendage; the snout is rather pointed. We believe that these differences are correlated with sex; the former type represents the male and the latter the female (text-fig. 2). As these are the differences on which Hamilton separated *C. putitora* from *C. mosal*, we regard them as conspecific and on account of page priority adopt the former name for the species. This fish is popularly known as *Mahseer* in the Eastern Doons whereas *B. tor* is known as *Makhni*. It is stated by Hamilton that his *C. putitora* grows to about 9 feet while the female

¹ Gray, *Ill. Ind. Zool.* I, pl. xciii, fig. I, & II, pl. xcvi, fig. 1. (1832).

of the same (= *C. mosal*) grows to about 5 feet. *B. tor* is a smaller species attaining 3 to 4 feet in length.

B. tor is a common food fish and by the local people it is believed to be more powerful than *Mahseer*, *B. putitora*. The intestine is moderately long and convoluted; its length is equal to about 4.5 times the total length of the fish. It feeds preferably on filamentous algae and water plants, but in some cases young Gastropod molluscs, sand and gravel were found among the stomach contents. The young specimens were found to feed on slimy matter encrusting rocks and stones.

From the presence of a large number of young specimens in our collection, it would appear that the fish breeds in August-September. The fry is characterised by a black spot before the base of the caudal fin.

According to Day, this species is found in "Rivers on and around Himalayas, Cashmere, Sikkim and Assam"

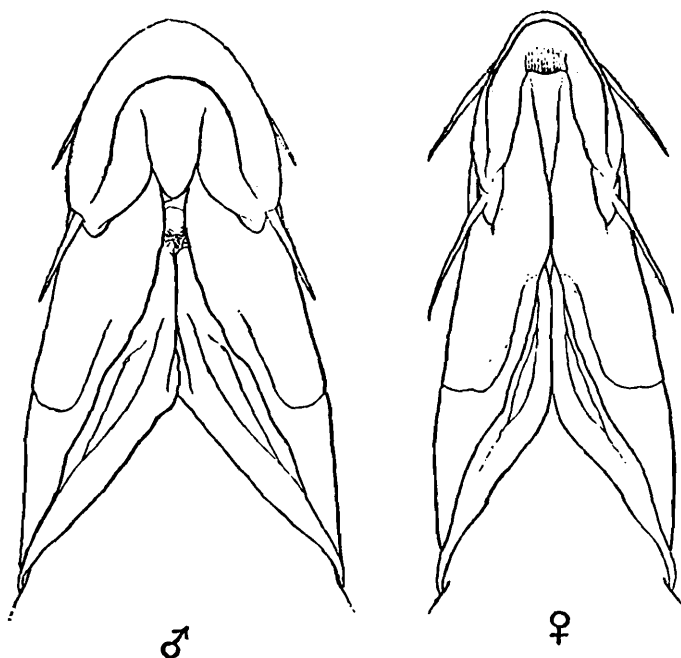
***Barbus putitora* (Ham.).**

1822. *Cyprinus putitora*, Hamilton, *Fish. Ganges*, pp. 303, 388.

1822. *Cyprinus mosal*, Hamilton, *Fish. Ganges*, pp. 306, 388.

1878. *Barbus tor*, Day (in part), *Fish. India*, p. 564, pl. cxxxvi, fig. 5 & pl. cxl, fig. 1.

Under *Barbus tor* we have referred to the systematic position of *B. putitora*, but it may be mentioned here that this species is the celebrated *Mahseer* of India. In its habits it corresponds with *B. tor* and it is probable that these two species compete for food in the same environment. Both the species were equally abundant in the streams at



TEXT-FIG. 2.—*Barbus putitora* (Ham.) from the Eastern Doons. Ventral surface of head of ♂ and ♀ showing sexual dimorphism in nature of both upper and lower lips and jaws. $\times ca \frac{2}{3}$.

Lachhiwala and Satnarain, but in the deeper waters of the Ganges *B. putitora* seemed to predominate.

In most of the specimens dissected, the stomach was found to be empty showing that the feeding is probably intermittent in this species. The alimentary canal is considerably shorter than that of *B. tor*, being 2.6 times as long as the length of the fish. The fish feeds on green filamentous algae, insect larvae, water plants, slimy matter from rocks, etc. Judged by the length of its intestine, it would appear to be more carnivorous than *B. tor*.

B. putitora is represented by a large number of young specimens in our collection. This species also seems to breed in August-September. The fry is provided with a black spot in front of the base of the caudal fin.

The species is said to be widely distributed in India and Burma, but till the large-scaled Barbels are revised it is difficult to form an exact idea of its range.

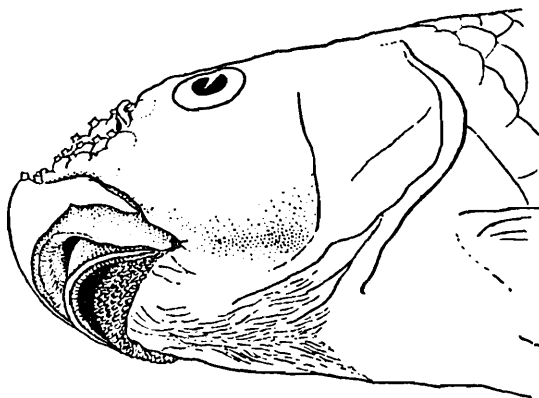
***Labeo dero* (Ham.).**

1822. *Cyprinus dero*, Hamilton, *Fish. Ganges*, pp. 277, 331, 385.

1878. *Labeo diplostomus*, Day, *Fish. India*, p. 540, pl. cxxix, fig. 2.

Labeo dero is a common fish of the Eastern Doons and is highly esteemed as food. We preserved 18 young, half-grown and adult specimens of the species from the Suswa and Song rivers. Day had some hesitation in regarding *L. dero* and *L. diplostomus* as conspecific, but an examination of a large number of specimens from the Tista Valley and the Dehra Dun Hills makes it abundantly clear that the two forms are identical and that the differences between them are probably due to the age of the specimens on which the original descriptions were based.

L. dero usually lives along the sides of streams and feeds by "licking" off slippery growth from the rocks. Fishes were noticed to settle on rocks and apply their mouths closely to them; then they moved round and round the rocks till the slimy growth was polished off from them. The intestines of several specimens examined were found to be full of this slimy stuff. The alimentary canal is very long and convoluted; its length being 14 to 15 times as much as the total length of the fish.



TEXT-FIG. 3.—*Labeo dero* (Ham.) from the Eastern Doons. Ventro-lateral view of head showing sharpness of lower jaw and papillated nature of inner surface of lower lip (deflected). Nat. size.

The lower jaw is sharp and blade-like (text-fig. 3) and the lip is free from the jaw. The dorsal surface of the lower lip is covered with large,

spinose papillae. When the fish begins to feed, it seems probable that, during the forward movements of the fish, the lower lip is turned over and the papillae come in contact with the rock. In all probability they enable the fish to keep its mouth closely applied to the rock.

L. dero can be readily caught with cast nets and is commonly used by anglers as bait for *Barbus putitora* and *Raiamas bola*. It is the well-known *Kalabans* of the sportsmen of this area.

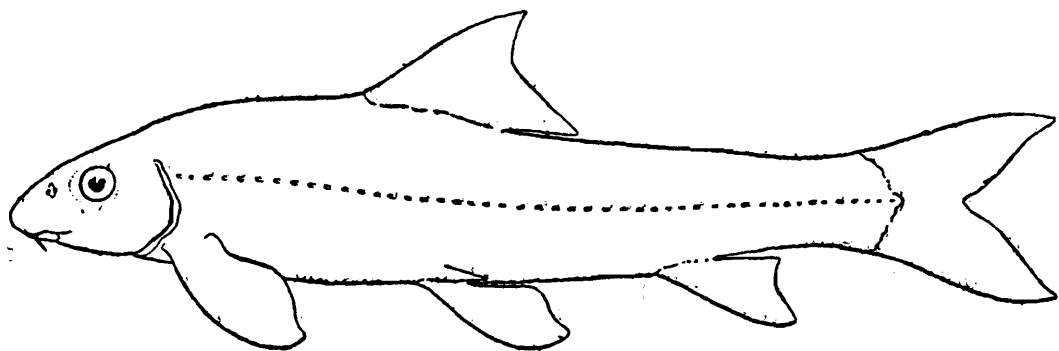
L. dero is found in the Sind hills, all along the Himalayas and Assam.

***Crossochilus latius* (Ham.).**

1934. *Crossochilus latius* (forma typica), Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, p. 50.

We obtained two fine examples of *Crossochilus latius* from the Song river at Satnarain; the larger specimen is about 20.5 cm. in total length. These examples correspond with the typical form (text-fig. 4) of the species as recently restricted by one of us (Mukerji, *op. cit.*).

The sides and the front part of the snout are covered with small, spiny tubercles. The body is irregularly marked with a number of dark spots.



TEXT-FIG. 4.—Lateral view of *Crossochilus latius* (Ham.) forma typica from the Eastern Doons. $\times \frac{1}{2}$.

The feeding habits of this species correspond with those of *Garra gotyla* (*vide infra*). The food seems to be ingested in lumps so that the alimentary canal presents a beaded appearance. The food consists of algae and algal slime which are scraped from rocks. It would thus appear that *Garra* and *Crossochilus* compete for food. *Garra* is, however, equipped for life in stronger currents where it can use its vacuum sucker for attachment; while *Crossochilus*, as a rule, frequents less rapid currents. It was remarked by one of us¹ that *Garra* may have evolved from *Crossochilus*-like ancestors. The observations on the feeding habits of the two forms seem to lend further support to this view.

The typical *C. latius* is found in the Gangetic watershed of the Himalayas; the Assamese and Burmese form is more allied to it than the Punjab form² which has quite a different facies.

¹ Hora, *Rec. Ind. Mus.*, XXII, p. 646 (1921).

² Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, p. 53, fig. 7 (1934).

Garra gotyla (Gray).1921. *Garra gotyla*, Hora *Rec. Ind. Mus.*, XXII, p. 653.

In his revision of the fishes of the genus *Garra*, Hora remarked as follows concerning the validity of *G. gotyla* :—

“ It is after long hesitation and not without reserve that I recognise this species as valid. Gray has not given any description of his species, but as most of his figures are made from specimens collected in Northern India, I have referred the North Indian specimens with a well-developed proboscis to this form.”

24 specimens of *G. gotyla* were collected by us from the Song and Suswa rivers. The Fishing Guard at Lachhiwala, a native of Garhwal, gave us *Gotyla* as the vernacular name of the species, thus leaving no doubt that the name has been rightly applied to the Himalayan species with a well-developed proboscis. The proboscis is present in both the sexes and even in young specimens, about 53 mm. in total length, it is fairly prominent. In a specimen about 38 mm. in length a transverse groove is present but there are no tubercles on the snout.

In young specimens, besides the normal colouration of the species, there is a vertical band extending in width over two to three scales and situated slightly in front of the base of the caudal fin. The characteristic dark mark near the superior angle of the gill-opening is also much deeper in colour.

The alimentary canal presents a beaded appearance, and it seems likely that each bead represents a morsal of food taken by the fish. *Garra* feeds by scraping algal matter from rocks and it appears probable that the food is collected between the rostral hood and the posterior jaw. Probably when sufficient food had been collected, only then it is ingested. In this way lumps of food are taken in at a time and passed along the alimentary canal.

G. gotyla is found along the southern slopes of the Himalayas. The largest specimen in our collection is 16 cm. in total length.

Nemachilus rupecola (McClell.).1935. *Nemachilus rupecola*, Hora & Mukerji, *Rec. Ind. Mus.*, XXXVII, p. 400, figs. 4 & 5.

In our recent account of the fishes of the Naga Hills, we referred to the variability of *Nemachilus rupecola* originally described from the Simla Hills. The specimens recently collected by us from the Bhatta falls, Mussoorie, agree with the typical form but are provided with several series of spots on the dorsal and caudal fins. A few marks are usually present on the dorsal and caudal fins in specimens collected from the clear streams of the Western Himalayas, while the rich colouration of the Mussoorie examples is probably correlated with the thick growths of filamentous algae in the Bhatta falls. The specimens from the Eastern Himalayas and the Naga Hills, which were collected from among bare rocks, have the fins dusky in the middle but there are no spots on them.

A very large number of young specimens was collected showing that the fish breeds after the rains.

The stomachs of the larger specimens are full of filamentous algae and the Trichopterous larvae that are found among them.

The range of *N. rupecola* extends from the Simla Hills along the Himalayas to the Naga Hills. The largest specimen in our collection is about 90 mm. in total length. From field observations in the Tista Valley and the Dehra Dun Hills, it seems probable that this species is found in precipitous streams where it lives in pools and channels below waterfalls.

***Nemachilus scaturigina* (McClell.).**

1935. *Nemachilus scaturigina*, Hora, *Rec. Ind. Mus.*, XXXVII, p. 64, pl. iii, figs. 7 & 8.

The specific limits of *Nemachilus scaturigina* were recently defined by one of us and a description was given from specimens collected in the Eastern Himalayas and Assam. We have now collected 20 specimens from the Song river at Lachhiwala and it seems probable that the species is widely distributed along the base of the Himalayas.

***Nemachilus savona* (Ham.).**

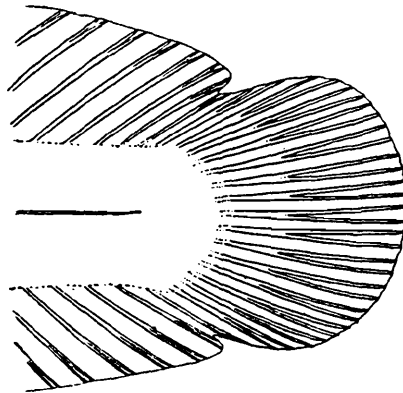
1935. *Nemachilus savona*, Hora, *Rec. Ind. Mus.*, XXXVII, p. 56, pl. iii, figs. 3 & 4.

Recently one of us defined the specific limits of *Nemachilus savona* and remarked that "It seems probable that this species has a wide range in the small, rapid and clear streams of the eastern sub-Himalayan region." There are 3 specimens in our collection from the Eastern Doons which belong to this species and it seems probable that it is widely distributed along the entire base of the Himalayas in suitable places.

***Mastacembelus armatus* (Lacép.).**

1877. *Mastacembelus armatus*, Day, *Fish. India*, p. 340, pl. lxxiii, fig. 2.

Mastacembelidae or Ditch-eels are usually found in great abundance in marshy areas, but certain species appear to be equally at home in clear waters of hill streams where they live at the bottom among stones and boulders. We collected a large number of young, half-grown and



TEXT-FIG. 5.—*Mastacembelus armatus* (Lacép.) from the Eastern Doons. Tail region of a young specimen showing incomplete union of dorsal and anal fins with caudal fin. $\times 4\frac{1}{2}$.

adult specimens of *Mastacembelus armatus* from the Song and Suswa rivers. As pointed out by Day the colouration varies considerably in

this species and from the material before us it appears that the young are more gaudily coloured and the colour pattern is very variable ; with the growth of the fish the colour markings become restricted and in some specimens fade out altogether.

Usually the dorsal and the anal fins are continuous with the caudal but in some specimens, especially the young ones (text-fig. 5), there are shallow notches between these fins.

M. armatus is a predaceous fish ; in the earlier stages it feeds on insect larvae and small prawns while as an adult it feeds on other fish. A specimen of *Nemachilus botia*, 60 mm. in length, was found in the stomach of a fish 375 mm. long ; while another specimen, 335 long, had a *Barilius*, 50 mm. in length, in its stomach. The alimentary canal is about three-fifths of the total length of the fish.

M. armatus is a widely distributed species ; its range extends from Sind, throughout India to Burma and China. It is found in the fresh and brackish waters of the plains and hills of India.

ISOPODS COLLECTED BY THE R. I. M. S. "INVESTIGATOR".

By K. H. BARNARD, D.Sc., F.L.S.,
South African Museum, Cape Town.

Whereas some of the Amphipods collected by the R. I. M. S. "Investigator" were described by Giles, the major part of the collection of Isopods has remained hitherto unworked, though the noteworthy capture of *Bathynomus giganteus* has been recorded [Wood-Mason and Alcock, *Ann. Mag. Nat. Hist.* (6) VII, p. 270; and Alcock, 1902, *A Naturalist in Indian Seas*].

For the privilege of studying this very interesting collection I have to thank the Director of the Zoological Survey of India and Dr. B. Chopra.

The collection contains littoral, shallow-water and deep-water species from localities in the whole Indian region extending from the Mergui Archipelago in the east to the Arabian Sea and mouth of the Persian Gulf in the west. Numerous shallow water Isopods have been recorded from this area. The early collectors contributed to the museums of Europe specimens from India and the East Indies, which were described by Milne-Edwards, Heller, Bleeker, Schioedte and Meinert, Miers, Hansen, and others. The expeditions of Stanley Gardiner to the Maldives and Laccadives (1899-1900), of Herdman to Ceylon a few years later, and of H. M. S. "Sea Lark" to the Chagos and Seychelles groups in 1905 made most important collections, which were reported on by Stebbing. In later years the Chilka Lake Isopods were described by Chilton. These are only the major contributions to our knowledge of the Isopods of the Indian coasts and seas. The fauna-list (excluding Epicaridea and Oniscoida, but including Tanaidacea) of the Indian, Arabian, and East African regions north of the Seychelles and Zanzibar contains approximately 100 species.

With the exception of *Bathynomus*, however, no deep-water forms have been recorded from this area. Barring the German Deep-sea Expedition ("Valdivia"), which crossed the Indian Ocean from Sumatra to Ceylon and Zanzibar, and whose results as regards Isopods have not been published, the "Investigator" is the only ship which has worked the deeper parts of this region, until the recent cruises of the John Murray Expedition in the western portion.

The "Investigator" made some interesting and unexpected captures, even more unexpected than the finding of the West Indian *Bathynomus* in the Arabian Sea. *Pleopodias* and *Livoneca propinqua* are not unexpected having been found in the region of the Philippine Islands, but the presence of the Arctic *Aega ventrosa* is very surprising. It would probably be straining speculation too far to regard this latter species as a relic from the days of the Cretaceous-Tertiary sea of Tethys.

The much more easily explained connection between the Indian and South African regions is exemplified by the more or less pelagic species *Cirolana hirtipes* and *Cleantis natalensis*.

The collection contains 34 species. Seven species are described as new, one of which is a littoral woodlouse necessitating the institution of a new genus in the Detonidae. Two singleton specimens of *Cirolana* and some juvenile Cymothoids and Sphaeromids are not specifically identifiable.

Family ANTHURIDAE.

Barnard, 1925, *J. Linn. Soc. Lond.* XXXVI, p. 109 (revision).

Accalathura Brnrd.

Barnard, *l. c.*, p. 147.

Accalathura gigas (Whitel.).

Whitelegge, 1901, *Austr. Mus. Mem.* IV, p. 225, figs. 19a-e.

Stebbing, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 91, pl. vii (*A. sladeni*).

Barnard, 1925, *l. c.*, p. 148.

Locality.— $\frac{6407}{3}$ East of the Terribles, 13 fathoms (Arakan, Lower Burma). 1 ovig. ♀, 19 mm.

Remarks.—Contrary to the South Australian ♀ specimen, which had 3 pairs of oostegites, this ♀ has 4 pairs (on segments 2-5). Eyes well developed.

Distribution.—New South Wales (*gigas*); Seychelles and South Australia (*sladeni*).

Family EURYDICIDAE.

(Cirolanidae auct.)

Stebbing, 1905, *Herdman's Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 10.

Monod, 1930, *Ann. Sci. Nat. Zool.* (ser. 10) XIII, pp. 129-183.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 147, (Cirolaninae).

Eurydice Leach.

Monod, *l. c.*, p. 169.

Nierstrasz, *l. c.*, pp. 147, 148.

Remarks.—Nierstrasz includes *Cirolana latistylis* Dana in this genus. If Dana's species really is an *Eurydice* then it seems that Vanhöffen's Simonstown specimen (1914, *Deutsch Südpol. Exp.* XV p. 505 (fig. 41) is wrongly identified, for the figure is certainly not that of a species of this genus but looks more like an *Argathona*.

Eurydice orientalis Hansen.

Hansen, 1890, *Vid. Selsk. Skr.* (ser. 6) V, pp. 369, pl. vi, figs. 2-2h.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 8.

Nierstrasz, 1930, *Mem. Mus. d'Hist. Nat. Belge.* III, p. 3, fig. 1.

Id., 1931, *l. c.*, p. 147.

Hale, 1933, *Ann. Mag. Nat. Hist.* (10) XI, p. 558.

Locality.—St. 582, 11° 13' 50" N. 98° 11' 40" E., 12 fathoms. (Mergui) 2 ♂♂ 4-5 mm. 2 juv. 2.75-3 mm.

Distribution.—Java (Hansen); Philippine Islands (Richardson); East Indies (Nierstrasz); Low Isles, Gt. Barrier Reef (Hale).

Cirolana Leach.

Nierstrasz, 1931, *l. c.*, p. 149 seq.

***Cirolana elongata* M. Edw.**Milne-Edwards, 1840, *Hist. Nat. Crust.* III, p. 236.Hansen, 1890, *l. c.*, p. 345, pl. iii, figs. 4-4l.*Id.*, 1895, *Plankton Exp.* II G., p. 12.Thielemann, 1910, *Abh. K. Bay. Ak. Wiss.* II Suppl. Bd., p. 14.Nierstrasz, 1931, *l. c.*, p. 151.*Localities*—

St. 492, 12° 58' 15" N. 97° 50' 45" E. ca. 30 fathoms. (Mergui)

3 ♂♂ 11-12 mm., 22 immat. ♀♀ and juv. 7.5-17 mm.

7361 14° 37' N. 73° 49' E., 29 fathoms. (Goanese coast) 3 juv.

6 7-9.5 mm.

Remarks.—Nierstrasz has already remarked upon the size of the eyes as figured by Hansen. The outline of the head in Hansen's figure is correct, but the eyes occupy only half the lateral margin, the front margin forming a bilobed projection.

In juveniles 7-7.5 mm. in length the 7th peraeopods are not fully developed, being shorter and more slender than the 6th pair, and their 2nd joints are nearly linear. The head has the characteristic bilobed front margin, though not quite as strongly developed as in larger specimens.

The ♂♂ have the stylet on pleopod 2 separate from and about as long as the inner ramus (as in Hansen's fig. 4*k*). The vasa deferentia open on the 7th peraeon sternite flush with the surface, or in a very slightly raised tubercle the openings about .65 mm. apart. It is possible that in larger ♂♂ definite penial processes are developed.

No rostral point; bases of 1st antennae contiguous.

This species is stated to be pelagic, and doubtless the delicate and nearly transparent telson and uropods are in keeping with this mode of existence. Along with the present specimens was a specimen of the pelagic Amphipod *Synopia scheeleana* Bov.

Distribution.—Mouth of the Ganges (M. Edwards); Bay of Bengal, East Indies to Japan (Hansen).

***Cirolana porcellana*, sp. nov.**

Locality.—St. 561, 12° 0' 10" N. 98° 20' 30" E., 7½ fathoms. (Mergui) 1 non-ovig. ♀ 17×4 mm.

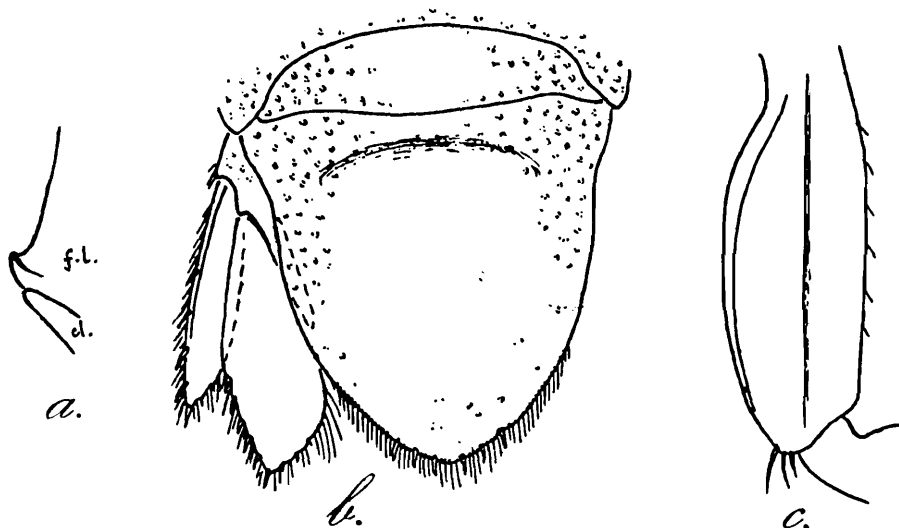
Description.—Body elongate and narrow. Frontal margin of head very slightly convex, costate (*cf. pumicea* Hale 1925). Peraeon and pleon smooth and polished, punctate laterally and more or less in two transverse lines on each peraeon segment. Side-plates as in *pumicea*. Telson very nearly as long as basal width, shield-shaped, with shallow concavity proximally, apex with 6 spines among the setae; punctae mainly at outer basal corners.

Frontal lamina as in *pumicea*, *i.e.*, very narrow and deep-lying between the bases of the antennae, but widened and raised into a short projecting knob at its junction with clypeus, not so prominent however as in *pumicea*, and not nearly so prominent as in *elongata* (even the juvenile of the latter).

Antenna 1 extending almost to end of peduncle of antenna 2, 1st joint very short. Antenna 2 extending to end of 3rd peraeon segment.

Peraeopods 1-3 as in *elongata* and *pumicea*, the 3rd and 4th joints strongly expanded, the apex of the expansion on 4th joint in peraeopod

1 reaching almost to end of 6th joint. Peraeopods 4-7 not strongly spinose or setose, 2nd joints nearly linear, without fringes of setae.



TEXT-FIG. 1.—*Cirolana porcellana*, sp. nov. a. profile of epistome and clypeus. b. telson and uropod. c. 2nd joint of peraeopod 7. c. l. clypeus; f. l. frontal lamina.

Inner ramus of uropod extending to level of telsonic apex, outer ramus narrower and shorter, both with spines and setae around the apex.

Colour (as preserved) creamy-white, with faint indications of pigment across hind margins of the hinder peraeon segments, and of the pleon segment, eyes black.

Remarks.—Although Hale did not say so (*Trans. Roy. Soc. S. Austr.* XLIX, p. 130), *pumicea* appears to be very nearly related to *elongata* M. Edw., but differs in the shape of the head and the frontal lamina. The present specimen agrees with *pumicea* as regards these two characters (though the ridge on frontal margin of head is here scarcely “bisinuate”), but the process on the frontal lamina is less conspicuous and hook-like. The anterior legs also are like those of the two species mentioned. As regards the features of the hinder end, however, the shape of the telson of the inner ramus of uropod, and of the 2nd joints of peraeopods 4-7 easily distinguish the present species from *elongata* and *pumicea*.

Cirolana hirtipes M. Edw.

Milne-Edwards, 1840, l. c., p. 236, pl. xxxi, figs. 25, 26.

Id. 1836-49, *Regne Anim. Crust.* p. 67, figs. 6-6i.

Hansen, 1890, l. c., p. 326, pl. i, figs. 2-2g.

Stebbing, 1910, *Ann. S. Afr. Mus.* VI, p. 421.

Tattersall, 1913, *Trans. Roy. Soc. Edinb.* XLIX, p. 880.

Vanhöffen, 1914, *Deutsch. Südpol. Exp.* XV, p. 501, fig. 38.

? Filhol, 1885, *Mem. Rapp... Venus.* III, p. 455, (*fide* Nierstrasz, 1931, l. c., p. 158).

Localities.—

St. 291, 26° 22' N. 56° 10' E., 48-49 fathoms. (Strait of Ormuz)
1 ♀ 13.5 mm.

5714 W. of Mangalore, 26-31 fathoms. (Malabar coast) 1 immat.
9 (? ♀) 8.5 mm.

St. 556, 12° 40' N. 98° 26' 30" E., 10 fathoms. (Mergui) 1 ♂ 6 mm.

Remarks.—This species was described by Milne-Edwards from the “Cape of Good Hope” (without particular locality), and later recorded

by Hansen from Table Bay, by Tattersall from Saldanha Bay (West coast) and by Vanhöffen from Simonsbay (False Bay). Tattersall makes no comments on his specimen. None of the specimens collected by the Cape Government Trawler s. s. "Pieter Faure" seem to have been submitted to Stebbing.

It is, therefore, not surprising that Nierstrasz (1917, *Zool. Med.* III, pp. 93, 94) claims *hirtipes*, along with *borealis* and others, as an Atlantic species, accepting Lo Bianco's record from the Mediterranean (1903-04, *Mitt. Zool. St. Neapel*, XVI, p. 258). Hansen has doubted European records of this species, and Filhol's record from Cook Strait seems to me also suspect in view of the very close similarity between *hirtipes* and *rossi* (see Nierstrasz, 1917, *l. c.*). Monod (1930 *l. c.*, p. 142 seq.) does not include *hirtipes* among the European and Mediterranean species.

True diagnoses of *borealis*, *hirtipes*, *japonensis* and *rossi* can only be given after a detailed comparison of actual specimens side by side. It may be mentioned that there is another South African species so deceptively like *hirtipes* that only after prolonged study I have satisfied myself as to its distinctness; it will be dealt with on another occasion.

Although *hirtipes* has been reckoned an Atlantic species, the South African Museum collection possesses only 4 specimens taken in the neighbourhood of Table Bay (3 of them from mouth of a *Carcharias* shark), and no others from west of 25° E. long.; on the other hand it has a number of specimens from Algoa Bay to Natal. It seems therefore probable that *hirtipes* is more at home in the warmer waters of the Mozambique current and its capture by the "Investigator" in the mouth of the Persian Gulf and on the west coast of India is not, after all, so surprising. Its presence in the Mergui Archipelago requires confirmation.

Hansen has used the furrows on the side-plates to distinguish *hirtipes* and *borealis*. I have no example of the latter for a direct comparison, but the following features of *hirtipes* may be noted. The front of the head is bisinuate, with a short rostral point which just meets the frontal lamina, and separates the 1st antennae; from the hind margins of the eyes a very fine impressed line more or less punctate, is continuous across the head; the greatest width of 2nd joint of peraeopod 7 is in the distal third of its length. The shape of the side plate of peraeon segment 4 may also prove useful in diagnosis.

The ♂ is small for a normal specimen of this species, and I am not fully satisfied as to its identity.

Distribution.—South and south-east Africa.

***Cirolana pleonastica* Stebb.**

Stebbing, 1900, Willey's *Zool. Res.* V, p. 629, pl. lxxvii A.

Barnard, 1935, *Rec. Ind. Mus.* XXXVII, p. 309, fig. 18a [non Chilton, 1924 and 1926.]

Localities :—

1124 St. 175, 8° 51' 30" N. 81° 11' 52" E., 28 fathoms. (N. E. of Ceylon) 1♂ 6 mm. 1 ovig. ♀ 7 mm. 1 immat. 5.25 mm.

5549 6° 1' N. 81° 16' E. 34 fathoms. (S. E. of Ceylon) 1 ovig. ♀ 5.5 mm.

Remarks.—I have already shown that the Chilka Lake specimens, and probably also those from Talé Sap, are referable to another species. The present specimens, however, are the true *pleonastica* (I have compared them with cotypes), and constitute the second record of this species.

The front margin of the head is well marked and in dorsal view hides the bases of the 1st antennae; its rim is slightly up-turned, more so in ♂ than in ♀. An additional feature in the ♂, which is not found in the cotypes, and is not mentioned by Stebbing, is a short transverse ridge between the eyes. The three middlemost tubercles on pleon segments 4 and 5 are distinctly more prominent than any of the others.

The discovery of this species actually on the coast of India increases the desirability of a fresh description, with figure, of the type, if it is still extant, of *sculpta* M. Edw., which came from the Malabar coast.

Distribution.—Blanche Bay, New Britain, 60 and 100 fathoms.

***Cirolana albicaudata* Stebb.**

Stebbing, 1900, *l. c.*, p. 631, pl. lxvii B.

Richardson, 1910, *l. c.*, p. 5.

Thielemann, 1910, *l. c.*, p. 8, figs. 1-4, (subsp. *japonica*).

Nierstrasz, 1931, *l. c.*, p. 152, (and subsp. *japonica*).

Locality.— $\frac{572}{10}$ St. 189, 20° 37' 15" N. 69° 24' 20" E., 44 fathoms.

(Kathiawar Peninsula, Bombay) 1 ♂ 8 mm.

Remarks.—This remarkable specimen is, I believe, the fully adult ♂ of this species. Leaving out of discussion for a moment the 2nd antennae and the uropods, the only appreciable difference lies in the shape of the telson, which is more broadly rounded in the present specimen than in Stebbing's enlarged figure (T). All the spines and setae have been rubbed off. On the other hand there is full agreement in the peraeopods, and also in one feature which is illustrated but not described by Stebbing, *viz.*, the pair of long plumose setae on 2nd joint of antenna 1, and the simple and plumose setae on inner apex of 5th joint of antenna 2. In the present specimen there are 2 simple and 2 plumose setae on antenna 2. This may be a feature of minor importance, but the agreement with Stebbing's figures is noteworthy.

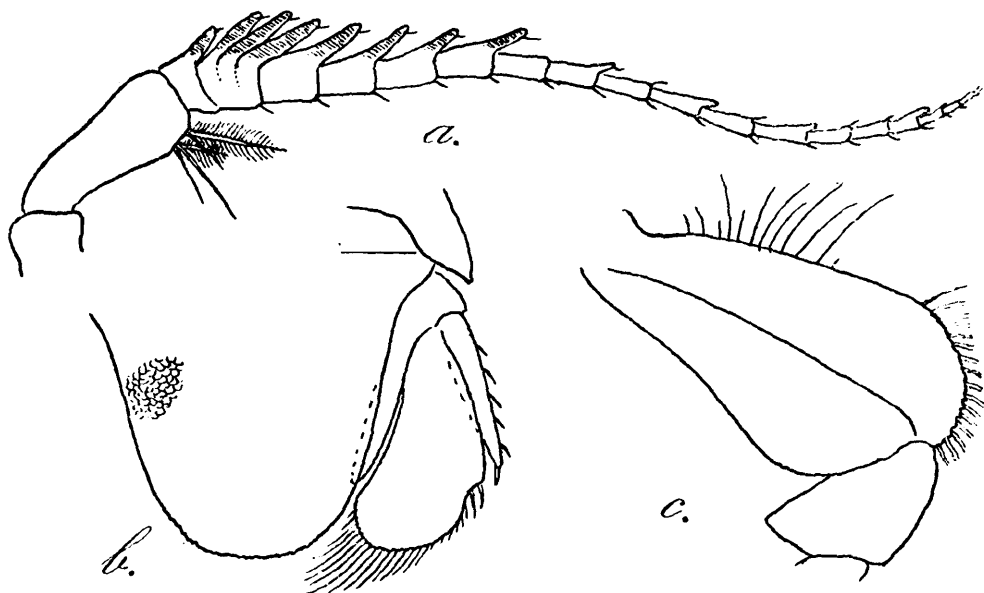
Frontal lamina narrow, elongate, but not constricted as in the form described by Thielemann as *japonica*.

The stylet on pleopod 2 as figured by Stebbing. No penial processes, vasa deferentia opening flush with surface of sternite.

The inner ramus of uropod (like the telson) agrees in general shape better with Stebbing's small figure than with his larger one; there is no outer distal angle, but on the contrary a shallow excision.

The remarkable feature of this specimen is the development of digitiform processes on the flagellum of antenna 2. The joints from which the first 4 processes arise are indistinctly demarcated, but assuming there are 4 joints, the processes arise from joints 1-8 inclusive, 10, 12, 14, and 17; joints 9, 11, 13, 15, 16, and 18-20 lack processes. Each of the first 8 processes is minutely transversely striate, and bears a subapical setule.

These processes may be suspected to be sensory, and to be peculiar to the adult ♂. Secondary sexual characters are not abundant in *Cirolana*: Thielemann (*l. c.*, p. 8.) mentions *harfordi* subsp. *japonica*, and *willeyi* in both of which the ♂ has the flagellum of antenna 2 more strongly setose than the ♀. The excision on the inner ramus of uropod is probably not a sexual but an adult character.



TEXT-FIG. 2.—*Cirolana albicaudata* Stebb. a. 5th peduncular joint and flagellum of 2nd antenna ♂. b. telson and uropod, surface sculpturing on former partly indicated, and apical setae omitted. c. 2nd and 3rd joints of peracopod 7, the plumose setae on distal front margin not completely drawn in, and those on hind margin omitted.

The colour (as preserved) is pale horny, with darker, irregularly oval, and closely aggregated dots on the head and anterior 3 peraeon segments, and laterally on the other peraeon segments, leaving a uniform space medio-dorsally; the pleon and telson are uniform, the latter very pale.

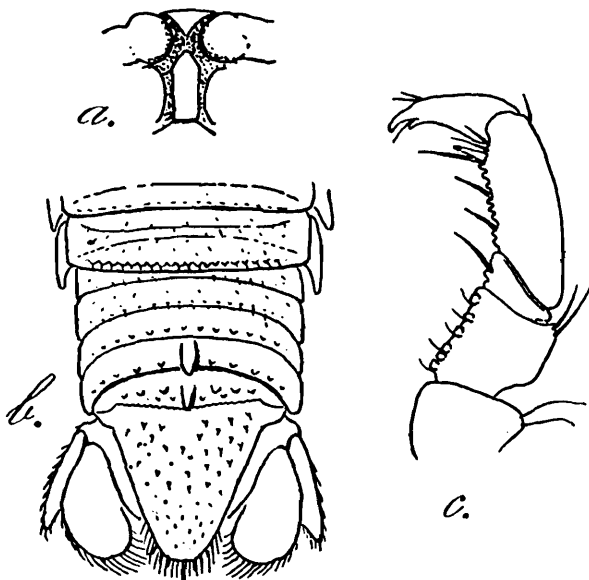
Distribution.—New Britain (Stebbing); Philippine Islands (Richardson); East Indies (Nierstrasz). The subsp. *japonica* is recorded from Japan (Thielemann) and East Indies (Nierstrasz).

***Cirolana perlata*, sp. nov.**

Locality.—Bassein River estuary. 30.x.09. Townet. (Lower Burma) 1♀ 7×2 mm., 1 ovig. ♀ 6 mm. 1 ♀ (with brood lamellae) 5.5×1.75 mm., 1 juv. 3.5 mm.

Description.—A rather slender, elongate species. Head with rostral point, which almost meets the narrowly pentagonal frontal lamina. Peraeon segments with a few fine setules on hind margins, giving a crimped or beaded appearance, chiefly noticeable on segment 7; each segment with 2 fine impressed transverse lines. Pleon segment 4 overlapping segment 5 laterally; hind margin of segments 3, 4 and 5 very minutely crenulate; segment 3 with a transverse series of small tubercles; segment 4 with a prominent medio-dorsal tooth, flanked by 4-5 small tubercles on each side; segment 5 with a smaller and less prominent medio-dorsal tooth flanked by 3 (or more) small tubercles.

Telson smooth but with fine setules arising from minute conical granules, sides straight, apex narrowly rounded, with plumose setae and 8 spines.



TEXT-FIG. 3.—*Cirolana perlata*, sp. nov. a. ventral view of rostral point and frontal lamina. b. peraeon segments 6 and 7, and pleon. c. distal joints of peraeopod 7.

Antenna 2 extending to end of peraeon segment 2.

Peraeopods in general (extent of outer apex of 4th joint etc.) resembling those of *pleonastica* Stebb. (1900, *l. c.*, pl. lxxvii A), but hinder peraeopods more slender. Inner margin of 5th and 6th joints of peraeopod 1 with 2-3 rounded denticles proximal to the spine-setae (*pleonastica* has a single rather larger denticle before each spine-seta, not shown in Stebbing's figure). Inner ramus of uropod apically rounded, outer ramus subacute.

Remarks.—It does not seem possible to regard this form as *sculpta* M. Edw. for the same reasons as Stebbing gave in describing *willeyi* (1904, *Spolia. Zeylan.* II, p. 13). *C. sculpta* has the inner ramus of uropod pointed, and a median tooth on the "last segment of abdomen"; here the more prominent of the two median teeth is not even on the 5th segment (as in *willeyi*) but on the 4th segment.

The specimens are quite colourless, with black eyes. The largest specimen is probably also a ♀. It is a much more slender form than either *willeyi* or *pleonastica*; the lack of pigmentation also prevents it being regarded as a less highly sculptured variety of the former. The frontal lamina is a further point of difference from *willeyi*, *pleonastica* and *fluviatilis*, and from *arabica* Kossm.

***Cirolana parva* Hansen.**

Stebbing, 1905, p. 12.

Id., 1910, *J. Linn. Soc. Lond.* XXXI, p. 217.

Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 353a.

Nierstrasz, 1931, *l. c.*, p. 151.

? Chilton, 1924, *Mem. Ind. Mus.* V, p. 883, fig. 5.

? Chilton, 1926, *Rec. Ind. Mus.* XXVIII, p. 180.

Locality.— $\frac{229}{7}$ Off Little Andaman Island. 1 ♀ with embryos 4.5 mm.

Remarks.—Chilton identified the Chilka Lake specimens with hesitation as this species. His figure of the telson is much more like that of *cranchii*, a European species which occurs in varietal forms in South Africa (Barnard, *l. c.*, *supra*, p. 351*a. vicina*, and 1920, *Ann. S. Afr. Mus.* XVII, p. 346) and in Australia (Hale, 1925, *Tr. Roy. Soc. S. Austr.*, XLIX, p. 141).

Distribution.—Ceylon, Red Sea (Stebbing); Samoa (Hansen); Mozambique (Barnard); East Indies (Nierstrasz); West Indies and Gulf of Mexico (Hansen, Richardson, Moore); ? Chilka Lake and Talé Sap (Chilton).

Cirolana spp.

There are two specimens of *Cirolana* which I do not care to identify definitely without further material of other species for comparison.

St. 464, 6° 2' 30" N. 81° 29' E. 52-68 fathoms. 1♂ 11×3.5 mm. Pale yellowish with scattered (faded) dendritic dots. Resembles *parva* in the pentagonal frontal lamina, broadly rounded telsonic apex, and uropods, but seems too large for this species. There are 8 stout spines set rather far apart, and in definite notches, around the telsonic apex. Peraeon and pleon perfectly smooth. Antenna 2 reaching to end of 3rd peraeon segment.

$\frac{8622}{10}$ St. 513, Mergui Archipelago, shore-collecting. 1 ovig. ♀ 7×2.5 mm. Closely pigmented with grey dendritic dots. Frontal lamina pentagonal. Telson triangular, slightly shorter than basal width, sides straight, apex narrowly rounded (not so sharp as in Chilton's figure 5 of the Chilka Lake specimen), with 6 spines (*cf. cranchii*).

Family CORALLANIDAE.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 703.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXIIc, p. 163, (Corallaninae).

Argathona Stebb.

Stebbing, 1905, Herdman's *Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 17.

? Budde-Lund, 1909, *Voeltzkow Reise*, II, p. 305, (*Gurida*).

Id., *ibid.* p. 306, (*Brotherus*).

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 9.

Stebbing, 1910, *l. c.*, p. 99.

Id., 1911, *Rec. Ind. Mus.* VI, p. 179.

Nierstrasz, 1917, *Zool. Med.* III, pp. 102, 103.

Hale, 1925, *Trans. Roy. Soc. S. Austr.* XLIX, p. 161.

Nierstrasz, 1931, *l. c.*, p. 172 seq., and p. 170 (*Orcilana*).

Monod, 1933, *Bull. Inst. d'Egypte.* XV, p. 153.

Remarks.—Stebbing (1911) has no hesitation in uniting *Brotherus* with *Argathona*, or alternatively transferring *A. reidi* Stebb. 1910, to *Brotherus* if the fusion of two joints in the palp of maxilliped should be regarded as of generic value. Neither in 1910 nor in 1911, however, does he mention Budde-Lund's genus *Gurida* or compare *A. reidi* with *G. caelata*. While Budde-Lund gives "lacinia mobilis nulla" for *Gurida* (differing in this respect from *Brotherus*), Stebbing finds it very feeble in *A. reidi*. There is so great a resemblance between these two forms, from localities not

so very far apart, that I venture to suggest that *A. reidi* will prove to be synonymous with *G. caelata*, and that Budde-Lund failed to observe the delicate and easily broken lacinia mobilis in his preparation of the mandible of *Gurida*. Monod regards *Orcilana* as synonymous.

As regards the species, the genotype *normani* is easily distinguished by the pair of prominent tubercles on the 5th pleon segment and the smaller one in each outer basal corner of the telson. These tubercles are present in both sexes. But the breadth of the animal relative to its length should not be used as a specific character, as this seems to vary with age and according to whether a specimen is "gorged" or not.

Argathoa normani Stebb.

Stebbing, 1905, *l.c.*, p. 17. pl. iii A.

Localities :—

7361	14° 37' N. 73° 49' E. 29 fathoms. (Goanese coast)	1 ♂
<u>6</u>	11×4.5 mm.	
5647-8	26 miles WSW of Honawar, 28 fathoms. (Malabar coast)	
<u>9</u>	1 ♂ 8.5×3.5 mm., 1 ♀ 7.5×3 mm.	
5712-3	W of Mangalore, 26-31 fathoms. (Malabar coast)	2 ♂♂
<u>9</u>	9×3.5 and 8×5 mm.	
1124	St. 175, 8° 51' 30" N. 81° 11' 52" E. 28 fathoms. (N.E. of	
<u>10</u>	Ceylon) 1 ♂ 11×5 mm., 1 gorged ♀ 10×4 mm., 1 ♀ 8×	
	4.3 mm., 3 juv. 6×2, 4×2.3, and 3.5×1.5 mm.	

Remarks.—The tubercles of peraeon segments 5-7 are not conspicuous (owing to the covering of spines and setae) in the large ♂♂, and in the smaller ♂♂ and ♀♀ are very obscure (10 mm. specimens) or absent (8 mm.). The tubercles on 5th pleon segment and telson are present in the ♀ but less conspicuous than in the ♂, especially in the smaller ♀. None of the tubercles are present in the juveniles, which, however, are equally as spinulose and setose as the adults, judging by the numerous punctae (or scars from which the spines and setae have been rubbed off) along the hind margins of the segments.

In one specimen examined the inner margin of the 4th joint of the maxilliped (*i.e.*, Stebbing's fused 4th+5th=ischium+merus) shows a slight indent with a seta, indicating the fusion of two joints.

Penial processes are almost obsolete, the vasa deferentia opening by two very short papillae.

Distribution.—Gulf of Manaar and Galle, Ceylon.

Barybrotes Sch. and Mein.

Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 280.
Hansen, 1890, *Viden. Selsk. Skr.* (6) V, pp. 290, 314, 402.
Stebbing, 1893, *Hist. of Crust.* p. 347.

Remarks.—As Stebbing points out the specific name of the only known species should be *indus*.

Barybrotes indus Sch. and Mein.

Schioedte and Meinert, 1879, *l. c.*, p. 281, pl. iii, figs. 1-10, pl. iv, fig. 1.

Id. ibid., p. 283, pl. iii, figs. 11-13, (*agilis*).

Hansen, 1890, *l. c.*, p. 403, pl. ix, figs. 3-3s. (*agilis*).

Richardson, 1910, *l. c.*, p. 8, (*agilis*).

Locality.—St. 291, 26° 22' N. 56° 10' E. 48-49 fathoms. (Strait of Ormuz) 1 immat. ♀ 9 mm.

Remarks.—On the inner apex of 5th peduncular joint of antenna 2 there is a strong plumose seta and one or two simple setae, as in *Cirolana albicaudata* (*supra*).

This species is stated to be pelagic, and in the present instance was caught in association with *Cirolana hirtipes*.

Distribution.—Bay of Bengal, Java Sea, Gaspar Strait (2° 41' S. 107° E.) (Schioedte and Meinert); Southern China Sea (Hansen); Philippine Islands (Richardson).

Family AEGIDAE.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXIIc, p. 177, (*Aeginae*).

Aega Leach.

Hale, 1925, *Tr. Roy. Soc. S. Austr.* XLIX, p. 168.

Nierstrasz, 1930, *Mem. Mus. Roy. Hist. Nat. Belge*, p. 4.

Id., 1931, *l. c.*, pp. 177 seq.

Remarks.—Nierstrasz (1930, fig. 2.) figures a maxilliped with 2 endites (inner plates). In 1931 (p. 181) he regards this as possibly an abnormality. The figure seems to indicate that the appendage is in course of ecdysis.

Aega ventrosa M. Sars.

Sars, M., 1859, *Forh. Vid. Selsk. Christiania*, p. 156.

Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 375, pl. viii, figs. 7-10.

Sars, G. O., 1897, *Crust. Norw.* II, p. 64, pl. xxvi, fig. 3.

Norman, 1904, *Ann. Mag. Nat. Hist.* (7) XIV, p. 432, pl. xii, figs. 5-8, pl. xiii, figs. 8, 9.

Richardson, 1905, *Bull. U. S. Nat. Mus.* LIV, p. 187, figs. 173, 174.

Stephensen, 1913, *Medd. Gronland*, XXII, p. 234 (synonymy).

Hansen, 1916, *Dan. Ingolf Exp.* III, 5, p. 172.

Gurjanova, 1933, *Fauna Arctica*, VI, p. 430.

Localities :—

842 St. 184, 22° 14' 25" N. 67° 8' 55" E. 947 fathoms. (Arabian
10 Sea) 1 non-ovig. ♀ 32×13 (14) mm.

7° 17' 30" N. 76° 54' E. 430 fathoms. (Maldives) 1 juv. 11.5 mm.

Description.—Integument with rather numerous punctae. Eyes separated by a space equal to basal width of rostral point, which curves down between bases of 1st antennae to overlap anterior margin of frontal lamina. The transverse keel on the latter is entire (not bilobed).

Antenna 1 extending to end of 1st peraeon segment, 3rd peduncular joint subequal to 1st plus 2nd joints, flagellum *ca.* 19-jointed (12 in juv.). Antenna 2 extending to middle of 3rd peraeon segment, 5th peduncular joint very slightly longer than 4th, flagellum *ca.* 20-jointed (15 in juv.).

Side-plates with oblique, curved keel; side-plates on segments 2-5 with postero-inferior corner quadrate with short sharp point, those on segments 6 and 7 more produced and more acute.

Peraeopods 1-3, 6th joint subequal to 4th plus 5th joints, and distinctly longer than 3rd ; on inner apex of 6th joint there is a small spine, and on inner apex of 5th joint a slightly larger and stouter one. Inner margin of 4th joint slightly concave and without armature.

Remarks.—G. O. Sars, although fully cognisant of the puncturation of the integument in other species, describes this species as being “ quite smooth.” It is very unusual to find an integument entirely smooth, and as the present specimen is punctate I am inclined to regard Schioedte and Meinert’s description as being more correct. The anterior peraeopods are in better agreement with Norman’s figure 8 than with the figures given by G. O. Sars and Richardson. Neither the Danish collaborators nor G. O. Sars give a full side view of the side-plates, but the present specimens agree very well with the former authors’ figure 9 (*virgo*) on pl. ix.

In comparison with the Cape specimen of *A. gracilipes* Hansen (Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 362), which I am satisfied is correctly identified, the present specimens have the side-plates not nearly so acutely produced, especially the hinder plates ; and the keel forming the lateral margin of the plates on segments 5-7 is not so sharp and is not continued so far towards the upper anterior corner of the plates. The telson in *gracilipes* is slightly shorter than its basal width, whereas in the present specimens the length is almost exactly equal to the basal width and in *gracilipes* the lateral margins are a little more strongly sinuous.

There is no question that the present specimens are distinct from *gracilipes*, and although I have no actual specimen of *ventrosa* for direct comparison, the descriptions of the Danish authors and G. O. Sars leave no choice but to identify them with the Northern Atlantic and Arctic species. Moreover, I have all the less hesitation in doing this, since the John Murray Expedition has captured two Amphipods in the Arabian Sea area which hitherto have not been recorded from outside the Northern Atlantic region (Barnard, *John Murray Exp. Rep. Amphipoda*. In preparation).

Distribution.—N. Atlantic ; W. of Ireland to Greenland, Iceland, Scandinavian seas, Spitzbergen, Kara Sea and Murman coast. 216-1428 metres.

***Aega ommatophylax* Stebb.**

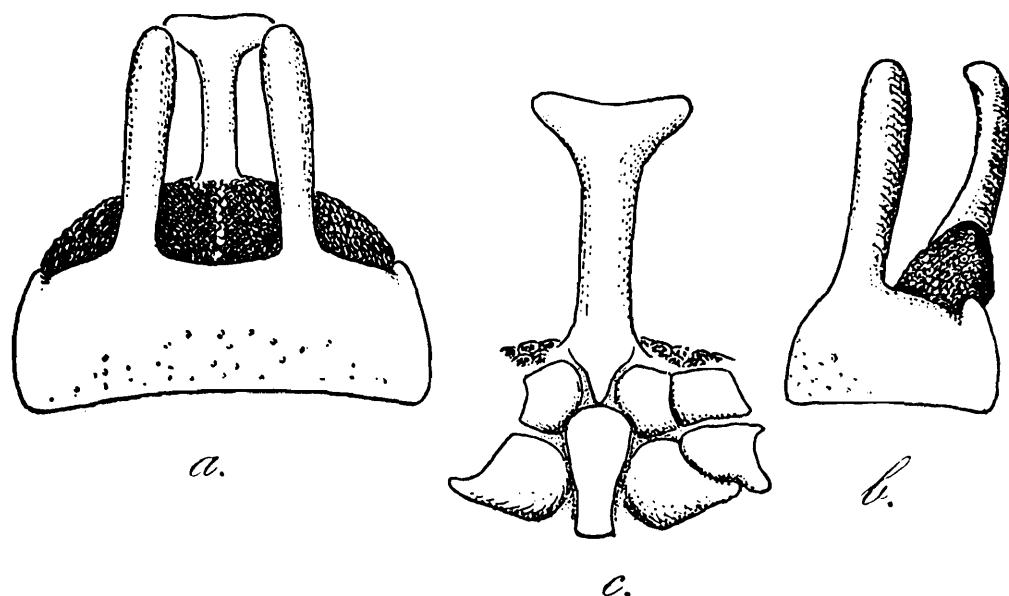
Stebbing, 1905, *Herdman’s Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 21, pls. iv (♂) and v A (♀). ? *Id.*, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 101, pl. ix B (♀).

Locality.— $\frac{8596}{6}$ Andaman Islands, 36 fathoms. 1 ♂ 16 mm. (excl. rostral process).

Remarks.—This specimen, slightly larger than Stebbing’s type, is noteworthy for the much greater development of the processes on the head and 1st peraeon segment, which somewhat resemble the 3-pronged arrangement in the males of some Coprine beetles.

The rostral process is 2 mm. in length, and expanded at the apex ; at its base is a small acute rostral point which meets the frontal lamina.

As the latter was not figured by Stebbing for the ♂, a figure is here given; it differs from that figured for the supposed ♀ (1905, pl. v A.) in having



TEXT-FIG. 4.—*Aega ommatophylax* Stebb. a, b, dorsal and lateral views respectively of head and pereon segment 1. c. ventral view of rostral projection and frontal lamina.

a broader base. Assuming that the frontal lamina of Stebbing's ♂ resembled that of the present specimen, the difference in shape does not seem to warrant us in regarding the 1905 ♀ as belonging to another species (e.g. *vigilans* or *dubia*); and in the absence of any other distinguishing characters in the ♀♀ it is reasonable to assume that the 1905 ♀ (but not the 1910 ♀ from Mauritius) from approximately the same locality is the ♀ of *ommatophylax*, unless the cultriform process of 5th joint of pereopods 2 and 3 can be shown to be a specific character (as in *crenulata*) and not merely sexual.

The eyes in the present specimen are continuous across the head, but some of the ocelli in the middle line are unpigmented, causing an irregular white line. The processes of the 1st pereon segment are 2.75 mm. in length. The cultriform process on 5th joints of pereopods 2 and 3 is present on both right and left sides. The 2nd joints of pereopods 4-7 are keeled in middle of outer surface. The genital papillae are as in Stebbing's figure.

Distribution.—Ceylon; ? Mauritius.

Rocinela Leach.

Nierstrasz, 1931, *l. c.*, pp. 184 seq.

Remarks.—Besides *orientalis*, the following species have been described from the Indian region; *mundana* Lanchester (1903, *Proc. Zool. Soc. Lond.* 1902, II, p. 378, pl. xxxv, figs. 9, 9a. from gills of a freshwater skate, Talé Sap), *latis* Southwell (1915, *Rec. Ind. Mus.* XI, p. 321, pl. xxviii, figs. 12-15, from skin of the fish *Lates*), and *simplex* Chilton (1926, *Rec. Ind. Mus.* XXVIII, p. 182, figs. 4a-m, from Chilka Lake, recorded in 1924 as *orientalis*, and Talé sap).

Lanchester describes the anterior legs as "without teeth, but with a few short cilia", and unfortunately he figures a posterior leg and not an anterior one. Nevertheless one suspects that the 6th joint of the anterior peraeopods is not enlarged, and also that Chilton's *simplex* from the same locality is synonymous. This latter species is clearly an *Alitropus* and is probably synonymous with *A. typus* M. Edw. already recorded from Bengal and other localities.

Southwell's specimens are not *Rocinela*, but ♂♂ of either *Nerocila* or *Livoneca*, in view of the number of spines on the 6th joints of the anterior legs probably the latter (see *infra* under *Nerocila*).

Rocinela orientalis Sch. and Mein.

Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 395, pl. xiii, figs. 1, 2.

Miers, 1884, *Zool. "Alert"*, p. 304.

Stebbing, 1905, *l. c.*, p. 24, pl. vi C.

Id., 1910, *l. c.*, p. 101.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 17.

Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 369, pl. xxxvii D.

Hale, 1925, *l. c.*, p. 182, fig. 27.

Locality.—St. 291, 26° 22' N. 56° 10' E. 48-49 fathoms (Strait of Ormuz). 1 ♂ 12×5.5 mm.

Remarks.—The 6th joints of peraeopods 1-3 carry 3 slender spines and a still more slender spine-seta on the inner margin, as in *granulosa* Brnrd. (1914, *l. c.*, pl. xxxi D.), but the inner margin is here evenly expanded. The spines are much more slender than in the South African representatives assigned to *orientalis*.

The flagellum of antenna 2 is 13-jointed, and bears a thick fringe of plumose setae on its outer surface. A long simple seta on inner apex of 4th peduncular joint, and a shorter plumose one on inner apex of 5th peduncular joint.

The outer rami of pleopods 2-5 show a submarginal series of little opaque squarish spots, as in Chilton's figure 4*k* (1926, *l. c.*, *supra*) of *simplex*.

Distribution.—Philippine Islands (Schioedte and Meinert, Richardson); Calcutta (Schioedte and Meinert); Ceylon (Miers, Stebbing); Gulf of Suez (Miers); Zanzibar (Stebbing); Natal coast (Barnard); Torres Straits, Moreton Bay and Queensland (Miers, Hale).

Family CYMOTHOIDAE.

Schioedte and Meinert, 1881, *Nat. Tidsskr.* (3) XIII, pp. 1-166.

Id., 1883, *ibid.*, XIII, pp. 281-378.

Id., 1884, *ibid.*, XIV, pp. 221-454.

Stebbing, 1900, *Mar. Invest. S. Afr.* I, p. 55.

Hale, 1926, *Tr. Roy. Soc. S. Austr.* I, p. 201.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c. p. 123, (Cymothoinae).

Renocila Miers.

Miers, 1880, *Ann. Mag. Nat. Hist.* (5) V, p. 464.

Schioedte and Meinert, 1884, *l. c.*, p. 414.

Stebbing, 1900, Willey's *Zool. Res.* V, p. 640.

Remarks.—In discussing *Livoneca dubia* Nierstr. 1918, Nierstrasz (1931, *l. c.*, p. 141) himself doubts whether his species is assigned to its

correct genus. In figure 4 he shows a peculiarity of the anterior peraeopods, which is again illustrated by Stebbing (1900, *l. c.*, pl. lxxviii B. gn. 1, gn. 2), though neither author mentions it in his description, *viz.*, the apical projection of the 2nd joint of the (three) anterior peraeopods. In Stebbing's specimen this process was small, but this author's accurate draughtsmanship leaves no doubt as to its actual presence. It is larger in Nierstrasz' figure; and in the specimen mentioned below it is very large. Stebbing has dealt with the mouth-parts of a ♂, but unfortunately no author has described these parts in an adult ♀.

I think that *Livoneca dubia* should be transferred to this genus, but the question whether all the hitherto described species (*ovata* Miers, *indica* Sch. and Mein., *periophthalmi* Stebb., and *dubia* Nierstr.) should be recognized as valid is much more difficult. Stebbing had a ♂ (or perhaps a very young ♀ with persistent ♂ stylet on pleopod 2) 12 mm. in length, Miers 2 ♀♀ *ca.* 24 and 17 mm. with brood-pouches, Schioedte and Meinert a non-ovigerous ♀ 18 mm., and Nierstrasz ♀♀ with embryos 11½-21 mm., and 2 ♂♂ 6.5 and 11 mm. in length. It is possible that the size of breeding females varies according to the size of the host-fish and the available space in its mouth- (or gill-) cavity. Some of Nierstrasz' specimens, however, were collected amongst coral, and the present specimen has coralline and filamentous algal growths on the pleon and hinder peraeon segments, clearly indicating a free-living existence, at least for part of its life.

***Renocila ovata* Miers.**

Miers, 1880, *l. c.*, p. 464, pl. xv, figs. 11-14.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 735, p. 22.

Locality.— $\frac{3970}{10}$ Andaman Islands. 1 ♀ with embryos 25×12 mm.

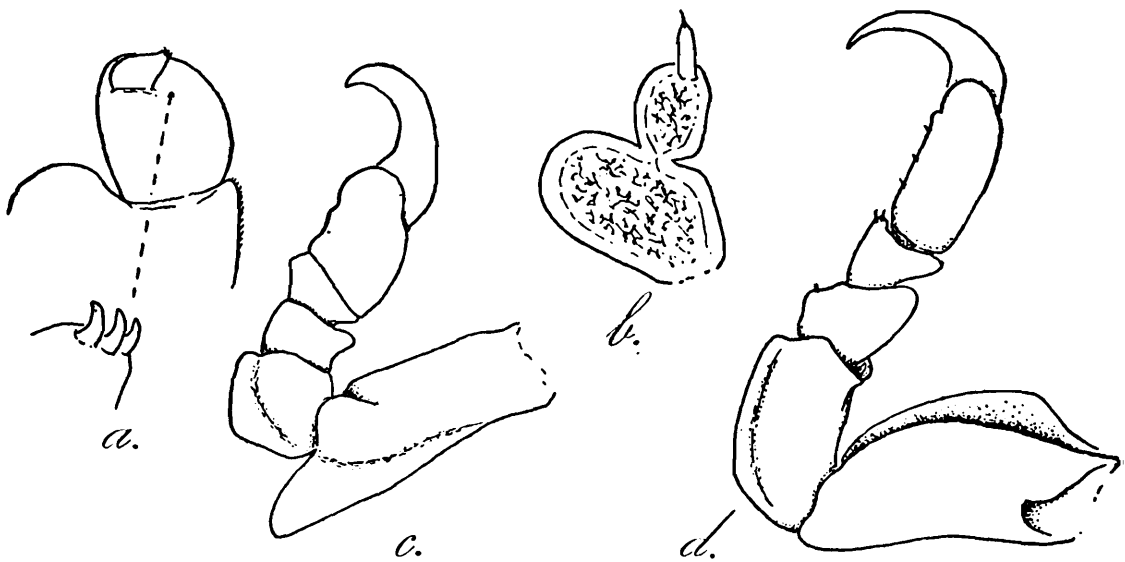
Description.—Agreeing well with Miers' figure, though the pleon anteriorly is narrower, and the telsonic apex is feebly excavate. Eyes distinct. The first peraeon segment has been injured, and has been abnormally regenerated, its hind margin strongly arcuate, and medianly sunk into a hole in the 2nd segment. Side-plates agreeing with Miers' description, and the later description of those of *dubia* by Nierstrasz.

Antennae 1 and 2 respectively 7- and 8-jointed. Mandible with palp greatly enlarged, 1st joint transverse, projecting inwards as a rounded lobe, 2nd joint stout but longer than broad, 3rd slender, terete. Maxilliped with 1st joint of palp very broad, 2nd joint inserted sub-apically and scarcely projecting beyond apical margin of 1st joint (unless forcibly extended).

Peraeopods 1-3, 2nd joint keeled on anterior (outer) margin inner distal corner produced as a subacute lobe, which is easily pliable like one of the pleopods, and (as preserved) is folded up against the posterior surface of the joint, 3rd joint strongly keeled on inner margin, dactylus not noticeably geniculate and without any thickening on outer margin (such as is present in *indica*, *periophthalmi* and *dubia*).

Peraeopods 4-7, 2nd joint keeled on anterior outer margin, with a less conspicuous keel on the posterior outer margin (neither keel prominent on peraeopod 4, but becoming more prominent on the other peraeopods), inner margin of 3rd joint keeled but not so sharply as in the anterior

peraeopods, one minute spinule on inner apex of 4th joint, 2 on 5th, and 3 on inner margin of 6th joint (all easily overlooked).



TEXT-FIG. 5.—*Renocila ovata* Miers. a. palp of maxilliped, with apex of 2nd joint further enlarged. b. mandibular palp, inner margin to left. c, d. peraeopods 1 and 7 respectively, posterior surfaces.

Pleopods with small notch on outer margin of outer ramus, but the suture between the two joints barely traceable; no persistent stylet on pleopod 2; inner ramus of pleopod 5 with 2-3 large longitudinal folds or pleats.

Outer ramus of uropod a little longer than inner ramus, apically subacute.

Colour (as preserved) dull olivaceous or plumbeous; both antennae, mandibular palp, all peraeopods, basal portions of the brood-lamellae, and the pleopods (especially the first pair) closely speckled with dark grey stellate and dendritic pigment; eyes black.

Embryos 2.75 mm. in length, yellowish, with black eyes and a dark stripe on each lateral margin of the peraeon and pleon, and continued on to outer rami of uropods. Rostrum very short, constricted in front of eyes. Telson longer than its basal width, apex rounded, with plumose setae. Inner ramus of uropod oval, apically rounded, extending beyond telsonic apex, outer ramus narrow, elongate, twice as long as inner, apex acute with one spine, inner margins of both rami with plumose setae (cf. Schioedte and Meinert, *l. c.*, pl. xvi, fig. 14.)

Peraeopod 1, 5th and 6th joints unarmed or with 1-2 very obscure spinules on inner margin of 6th, 3 blunt denticles on inner margin near base of dactylus. Peraeopods 2 and 3, one spinule on inner apex of 5th joint, 3 on inner margin of 6th, 4-5 spiniform denticles, well spaced on dactylus. Peraeopods 4-6 (7 of course not yet developed), one spine on inner apex of 5th joint, 3-4 strong spines on inner margin of 6th, and 4 blunt denticles on dactylus.

Remarks.—As the present specimen exhibits both resemblances to and differences from the other species of the genus, I think best to employ Miers' name for it, until such time as more material is available for comparison.

Distribution.—East Indies: Philippine Islands. The other species inhabit the same region, as far east as the Loyalty Islands.

Nerocila Leach.

Nierstrasz, 1931, *l. c.*, pp. 124 seq.

Monod, 1931, *Rev. Zool. Bot. Afric.* XXI, p. 5.

Remarks.—Southwell (1915, *Rec. Ind. Mus.* XI, p. 321, pl. xxviii, figs. 12-15) has described male specimens of parasites of *Lates calcarifer* from the Hughli River as *Rocinela latis*. They do not, however, belong to that genus, but are the males of a species of either *Nerocila* or *Livoneca* (cf. Schioedte and Meinert, 1881, *l. c.*, pl. ii figs. 11-13 and 1884, pl. xiv, figs. 8-12). They closely resemble the males of *N. phaeopleura* mentioned below, but the 6th joint of the anterior peraeopods is said to have "about 8" strong spines, and the figure shows 9 (the 10th probably arising from the 5th joint). It is perhaps more likely that "*R. latis*" is really a species of *Livoneca*. See remarks on juvenile Cymothoids *infra*, p. 172.

Nerocila sundaica Blkr.

Bleeker, 1857, *Verh. Nat. Ver. Nederl. Ind.* II, p. 26, pl. i, figs. 4-4b.

Schioedte and Meinert, 1881, *l. c.*, p. 9, pl. i, figs. 1-3.

Lanchester, 1903, *Proc. Zool. Soc. Lond.* 1902, II, p. 378.

Nierstrasz, 1915, *Zool. Med.* I, p. 72.

Id., 1918, *ibid.*, IV, p. 111.

Localities—

3968 Off Godavari (Sacraments mouth), 6 fathoms. 1 ovig.
 $\frac{10}{}$ ♀ 36 mm. (apex of telson mutilated).

3516
 $\frac{7}{}$ St. 72, Ganjam coast, 7 fathoms. 1 non-ovig. ♀ 22.5 mm.

Remarks.—The outer margin of inner ramus of uropod of the non-ovigerous ♀ is serrulate as in *serra*.

Distribution.—Indian seas to East Indies.

Nerocila serra Sch. Mein.

Schioedte and Meinert, 1881, *l. c.*, p. 17, pl. i, figs. 12-14.

Nobili, 1903, *Boll. Mus. Zool. Anat. Torino*. XVIII, p. 39.

Nierstrasz, 1915, *l. c.*, p. 74.

Barnard, 1925, *Ann. S. Afr. Mus.* XX, p. 392.

Nierstrasz, 1931, *l. c.*, p. 124.

Localities—

3844 Off Devi River, Orissa coast, 30.xii.88. 1 ovig. ♀ 21 mm.,
 $\frac{9}{}$ clinging to abdomen of *Arius sagor* (Hamilton).

1781 St. 87, Vizagapatam coast, $7\frac{1}{2}$ - $9\frac{1}{2}$ fathoms. 1 ♂ 16×4.3
 $\frac{7}{}$ mm.

1783 St. 88, Vizagapatam coast, $7\frac{1}{2}$ - $9\frac{1}{2}$ fathoms. 1 ovig. ♀
 $\frac{7}{}$ 18 mm. attached to throat of the Sea-snake *Hydrophis obscurus* Daud.

3515 St. 72, Ganjam coast, 7 fathoms. 1 ♀ 19 mm. (brood
 $\frac{7}{}$ escaped).

Remarks.—Nierstrasz (1931) quotes an opinion of Monod (*in litt.*) that Hale's Queensland specimens (1926. *Tr. Roy. Soc. S. Austr.* I,

p. 208, fig. 6.) belong not to *serra* but to *trivittata* Blkr. The latter species was not dealt with by Schioedte and Meinert, and Bleeker's paper is inaccessible to me. The present specimen is now uniform straw-colour.

As the ♂ was found in the immediate neighbourhood (St. 87 and 88, of one of the ♀♀ one assumes specific identity, but the specimen is indistinguishable from the ♂♂ actually found with ♀♀ of *phaeopleura* (see *infra*) where a similar assumption is unassailable. The anterior legs have 4 strong spines on the 6th joint. The specimen is, therefore, recorded as *Nerocila* sp. ♂.

Distribution.—East Indies ; Delagoa Bay.

Nerocila phaeopleura Blkr.

Bleeker, 1857, *l. c.*, p. 25, pl. i, fig. 3.

Schioedte and Meinert, 1881, *l. c.*, p. 13, pl. i, figs. 6, 7.

Nierstrasz, 1915, *l. c.*, p. 75, pl. iii, figs. 1, 2.

Id., 1913, *l. c.*, p. 113, pl. ix, figs. 6, 7.

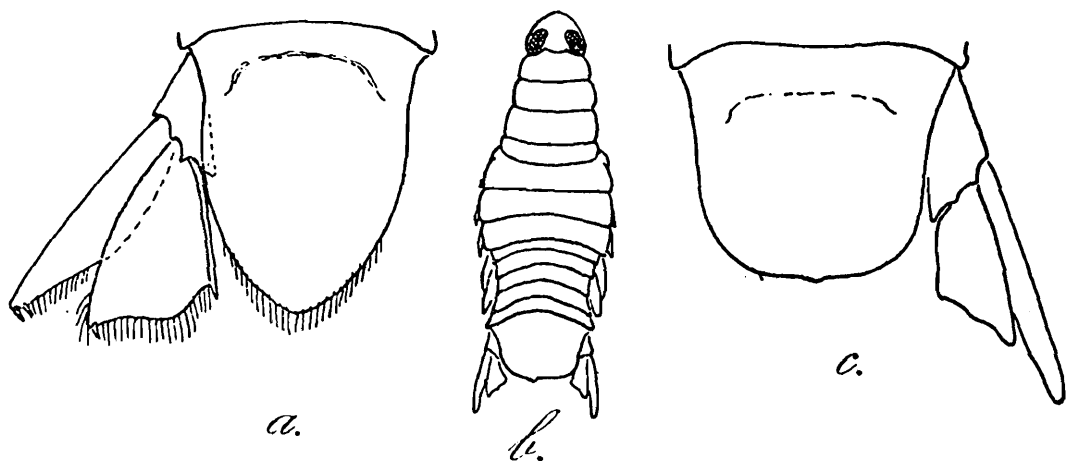
Barnard, 1925, *l. c.*, p. 392.

Chilton, 1926, *Rec. Ind. Mus.* XXVIII, p. 180, figs. 3a, b.

Locality.—Bay of Bengal, ectoparasitic on *Histiophorus gladius* 3 ♂♂ 13 × 3, 15 × 4, and 17 × 4.3 mm., 1 ♀ 14 mm., 2 ♀♀ 21 mm. (mutilated) 2 ovig. ♀♀ 19 and 20 mm.

Remarks.—The ♂ stylet on pleopod 2 is persistent in the ovigerous ♀♀, as Hale found (1926, *Tr. Roy. Soc. S. Austr.* I, p. 202).

The 3 ♂♂ measuring 13, 15 and 17 mm. in length resemble Schioedte and Meinert's figures of the "Pullus stadii secundi", some of which were probably functional ♂♂. As these authors apparently did not realize the occurrence of protandrous hermaphroditism in this genus, the specimens they figured as "Mas adolescens" and "Mas adultus" were probably in an intermediate stage, or even "Feminae virgines", with the persistent stylets. The body is nearly parallel-sided. The telson and uropods are fringed with plumose setae, the apex of outer ramus carries 2 short spines and the apex of inner ramus one or two spines: inner margin of inner ramus thickened and ending in a projecting spiniform



TEXT-FIG. 6.—*Nerocila phaeopleura* Blkr. a. telson and uropod ♂. b. specimen in course of ecdysis, anterior portion ♂, posterior portion ♀. c. telson and uropod of same specimen.

point (cf. Chilton's fig. 3a). The stylet on pleopod 2 is as long as the inner ramus. No penial processes (or genital papillae) on 7th sternite.

The lateral dark pigmentation is continued on to the peduncles and outer rami of uropods.

The 14 mm. "♂" is a most interesting specimen, caught midway between two stages, to which Schioedte and Meinert's words "Virgo in evolut." might justifiably be applied. This condition is commonly observed in terrestrial woodlice, but rarely in marine Isopods¹. The head and 4 anterior peraeon segments are masculine, including the peraeopods, which still retain the 4 strong spines on 6th joint and have not the much enlarged and strongly arcuate dactylus characteristic of the ♀. The hinder half of the body is broader and feminine; there is no marked difference in peraeopods 5-7 between the ♂ and the (ovigerous) ♀, but the telson and uropods have assumed the ♀ characters: total loss of fringing setae, shortening and broadening of the telson, reduction of inner ramus of uropod with loss of the thickened inner margin, increase in length and decrease in width of outer ramus. The persistent stylet on pleopod 2 is $\frac{3}{4}$ length of inner ramus. There is no difference in the hardness (as preserved) of the integument of the anterior and posterior parts of the body.

Anilocra Leach.

Schioedte and Meinert, 1881, *l. c.*, pp. 100 seq. (figures of 14 species).

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 18.

Neistrasz, 1915, *l. c.*, p. 79.

Hale, 1926, *l. c.*, p. 210.

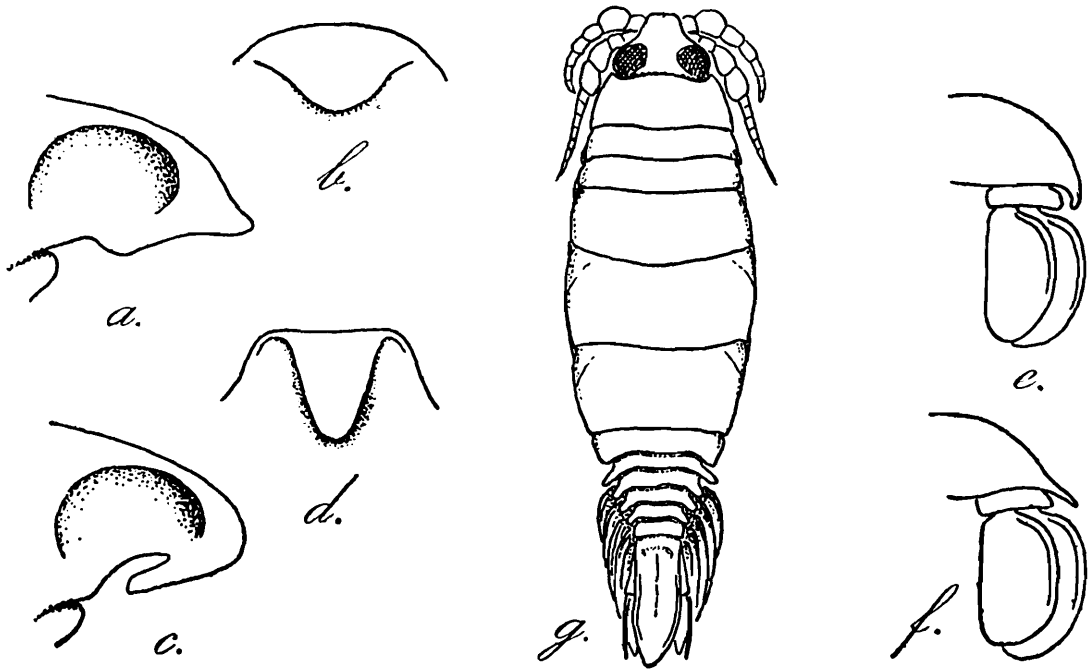
Nierstrasz, 1931, *l. c.*, p. 128.

Remarks.—Although there are no specimens of this genus in the present collection, a brief discussion is necessary as a preliminary to the following genus. In the conspectus given by the Danish authors the genus is divided into those species with geniculate 1st antennae (*i.e.*, the flagellum is distinct from the peduncle owing to the enlargement of the 3rd joint of the latter) and those with straight (or undifferentiated) 1st antennae. The first group includes *leptosoma*, *dimidiata*, *gigantea*, *longicauda* and *amboinensis*, all of which except the last seem to be of a more slender build than the species of the second group. *A. amboinensis*, however, is very broad and does not look like an *Anilocra* at all, though *rhodotaenia* and *laticauda* seem to be transitional between it and the more normal shape.

As I have examples only of the two South African species, I can only suggest an investigation to those students more fortunately situated. I find a correlation between the structure of the 1st antennae and the shape of the frons or rostral point. In *leptosoma*, with geniculate antennae, the rostral point is turned over on to the ventral surface where it forms a freely-projecting (and to some extent movable) point; in *capensis*, with straight antennae, there is no freely-projecting point (fig.

¹ See Stebbing (1923, *S. Afr. Fish. Mar. Biol. Surv. Spec. Rep.* 3, pl. xv) and Monod (1924, *Bull. Comité Hist. Sci. Afr. Occid. Franc. Parasitol. Mauritan.*, fasc. 1, p. 75 and fig. C on p. 80) for figures of similar stages in "*Rosca rogans*" (= *Nerocila orbignyi*) and *Nerocila cephalotes* Sch. Mein. (= *N. orbignyi*). Monod speaks of a "forme normale" and a "variété à péréon dilaté", whereas Stebbing rightly interprets the latter form as merely a stage in ecdysis.

7). If the correlation holds good for all the species, it might be convenient to separate the *leptosoma* group from *Anilocra*, *sensu stricto*.



TEXT-FIG. 7.—*Anilocra* and *Pleopodias*. a, b. lateral and ventral views respectively of rostrum of *A. capensis* M. Edw. c, d. the same of *A. leptosoma* Blkr. e, f. diagrammatic cross-sections of pleon of *Anilocra* (*leptosoma*) and *Pleopodias* respectively. g. *Pleopodias elongatus* Rich., "Investigator" specimen.

Pleopodias Rich.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 25.
Id., 1911, *Bull. Mus. d'Hist. Nat. Paris*, p. 525.

Remarks.—The status of this genus, so far as I am aware, has never been discussed. It contains one Philippine and one Atlantic species, which are characterized by the rapidly narrowing pleon, leaving the pleopods exposed laterally, and the 7th pair of peraeopods abruptly longer than the 6th pair, with relatively shorter and less curved dactyli.

Richardson neither compared the genus with *Anilocra*, nor placed it immediately after that genus in her 1910 paper, although it is clearly very closely allied to Leach's genus, more especially to the *leptosoma* group of species, with geniculate antennae, slender build, and more or less elongate linguiform telson.

The present specimen, which I think would be assigned to *Pleopodias* without hesitation by every carcinologist, has the freely-projecting rostral point on the ventral surface separating the bases of the geniculate 1st antennae, as in *leptosoma*. The 7th peraeopod is not more abruptly longer than the 6th than in *leptosoma*. Even in *capensis* the 7th peraeopod is very distinctly longer than the 6th; so that this feature will not separate *Pleopodias* generically from *Anilocra*.

Between Richardson's figure of *Pleopodias elongatus* and most of Schioedte and Meinert's figures of *Anilocra* there is a wide gulf; but not so wide when one includes in the comparison the present specimen and the figure of *dimidiata* (Schioedte and Meinert, *l.c.*, pl. viii, fig. 5). I have seen examples of *leptosoma* with an even more pronouncedly narrow pleon. Comparing the "Investigator" specimen with *leptosoma*, the

difference lies not in the width of the pleon segments, but in the degree of imbrication or telescoping, and the plane of the pleural portions; in *leptosoma* the latter are vertical or may even curl slightly inwards on the ventral surface, whereas in *Pleopodias* they lie more or less horizontal. But see the Danish authors' fig. 7 of *longicauda*, one of the *leptosoma* group. Here again there is no sharp distinction between *Anilocra* and *Pleopodias*.

As regards the exposed pleopods, Hale's figure (*l. c.*, fig. 7) of a specimen assigned to *A. cavicauda* Rich.¹ shows them, and also Nierstrasz' figure of *laticauda* (1915, *l. c.*, pl. iii, fig. 7), though in neither case so prominently as in the figure of *P. elongatus*. I have seen examples of *leptosoma*, and even of *capensis* (a species with broad pleon) in which the pleopods are more or less visible in a dorsal view; and inspection of these specimens leaves no doubt that the lateral spreading and consequent exposure of the pleopods is largely an accident of preservation, though of course it is more likely to become manifest in those species which have a narrow pleon.

Thus none of the alleged distinguishing characters of *Pleopodias* are really valid, yet both Richardson's figure of *elongatus* and the present specimen have a distinctive "facies" which it is impossible to ignore completely. I therefore retain *Pleopodias*, regarding it as a deep-water derivative of the *leptosoma* group of *Anilocra*.

***Pleopodias elongatus* Rich.**

Richardson, 1910, *l. c.*, p. 26, fig. 25.

Locality.— $\frac{2685}{10}$ 14° 13' N. 93° 40' E. 370-419 fathoms (N. of Andaman Is.) 1 ovig. ♀ 15.5 mm.

Remarks.—This specimen is identified with Richardson's species not without some diffidence. In the first place the description of *elongatus* gives the apex of the telson as rounded, whereas the figure shows it squarely truncate, with only the postero-lateral angles rounded. In the present specimen the telson is more like that of *A. cavicauda* Rich. (1910, *l. c.*, p. 18, fig. 17); it is concave dorsally, though there is a faint median keel in the basal half immediately following the transverse basal depression, the lateral margins are up-turned, the apex rather narrowly rounded and somewhat asymmetrical. The telson, especially the sides and apex, is very feebly chitinized, and its apex might easily suffer injury.

The relative lengths of the peraeon segments may be variable according to age or sex; the type specimen of *elongatus* was 22.66 mm. in length. In this respect our specimen agrees better with the figure of *A. cavicauda* which was even larger. Postero-lateral angles of peraeon segment 7 rounded.

The first pleon segment is laterally conspicuous. The difference in elongation of the pleon between Richardson's and our specimens may be due to preservation, the former appearing to be strongly contracted, whereas the latter is not at all contracted; it can in fact be squeezed

¹ For other reasons I think Hale's specimens are more likely to be *dimidiata*.

up so as to give the appearance shown in Richardson's figure. When thus manipulated the apex of the telson scarcely, if at all, extends beyond the apices of the uropods.

The uropods are very delicate, and, as preserved, the inner ramus lies horizontally under the telson, while the outer ramus is in a vertical plane. Both rami are elongate-oval, with rounded apices, and subequal in length.

Dactyli of the anterior peraeopods evenly tapering, without nodular enlargements.

Distribution.—Philippine Islands, 170 fathoms.

Lobothorax Blkr.

Bleeker, 1857, *Verh. Nat. Ver. Nederl. Ind.* II, p. 39.
Schioedte and Meinert, 1883, *l. c.*, p. 282, (*Saophra*).
Richardson, 1910, *l. c.*, p. 19.

Lobothorax laevis Rich.

Richardson, 1910, *l. c.*, p. 19, fig. 18.

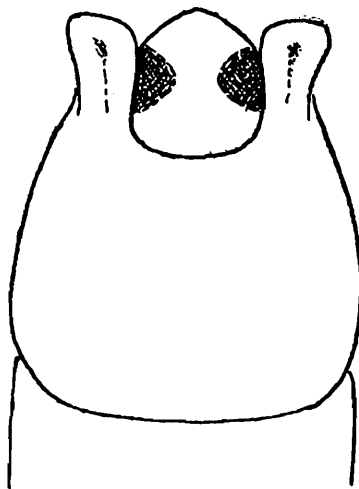
Localities.—

Bay of Bengal. 1 immat. ♀ 17 mm.

Morrison Bay, Mergui Archipelago, 1914. 1 mature but non-ovig. ♀ 17 mm.

Remarks.—These specimens agree with *laevis* in the smooth or nearly smooth body and the shape of the uropodal rami, which latter, however, are here narrower than in the figure of *laevis*.

As the figure of *laevis* does not show the processes of the 1st peraeon segment I give a figure here. They extend to the level of front of head (or almost), slightly expanded apically, with a shallow groove dorsally; in the immature specimen the apices are horizontal, but in the mature specimen they are vertical and pressed against the sides of head just like "ears". The length of the head and anterior four peraeon segments is 10.5 mm. in the Bengal specimen, 9 mm. in that from Mergui; the



TEXT-FIG. 8.—*Lobothorax laevis* Rich. Dorsal view of head and peraeon segment 1.

greatest width in the former is across the hind margin of 4th segment : 5.5 mm., and in the latter across the 5th segment : 6 mm.

The hindmost pair of brood-lamellae arising from the bases of the 5th peraeopods are fully developed in the Bengal specimen, folding over one another across the whole width of the sternite; but there are no traces of the anterior pairs. In the Mergui specimen 4 pairs (on segments 2-5) are developed. Miers [1880, *Ann. Mag. Nat. Hist.* (5) V, p. 461] mentions specimens of a *Cymothoa* in the stage in which the brood-lamellae are developed on the "three posterior segments of the body only", that being apparently one of the few Cymothoids which have seven pairs of brood-lamellae (Calman, 1909, *Lankester's Treat. Zool.* pt. 7, p. 203), and refers to Schioedte's paper [1878, *Ann. Mag. Nat. Hist.* (5) II, p. 196] on this subject.

Richardson's specimen was an adult ♀. It is possible, however, that like the present Mergui specimen it was not *fully grown*. The ruggedness of the peraeon segments and the falcate uropodal rami may be features of large and fully grown specimens; Schioedte and Meinert's examples of this genus measured 33-40 mm. The Bengal specimen has a perfectly smooth and hard integument; the Mergui one on the other hand has the head and first 3 segments softer than the rest of the body, and irregularly wrinkled.

Both specimens have a few dark stellate specks on head and across the peraeon and pleon segments and base of telson.

Distribution.—Philippine Islands, 188 fathoms.

Agarna Sch. and Mein.

Schioedte and Meinert, 1884, *l. c.*, p. 328.

Richardson, 1905, *Bull. U. S. Nat. Mus.* LIV, pp. 243-245.

Agarna engraulidis, sp. nov.

Locality.— $\frac{3845}{9}$ Off mouth of Devi River, Orissa coast, 28.xii.88
1 ovig. ♀ 12×8 mm., height 6 mm. Parasitic on operculum of *Engraulis setirostris*.

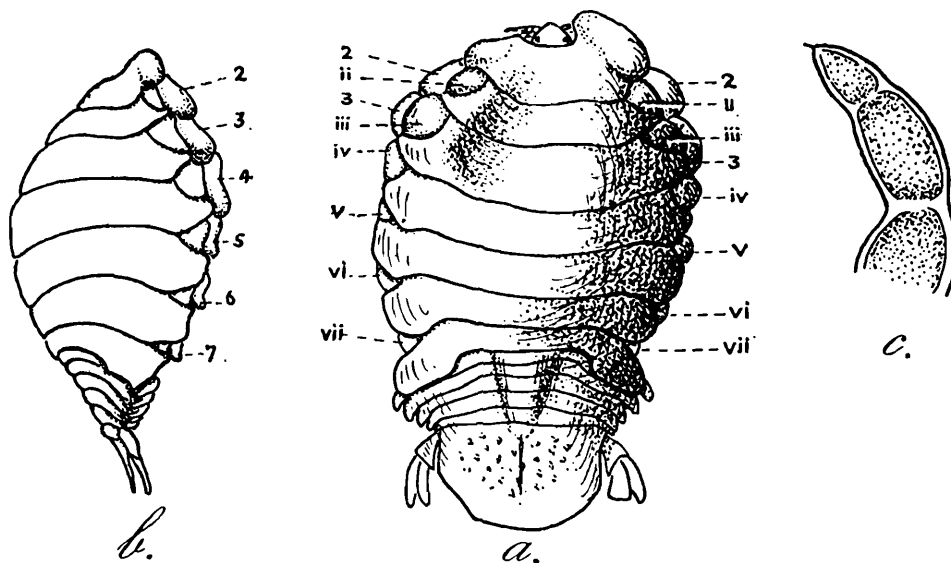
Description.—Body strongly convex dorsally, asymmetrical, with a remarkable resemblance to a Bopyrid parasite.

Head deeply immersed in 1st peraeon segment, subtriangular, eyes small, black.

Peraeon segment 1 with right lateral margin strongly gibbose, the left margin less so; segments 2-7 with the antero-lateral corners very clearly demarcated, those on segments 2-4, especially on the right side, gibbose and resembling the so-called "ovarian bosses" of the Bopyrids; those on segments 5-7 decreasing in size and much less conspicuous. In dorsal view the side-plates on segments 2 and 3 only are visible; the other side-plates are concealed beneath the lateral margins of the segments, shallow, and much shorter than their segments.

Pleon nearly as wide as peraeon; 1st segment visible medianly, and its lateral angles projecting beyond lateral corners of 7th peraeon segment; lateral angles of 5th almost hidden between those of the 4th segment and the peduncles of the uropods. Telson broader than long, apically rounded, surface faintly foveolate.

Mandibular palp with the 3 joints concrescent and not truly articulated, a minute apical seta.



TEXT-FIG. 9.—*Agarna engraulidis*, sp. nov. a, b. dorsal and right-side views respectively, roman numerals indicate the demarcated antero-lateral corners of segments 2-7, arabic numerals the side-plates, only the first two of the latter (on segments 2 and 3) visible in dorsal view. c. mandibular palp.

Peraeopods 4-7 with 2nd joint ovate (less so on peraeopod 4), with a low keel, which however runs in an even curve from base to apex, without the squarish projection at base found in some species of *Livoneca*, etc.

Outer rami of uropods narrow-ovate, inner ramus on left side similar, but that on right side much broader, obovate, with truncate apex.

Remarks.—I am not satisfied that this species is correctly placed in the genus *Agarna*, which hitherto has contained only one species from the West Indian region¹. The highly vaulted peraeon and broad pleon seem to indicate some affinity, though the former may be accidental. If so, the species might find a home in *Livoneca*. The swollen antero-lateral corners of the anterior peraeon segments give a very distinctive appearance, though it is only an extreme development of features found in other species (e.g., *Telotha indica* Nierstrasz, 1915, l. c., p. 94).

The label says parasitic "on" operculum, but one suspects that the specimen was found, or until the fish was caught had been living, within the branchial cavity.

Livoneca Leach.

Haller, 1880, *Arch. Naturg.* XLVI, p. 392.

Schioedte and Meinert, 1884, l. c., p. 340.

Nierstrasz, 1931, l. c., p. 138 seq.

Remarks.—In the species recorded below, and in the South African *raynaudii* M. Edw., there is a pair of penial processes on the 7th sternite, and the ♂ stylet on pleopod 2 does not persist in the ♀. In *Nerocila* the reverse seems to be the case, but whether it applies to all species remains to be seen.

¹ *A. carinata* Sch. and Mein., 1884, which seems to be a synonym of *Livoneca cumulus* Haller, 1880.

Livoneca propinqua Rich.

Richardson, 1904, *Proc. U. S. Nat. Mus.* XXVII, p. 37, figs. 6, 7.

Id., 1909, *ibid.*, XXXVII, p. 87.

Id., 1910, *l. c.*, p. 23.

Localities—

$\frac{122}{10}$ St. 184, 22° 14' 25" N. 67° 8' 55" E. 947 fathoms
2/i/95. (Arabian Sea) 1 ♀ without brood-lamellae 11×6 mm.

St. 386, 11° 55' N. 74° 22' E. 360 fathoms (Laccadives). 1 ♂
10×4 mm., 2 ♀♀ without brood-lamellae 12×6.5 and
17×9 mm. From gills of *Macrurus*.

$\frac{3762}{10}$ 8° 9' N. 76° 30' E., 464 fathoms (Maldives). 1 ovig. ♀
18×10 mm.

$\frac{3763}{10}$ 8° 10' N. 76° 26' E., 445-386 fathoms (Maldives). 1 ♂
9×3.5 mm.

$\frac{4764}{7}$ St. 197, 9° 34' 57" N. 75° 36' 30" E., 406 fathoms 20/i/95
(Maldives) 1 ♀ without brood-lamellae 11×6 mm.

Remarks.—In the ♀ the side-plates on segments 2 and 3 are rounded posteriorly, on segments 4 and 5 acute, on segment 6 acute, subacute or narrowly rounded, and on segment 7 broadly rounded. In the ♂ those on segments 4-7 are all subacute.

The penial processes are well developed, about 5 mm. in length in the 10 mm. ♂, and situated close together. The ♂ stylet on pleopod 2 is about $\frac{3}{4}$ length of inner ramus; traces of its persistence in ♀.

The eyes in the largest ♀ are composed of rather loosely aggregated ocelli. In all specimens they are dull reddish in colour.

There are two reasons for identifying these specimens with Richardson's species: similarity both of structure and of host. So far as I am aware *propinqua* is the only species which has been recorded from a Macrurid fish (Richardson, 1909, 1910). The host of the type Japanese specimen was not recorded, and only one of the present lots has a record of the host.

On the relationship of *propinqua* to the other species of this genus I am not prepared to express an opinion.

Distribution.—Japan; Philippine Islands. 189-244 fathoms.

IMMATURE CYMOTHOID FORMS.

Remarks.—To work out the growth-stages of the Cymothoids is difficult, as the young stages, and probably also the males, are to a large extent free-swimming. The youngest of these stages, ready to be liberated from the brood-pouch of the mother, can be described, but only the laborious examination of a very large amount of material of later stages is likely to produce satisfactory correlations; and probably even then only generic, not specific, differences will be recognizable. Fortunate chances occur sometimes when a number of these parasites in different stages is found on one fish, e.g., in the case of Southwell's

"*Rocinela latis*" (1915, *Rec. Ind. Mus.* XI, p. 321); but Southwell apparently was not aware that many of these parasites are protandrous hermaphrodites, and that where males are found on the skin of a fish, the female is likely to be found in the mouth or gill-cavities.

This point is mentioned so that future collectors, finding parasites on a fish, should thoroughly examine the fish and collect every one of the parasites, from the largest to the smallest.

All the following specimens are casual captures in townets etc., and cannot be identified specifically or even generically; nevertheless it may be useful to separate them into "species" and briefly point out their characters. In all of them the 7th pair of peraeopods and the ♂ stylets on 2nd pleopods are developed unless the contrary is stated. None of them show penial processes on 7th sternite. The antennae and mouth-parts have not been studied.

Form A.

Localities—

3846 False Point. Orissa coast, 20.xii.88. Surface. 2 specimens 9×2.5 and 12×3.3 mm.

St. 577, $11^{\circ} 58' 20''$ N. $98^{\circ} 18' 15''$ E., 8 fathoms, (Mergui). 6 specimens 4×1 mm.— 7×2 mm.

St. 595, $11^{\circ} 31' 15''$ N. $98^{\circ} 35' 15''$ E., 11 fathoms, (Mergui). 3 specimens 5×1.5 mm.— 7×2.3 mm.

Remarks.—Body nearly parallel-sided. Rostrum short with very slight constriction in front of eyes. Anterior peraeopods with 5-7 stout spines on expanded inner margin of 6th joint and blunt rounded denticles on inner margin of dactylus. Both rami of uropods oval, apically rounded, outer ramus with 2 apical spinules.

From the character of the 6th joint of the anterior peraeopods this form might be considered a young *Rocinela*, but according to Schioedte and Meinert the young of *Nerocila* and *Livoneca* have the same character.

Form B.

Localities—

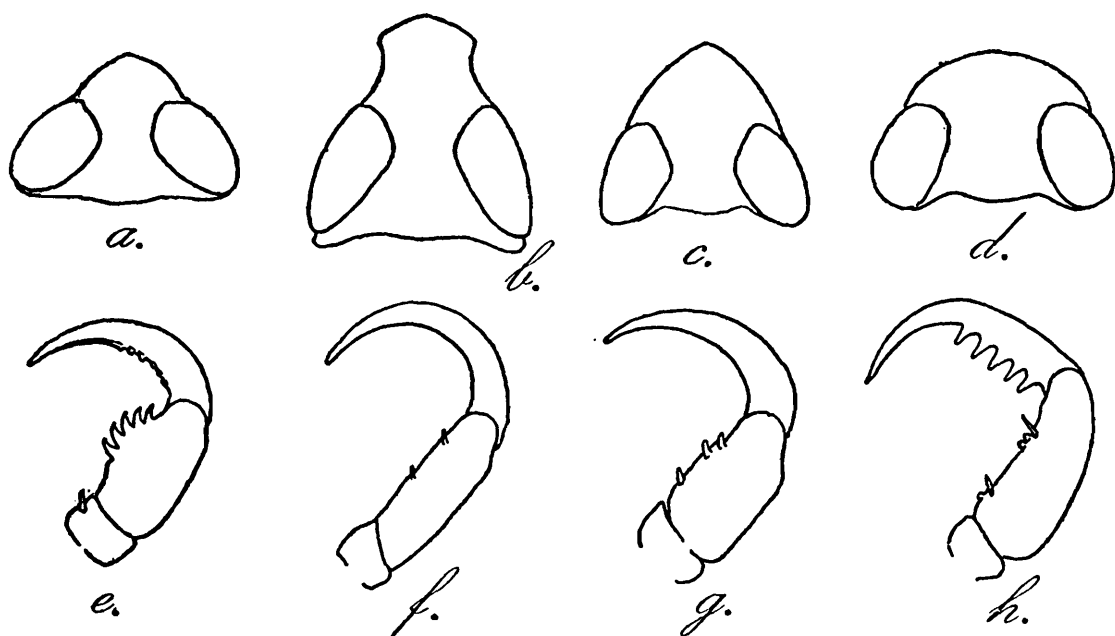
St. 556, $12^{\circ} 40'$ N. $98^{\circ} 26' 30''$ E., 10 fathoms (Mergui). 1 specimen 9×1.9 mm.

St. 577, $11^{\circ} 58' 20''$ N. $98^{\circ} 18' 15''$ E., 8 fathoms (Mergui). 2 specimens $6.5-6.75 \times 1.3-1.5$ mm.

Off Haingyi Is., off Bassein River. 14.xi.09. Towntet (Lower Burma). 1 specimen 7×1.5 mm.

Remarks.—Body parallel-sided and very narrow. Rostrum prominent, constricted in front of eyes, length of head equalling width. Anterior peraeopods with slender 6th joint, with only 2 spinules, and very long, strongly curved and smooth dactylus. Posterior peraeopods slender. Uropods with outer ramus ovate-lanceolate, ending in a spini-

form point, with (Haingyi Is.) or without (St. 577) an additional spine, inner ramus oval.



TEXT-FIG. 10.—Cymothoid juveniles. *a-d.* outline of head of Form A, B, C, and E respectively. *e-h.* distal joints of pereopod 2 of Form A, B, C and F respectively.

Form C.

Localities—

St. 524, 12° 29' 45" N. 98° 12' E., 7 fathoms 1912-13 (Mergui). 3 specimens 4.5×1.5, 6×2, and 8×2.75 mm. Attached to fish.

St. 595, 11° 31' 15" N. 98° 35' 15" E., 11 fathoms (Mergui). 1 specimen 7×2.5 mm.

Remarks.—Rostrum prominent, not constricted in front of eyes. Anterior pereopods stout, but inner margin of 6th joint not expanded, with 3 short stout spines, dactylus smooth. Uropods as in Form A.

Form D.

Localities—

St. 602, 11° 27' 40" N. 98° 38' 45" E., 8½ fathoms (Mergui). 1 specimen 9.5×2.5 mm.

Off Haingyi Is., off Bassein River (Lower Burma). 1 specimen 6.5×1.75 mm.

Remarks.—Body parallel-sided. Rostrum prominent as in Form C, without constriction. Anterior pereopods with 6 spines on expanded inner margin of 6th joint, dactylus smooth. Uropods as in ♂ of *Nerocila phaeopleura*.

As the specimens differ in size, but agree as regards the development of the uropods, two species may be represented. The specimens are considerably smaller than the ♂♂ of *phaeopleura*, and the curve of the front margin of rostrum is slightly different.

Form E.

Locality.—St. 394, Mouth of Rangoon River, 6 fathoms (Lower Burma). 1 specimen 3.75×1 mm.

Remarks.—Rostrum short and broadly rounded, without constriction. Anterior peraeopods with 5 spines on expanded inner margin of 6th joint, dactylus smooth. Both rami of uropod oval, apices rounded, 2 spinules on apex of outer ramus. Seventh peraeopods and stylet on pleopod 2 not developed.

Form F.

Locality.—St. 582, $11^{\circ} 13' 50''$ N. $98^{\circ} 11' 40''$ E., 12 fathoms (Mergui). 1 specimen 3×1 mm.

Remarks.—Scarcely any rostrum in front of the very large eyes, which almost meet. Telson shorter than its basal width, broadly rounded apically. Anterior peraeopods with 2 spines on inner margin of the nearly parallel-sided 6th joint, a small blunt knob proximal to the proximal spine, and 2 knobs proximal to the distal spine, dactylus angularly curved, with 5 sharp spiniform denticles on inner proximal margin. Posterior peraeopods with 3 spines on 6th joint, dactylus evenly curved, with 4-5 blunt denticles on inner margin. Rami of uropod oval, apically rounded. Seventh peraeopod and stylet on pleopod 2 not developed.

According to the figures in Schioedte & Meinert's work this is a very young Cymothoine or Livonecine. It is comparable with the above described embryo of *Renocila ovata*, but differs in the armature of the 6th joint of anterior peraeopods and the angularly bent dactylus.

Form G.

Locality.—St. 556, $12^{\circ} 40'$ N. $98^{\circ} 26' 30''$ E., 10 fathoms. (Mergui). 1 specimen 8.3×2 mm.

Remarks.—Body parallel-sided. Rostrum very short, frontal margin truncate and nearly straight, no constriction in front of the very large eyes, which almost meet. Anterior peraeopods with 6 spines on expanded margin of 6th joint, dactylus smooth. Antenna 1 with rather strongly moniliform joints, which are setose on their hinder distal margins. Antenna 2 with peduncular and flagellar portions distinct. Outer ramus of uropod distinctly longer than inner ramus, narrow lanceolate, with 2 apical spines, inner ramus obovate, 1 spine on rounded outer distal corner.

Family LIMNORIIDAE.**Limnoria** Leach.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 713.

Chilton, 1914, *Ann. Mag. Nat. Hist.* (8) XIII, p. 380 (comparison of species).

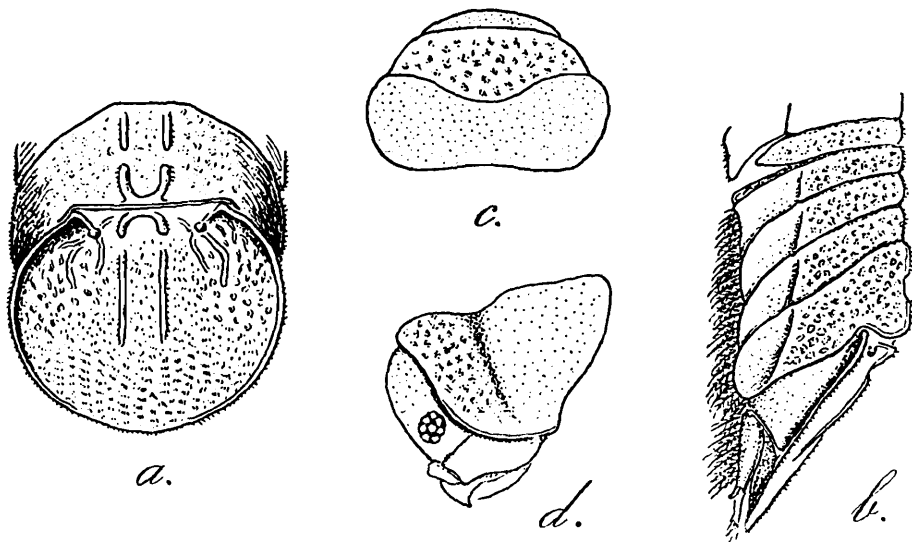
Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 191.

Limnoria septima*, sp. nov.Localities*—

3194 North Sentinel bearing N. 150, W 18 miles, 250 fathoms
 9 (Andamans). 2 ♀♀ (1 ovig.) 5.25 and 5.75 mm., 1 juv.
 3.5 mm.

3981 St. 233, 13° 17' 15" N. 93° 10' 25" E., 185 fathoms
 10 (Andamans). 1 juv. 4 mm.

Description.—Peraeon segment 1 longer but narrower than any of the following segments, separated by a shallow arcuate groove into an anterior portion, which is punctate-foveolate, and a posterior portion, which like the head is only minutely shagreened. The following peraeon segments shagreened, with very minute granules and short fine pubescence, arranged on the hinder segments more or less in a transverse row towards the hind margin of each segment.



TEXT-FIG. 11.—*Limnoria septima*, sp. nov. a. dorsal view of 5th pleon segment and telson. b. lateral view of pleon and telson. c, d. dorsal and lateral views respectively of head and 1st peraeon segment.

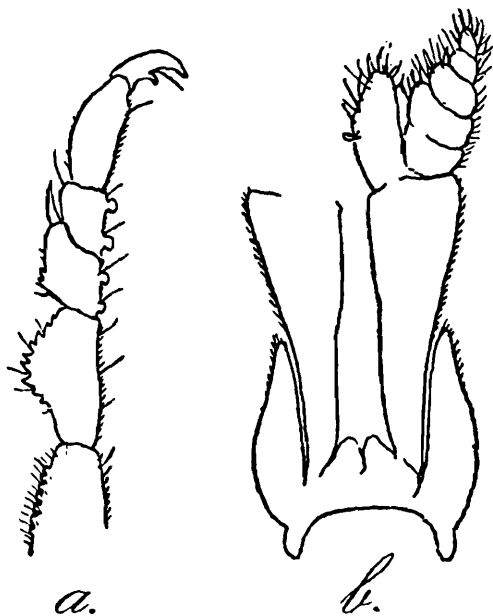
Pleon segment 1 narrower than segments 2-5, each of which has an oblique ridge laterally, becoming more conspicuous posteriorly. Segment 5 dorsally with 2 pairs of longitudinal ridges, the posterior pair joined behind, forming a U-shaped ridge. Telson concave, except in the centre where it is slightly convex, with strongly raised marginal rim; at the base a $\cap$ -shaped ridge, followed by a pair of elongate longitudinal ridges; on either side of the $\cap$ -shaped ridge a small tubercle, from which radiate short vermiculiform ridges. Whole of upper surface of pleon segments 1-5 foveolate, more strongly so on the posterior segments; telson also foveolate proximally; rest of surface with minute short pubescence, which is arranged more or less in little groups.

Antennae 1 and 2 as in *lignorum* (see Sars, 1897, *Crust. Norw.* II., pl. xxxi). Mandibles with well developed palp. Maxilliped with 2nd joint widening distally from a narrow base, epipod narrow lanceolate, extending only half the length of 2nd joint.

Peraeopod 1, 6-7 stout blunt knobs on inner margin of 3rd joint, one on 4th, 6th joint with apically 2 ctenate spines (one short, one longer), 7th with stout bifid spine below unguis.

Peraeopods 2-5, 2 blunt knobs on inner margin of both 4th and 5th joints.

Outer distal margin of 2nd joint and outer margin of 3rd joint in peraeopods 1-5 serrate, the serrations blunt on the 2nd joint (more crenulate or castellate), but sharp on the 3rd joint.



TEXT-FIG. 12.—*Limnoria septima*, sp. nov. a. peraeopod 3. b. maxilliped (palp on one side omitted).

Peraeopod 6 similar, but 3rd joint more elongate, and with 3-4 spines on outer apex of 4th joint, and 3 strong spines on apex of 5th, one of them bidentate, but inserted laterally and easily overlooked as it lies against the 6th joint.

Peraeopod 7 elongate as in *lignorum*, but more slender than in Sars' figure (and also Stebbing's figure of *pfefferi*, 1904, *l.c.*, pl. lii A.).

Uropod, peduncle with a blunt knob on outer distal corner, but no serrations along outer margin, which is fringed with long plumose setae, subacutely produced between the two rami, inner ramus only half the length of peduncle, outer ramus barely half the length of inner ramus, unguiform.

Remarks.—The species to which the present specimens bear most resemblance is *japonica* Richardson (1909, *Proc. U. S., Nat. Mus.*, XXXVII, p. 95, fig. 21). The latter species has "two tubercles in longitudinal series" on pleon segment 5 (the figure shows only one), and a large median basal tubercle on the telson followed by a pair of tubercles and these again by 2 parallel ridges. As will be seen from the figure the arrangement in the present species is quite distinct. Richardson gives no details as to the maxilliped or mandible, and though Chilton (*l.c.*, p. 388) suspects that the epipod of the maxilliped will be found to be short, he includes the species in his key under the heading "epipod longer than 2nd joint". In the present species the epipod extends a relatively shorter distance along the 2nd joint than in any of the other species.

Whereas most records of *Limnoria* are from shallow water (floating logs, wharf-piles, sea-weed), *japonica* was taken in 163 fathoms. Thus the two species which show the greatest development of sculpturing on the pleon are both from fairly deep water.

Family SPHAEROMIDAE.

Group HEMIBRANCHIATAE.

Sphaeroma Bosc.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 192.

Sphaeroma triste Heller.

Heller, 1868, *Novara Reise. Zool.* II, p. 142, pl. xii, fig. 12.

Studer, 1884, *Abh. K. Preuss. Ak. Wiss.* 1883, p. 18.

Lanchester, 1903, *Proc. Zool. Soc. Lond.*, 1902, II, p. 379, pl. xxxv, fig. 10 (*felix*).

Locality.—St. 619, West of jetty, Camorta Is., Nicobars. 1 ovig. ♀ 8.5 mm., ♀♀ 6.5-9 mm.

Remarks.—In spite of Lanchester's brief but pertinent description, I was already convinced that the present specimens were referable to his species, when I recollected the locality of Heller's species. Lanchester unconsciously named his species on the principle *lucus a non lucendo*.

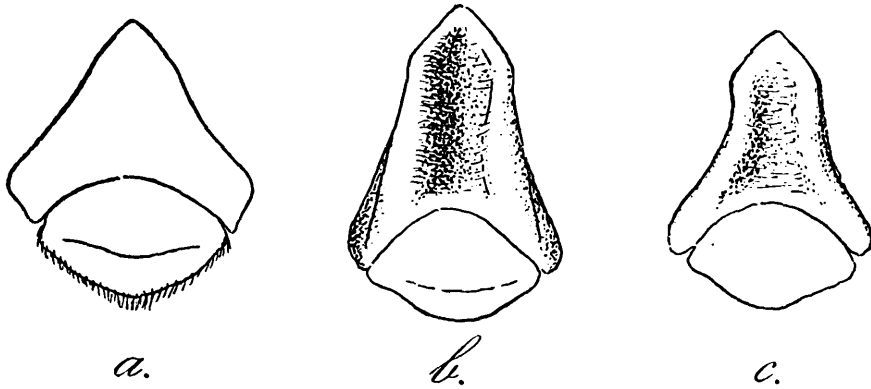
Heller's description is also short and to the point. Lanchester gives no size, and neither he nor Heller state the sex of their specimens. Heller's figure shows pairs of definite tubercles on the two divisions of the pleon, and the inner ramus of uropod apically bifid. One suspects it represents a ♂. The present specimens are all ♀♀ and correspond better with Lanchester's description and figure.

There is a minute and obscure tubercle in the middle of the head (best seen in a dried specimen). Head and peraeon segment 1 minutely granulate. Peraeon segments 2-7 (ignoring the smooth articular portion) with a transverse ridge or costa on both the anterior and posterior margins evanescent laterally, and more prominent on the hinder segments, especially the anterior ridges on segments 6 and 7, which are obscurely granulate. Compare Heller's "granulis in segmentis thoracis duas series transversas formantibus" and Lanchester's "a raised, broadish transversely-grooved ridge" with the above description, assuming that Heller described a ♂, in which the granulation is probably more marked.

There is a pair of very low and rounded setiferous tubercles on the anterior and posterior divisions of the pleon, the whole surface of which is covered with minute setiferous granules, which at the base of the telson are arranged more or less in longitudinal rows with narrow smooth intervals. This is usually visible only after cleansing; before cleansing "mit einem filzigen Überzuge", as Heller says.

Outer ramus of uropod with 9, or occasionally only 8, serrations, including the apical point. Apex of inner ramus in all the present specimens pointed, as in Lanchester's figure.

Inner plate of maxilla 1 with one small (on outer apex) and 3 large plumose setae (as in *annandalei* Stebbing, 1911, *Rec. Ind. Mus.*, VI, pl. x.). Inner plate of maxilla 2 as in *annandalei*, i.e., broad and subquadrate. Fifth (3rd palpal) joint of maxilliped also as in *annandalei* (not as in *walkeri* Stebbing, 1905, *l.c.*, *infra* pl. vii.). The inner plate of the maxilliped is triquetral in section and very setose; according to the position in which it is flattened under a cover-slip it may be either narrow pointed (*annandalei*) or broad and rather blunt (*walkeri*).



TEXT-FIG. 13.—Epistome and upper lip of a *Sphaeroma triste* Heller. *b.* *S. walkeri* Stebb. *c.* *S. annandalei* Stebb. (*c.* drawn from South African examples).

Colour of the present specimens (as preserved) pale buff with a faint greyish tinge, chiefly on the head and telson; eyes black.

The two little dots on the front of the head in Heller's figure represent the articular surfaces of the knob-like bases of the 1st antennae, which are kept clean of particles of mud, etc., and consequently stand out as two dark spots.

From *terebrans* Bate, *walkeri* Stebb., and *annandalei* Stebb. the present species is easily distinguished not only by the shape and sculpturing of the telson, but by the number of serrations on the outer ramus of uropod. The epistome (fig. 13) also distinguishes *triste* from *terebrans* and *walkeri* (Stebbing's figure of the epistome of *annandalei* is not a true full-view and is ambiguous).

Distribution.—Nicobars (Heller); some unknown locality visited during the course of the "Skeat" Expedition to the Malay Peninsula (Lanchester).

***Sphaeroma walkeri* Stebb.**

Stebbing, 1905, *Herdman's Ceylon Pearl Fish, Suppl. Rep.* XXIII, p. 31, pl. vii.

Id., 1910, *J. Linn. Soc. Lond.*, XXXI, p. 220.

Id., 1917, *Ann. Durban Mus.* I, p. 444, pl. xxiii.

Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 360.

Omer-Cooper, 1927, *Tr. Zool. Soc. Lond.* XXII, p. 204.

Baker, 1928, *Tr. Roy. Soc. S. Austr.* III, p. 49.

Monod, 1931, *Mem. Soc. Sci. Nat. Maroc.* XXIX, p. 36, figs. 5, 23A, 43A, B.

Id., 1933, *Bull. Inst. d'Egypte.* XV, p. 154.

Locality.—Off mouth of Devi River, Orissa coast, 23-25 fathoms. 15-25.iv.09. "Golden Crown" 1 immat. ♂ 8 mm., 1 juv. 4.5 mm.

Remarks.—The ♂ is obscurely sculptured on the telson, and the juvenile still more obscurely.

S. venustissimum Monod, (1930, *Bull. Soc. Zool. Fr.* LV, p. 492, figs. 1-3) from French West Africa is very closely allied (see Monod, 1931, *l.c.*, *supra*), but its epistome has not been figured.

Distribution.—Ceylon, Suez (Stebbing); Port Said (Omer-Cooper); Ismailia (Monod); Natal (Stebbing, Barnard); New South Wales (Baker).

Cymodoce Leach.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, pp. 198 seq.

Cymodoce longistylis Miers.

[*Non* Baker, 1928, *Tr. Roy. Soc. S. Austr.* LII, p. 53, pl. vi, figs. 1-4; *pelsarti* Tattersall 1922.]

? Stebbing, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 105, pl. ix, fig. D (*zanzibarensis*).

? Hale, 1933, *Ann. Mag. Nat. Hist.* (10) XI, p. 560 (*zanzibarensis*).

Miers, 1884, *Zool. "Alert"*, p. 305, pl. XXXIII, fig. C.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 27.

Nierstrasz, 1931, *l.c.*, p. 199, figs. 90, 91.

Localities—

St. 614, Octavia Bay, Nancouri Harbour, Nicobars, 13 fathoms.

1 ♂ 9.3 mm.

St. 621, East of jetty, Camorta Is., Nicobars. 1 ♂ 10 mm.

Also 3 ♂♂ 7.5-8 mm., 4 immat. ♀♀ 7-8 mm., 11 juv. 4-5.5 mm.

Remarks on the ♂.—Only one feature might cause one to hesitate in identifying the present two ♂♂ with Miers' species: the size of the granules on the pereon segments. In Miers' figure they are much larger than in our specimens. In view, however, of the almost exact agreement in other respects I think this discrepancy may be attributed to a slight error on the part of the artists who drew Miers' figure.

In conjunction with Miers' description the following points may be noted. Hind margin of 4th pleon segment with only one other tooth between each of the two (submedian) projections and the lateral lobes (*cf. zanzibarensis* Stebb., which has two teeth). Each of the two prominences (keels) on the telson is composed of a tubercle at its proximal end, and several smaller tubercles or granules along the ridge, and ends in a strong conical tubercle, with a somewhat smaller one on its outer flank, with a tuft of setae between the two tubercles (as is very roughly indicated in Miers' figure). Between these ridges 2 irregular lines of tubercles as in Miers' figure. The round button-like boss (the proximal part of whose circumference is not drawn in Miers' figure) is rose-coloured, as in *zanzibarensis*, more or less glabrous on top but fringed with stiff brown setae. Median and lateral lobes of telsonic apex bituberculate with brown setae between the pairs of tubercles; the median lobe more prominently bifid than the lateral lobes, as is indicated in both Miers' and Stebbing's figures.

Inner ramus of uropod as in Miers' figure; apices of both inner and outer rami formed by a sharp conical tubercle (*cf. figure of zanzibarensis*).

The outstanding difference between *zanzibarensis* and *longistylis* is the shortness of the inner ramus of uropod in the former. Stebbing's specimen was 11 mm. in length, and thus can scarcely be claimed as a

not quite adult ♂, in which the granulation of the peraeon and the inner rami of the uropods have not reached their full development, although the above comparison strongly tempts one to this conclusion.

C. bicarinata Stebb. from the Maldives, Ceylon, and Zanzibar (Stebbing, 1904, 1905, 1910) is closely allied to *longistylis*, but considerably more material is needed for the elucidation of the relationship of these two forms. The original 1904 figure, as Nierstrasz (1931) remarks, is rather different from the 1905 figure of the same species; there are points of resemblance between it and the figure of *zanzibarensis* which the 1905 figure does not show.

I cannot agree that the New South Wales specimens as figured by Baker, 1928, belong to Miers' species. The figure shows the two keels on the telson separated by a narrow space or groove (instead of a broad space with 2 rows of tubercles), and also a tubercle arising from the top of the subapical prominence. On the other hand the likeness to *pelsarti* Tattersall (1922, *J. Linn. Soc. Lond.* XXXV, p. 15, pl. ii, figs. 30-33; pl. iii, fig. 36) is evident, and I think Baker's specimens should be assigned to this latter species.

Remarks on the ♀♀ and immature ♂♂.—Nierstrasz, 1931, has described and figured ♀♀, captured along with a ♂ on two separate occasions, which may belong to this species. In the present collection there are 18 ♂♂, immature ♀♀, and juveniles which were captured along with one adult ♂ of *longistylis* at St. 621. It is a reasonable assumption, though by no means certain, that all these 19 specimens belong to one species.

Our specimens closely resemble Nierstrasz' figure except that none of them possess the small point on either side of the last peraeon segment. The ♀♀ have squarely truncate inner rami of the uropods, while in the ♂♂ the outer distal corner is more prominent and acute; but there is very little difference in the median lobe of the telson. None of the ♀♀ are ovigerous or have modified mouth-parts.

Although found with an adult ♂, it is a little difficult to believe that one of the smooth ♂♂ 8 mm. in length could undergo so great a change in sculpturing, as is necessary to produce the ornate adult form, with so little increase in size. I have, therefore, instituted the following comparison with another species, if only as a further comment on the well-known difficulty of assigning ♀♀ and immature ♂♂ of *Cymodoce* to their true adult ♂♂.

Our specimens are very like Haswell's Queensland species *mammifera* as described and figured by him (1880, *Proc. Linn. Soc. N. S. W.*, V, p. 474, pl. xviii, figs. 1, 1x), although the inner ramus of the uropod barely extends beyond the level of the telsonic apex. Haswell gave the length as $\frac{3}{8}$ inch (9.4 mm.), but no indication of the sex. The larger specimens (12 mm.) from West Australia, which were assigned to Haswell's species by Tattersall (1922, *l.c.*, *supra*, p. 14, pl. iii, fig. 35), have a more extended telsonic apex, reaching well beyond the rami of the uropods; this is a development which one might reasonably expect in a more fully grown male.

The South African species *setulosa* (Stebb.) (see Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 363) is well distinguished by a relatively broader body, and stronger granulation.

Hale's Gt. Barrier Reef specimen, assigned to *zanzibarensis*, was identified by Baker, who noted that the species is "closely allied to *coronata* Hasw." (see Baker, 1928, *Tr. Roy. Soc. S. Austr.* LII, pp. 51, 52, pl. ii, figs. 2-9 with vars.). *C. coronata*, however, does not appear from Baker's figures to have the button-like prominence at the end of the telson, and in this respect is comparable with Miers' figure of *longistylis*. A direct comparison of *longistylis*, *coronata* (the cotype of which is in the British Museum, *fide* Hansen, 1905, *Q. J. Microsc. Sci.* XLIX, p. 121), *zanzibarensis*, and *bicarinata* would certainly yield useful results.

Distribution.—Thursday Island and Singapore (Miers); Philippine Islands (Richardson); East Indies (Nierstrasz). Zanzibar (Stebbing); Gt. Barrier Reef (Hale).

Cilicaea Leach.

Stephensen, 1927, *Vid. Medd. Dansk. Nat. For.* LXXXIII, p. 364.
Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 204.

Remarks.—To the species now included in this genus, as listed in the above two papers, I am inclined to add *Cilicaeopsis dakini* Tattersall, 1922, as the description of the hind margin of the telson having a "vestige" of a median lobe is by no means borne out by the figure, which shows a well developed median lobe.

Cilicaea canaliculata (Thomson).¹

Thomson, 1879, *Tr. New Zeal. Inst.* XI, p. 234, pl. x, fig. A 7 (*Nesea caniculata*, sic).
Miers, 1884, *Zool. "Alert"*, p. 309. (*Cilicaea caniculata*).
Filhol, 1885, *Crust. Mem. passage de Venus* III, p. 458 (quoted from Nierstrasz, 1931).
Thomson & Chilton, 1886. *Tr. New Zeal. Inst.* XVIII, p. 153.
Hansen, 1905, *Q. J. Microsc. Sci.* XLIX, pp. 123, 125 (*Cilicaea canaliculata*).
Chilton, 1911, *Rec. Canterbury Mus.* I, p. 311 (*caniculata*).
Id., 1911, *Tr. New Zeal. Inst.* XLIII, p. 568 (*caniculata*).

Locality.—Bay of Bengal (without detailed locality). 2 adult ♂♂ 12 and 13 mm., 3 juv. ♂♂ 7.5, 10, and 11 mm., 1 ovig. ♀ 11.5 mm., 6 juv. ♀♀ 6-10 mm.

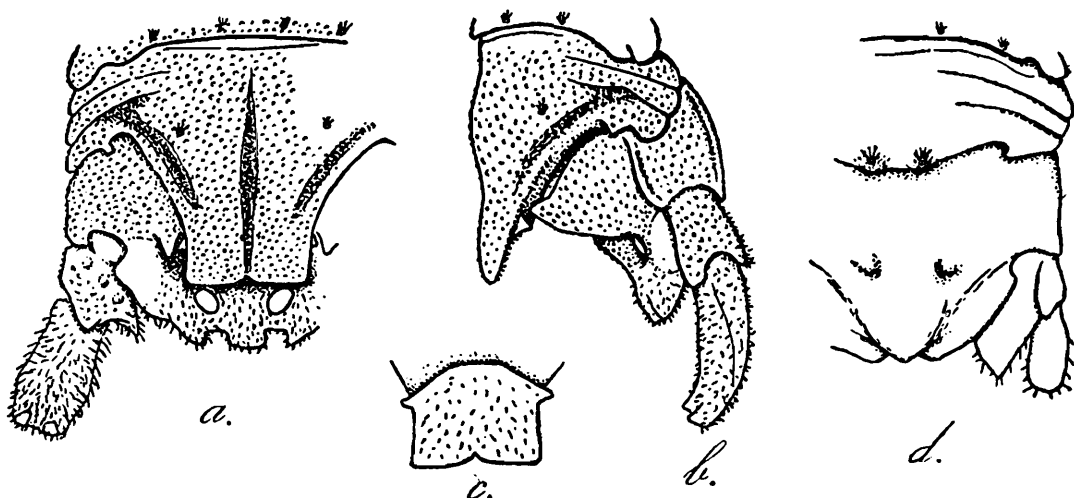
Description.—♂. Surface without pubescence or setae except on hind part of telson, and on outer ramus of uropod; a transverse series of 4 tiny pits on hind margin of head and each of the pereon segments, from which arise minute tufts of setules; 2 similar pits on process of 4th pleon segment. Head and 1st pereon segment closely punctate, the punctae not covering the very slightly raised vermiculate markings on the dorso-lateral parts of 1st segment. Segments 2-7 granulate, the granules on segment 2 more or less aggregated to form two slightly raised ridges, one on anterior, the other on posterior margin of the segment; these ridges are more distinct on segments 3-7.

Pleon segment 4 with a broad, apically squarely truncate, conical projection, not reaching quite to end of telson. This projection has a shallow medio-dorsal groove, and a similar groove on each lateral margin;

¹ A note by Thomson states that he cannot confirm Miers' reference of the species to the genus *Cilicaea* as the type appears to be lost.

The original spelling of the specific name was retained by Miers and twice by Chilton.

ventrally near the end there is a semicircular ridge which projects laterally like a small conical tooth.



TEXT-FIG. 14.—*Cilicæa canaliculata* (Thomson). *a*, *b*. dorsal and lateral views respectively of pleon and telson of adult ♂. *c*. ventral view of the dorsal process on pleon segment 4. *d*. dorsal view of pleon and telson of ♀.

Telson strongly convex proximally, with 2 conical bosses which fit in front of the lateral projections of the process of the 4th segment when the latter is depressed; distally the telson is depressed, with 2 longitudinally oval perforations; apical margin with squarish median lobe. Whole surface of pleon and telson, except a bare area adjoining the insertion of the uropods, strongly granulate.

Peraeopod 1, 3rd joint with 1 spine on outer distal margin, 4th, 5th and 6th joints with 5, 3, 4 spines respectively on inner margins.

Pleopod 2, stylet half as long again as inner ramus. Penial processes on 7th sternite elongate, extending to end of outer ramus of pleopod 1 (*in situ*).

Uropod, peduncle with upper surface shallowly punctate and with 3 low knobs near hinge, outer ramus granulate and setose, apically truncate, with 2 conical knobs.

Ovigerous ♀ (with modified mouth-parts)—Surface much smoother, punctate but with scarcely any granulation. The setiferous pits as in ♂, the pair on the 4th pleon segment being situated at the apices of very low and inconspicuous bosses. Two bosses, more conspicuous, on telson, the bluntly pointed apex of which overhangs the apical notch.

Spines on peraeopod 1 as in ♂. Uropods as in figure 14, sparsely setose.

The smallest juv. ♀ resembles the adult ♀ (except of course as regards the mouth-parts).

Immature ♂ resembles the ♀, but the surface is more granulate, the knobs on 4th pleon segment and telson are more prominent, and the outer ramus of uropod is shorter and broader, especially in the 10 and 11 mm. specimens. In these latter the penial processes extend to end of peduncle of pleopod 1; in the 7.5 mm. specimen they do not reach the base of pleopod 1.

Remarks.—To judge from Thomson's description and figure, it did not seem possible that these specimens could be referred to his species.

in spite of a certain superficial resemblance. But thanks to Prof. Percival of Canterbury College, New Zealand, I have received specimens identified by the late Dr. Chilton as *canaliculata*, with which the Indian Museum specimens are identical. The New Zealand specimens have the pair of perforations in the telson, which were not noticed by Thomson in his original description; and the later references (1886 and Chilton, 1911) are only locality records.

The absence of a detailed locality for the Indian Museum specimens leads one to suspect that the specimens really came from New Zealand, although Dr. Chopra assures me that there is no evidence that this was the case.

The broad square process of the 4th pleon segment is enough to separate the present species from all the others of the genus, apart from the peculiar perforations in the telson. When the animal is completely rolled up the epistome and peduncles of 1st antennae fit closely against the lower surface of the telsonic margin, and the two perforations allow the access of water to the branchial pleopods.

The ♀ is easily distinguished from that of *latreillei*, which is also recorded from Indian seas, by the absence of the tooth on outer margin of outer ramus of uropod.

Group EUBRANCHIATAE.

Remarks.—Among the specimens of *Cilicæa canaliculata* from some locality in the Bay of Bengal was a small juvenile Sphaeromid belonging to this group. The specimen is much too young to be identified even generically, and is only mentioned here because it, together with the following species, is the first record of a Eubranchiate Sphaeromid from this part of the Indian Ocean.

Cerceis, M. Edw.

Milne-Edwards, 1840, *Hist. Nat. Crust.* III, p. 220.

Hansen, 1905, *Q. J. Microsc. Sci.* XLIX., pp. 108, 127.

Baker, 1908, *Tr. Roy. Soc. S. Austr.* XXXLI, p. 153 (*Circeis*).

Id., 1910, *Ibid.*, XXXIV, p. 85.

Id., 1926, *Ibid.*, L, p. 270.

Hale, 1929, *Crust. S. Austr.* pt. 2, p. 299.

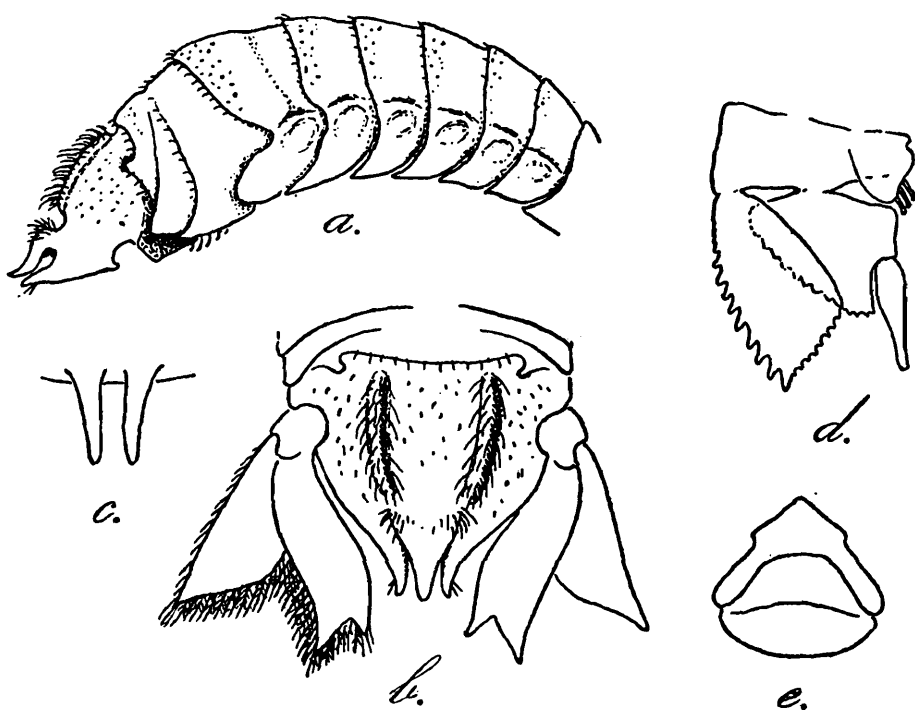
Nierstrasz, 1931, *l.c.*, p. 215 seq. (*Circeis*).

Cerceis bicarinata, sp. nov.

Locality.— $\frac{230}{7}$ Off Little Andaman Island. 1 ♂ 6×2.3 mm.

Description.—Body widest across 7th peraeon segment and pleon narrowing anteriorly, smooth, but hinder parts of peraeon segments, especially the posterior segments, coarsely punctate, margins with setules. Side-plates on segments 2-7 demarcated by distinct grooves, each side-plate feebly bulbous at base, postero-inferior corners acute, except side-plate 7 which is narrowly rounded (contrast *picta* Nierstr.). Anterior portion of pleon without ornamentation. Telson strongly convex proximally, with a pair of raised, strongly setose keels, distal to which is a sharply pointed median process, strongly setose at its base, more or less concealing the apical notch which is bounded on either side by a sharp, slightly out-curved point.

Antenna 1, 1st peduncular joint with the usual 2 apical teeth, flagellum 9-jointed. Antenna 2, flagellum 10-jointed.



TEXT-FIG. 15.—*Cerceis bicarinata*, sp. nov. ♂. a. lateral view of peraeon and pleon, (uropod omitted). b. dorsal view of telson and uropods. c. penial processes on 7th sternite. d. pleopod 2, marginal setae omitted. e. epistome and upper lip.

Pleopod 2, outer ramus strongly dentate on outer margin, stylet on inner ramus rather broad at base and tapering to a subacute apex; 3 coupling spines on basal joint.

Uropod, inner ramus elongate-oblong, slightly sinuous, apex deeply notched between the sharp outer and inner corners, outer ramus broadly lanceolate, with sharp apex, apical and outer margins of inner ramus and inner margin of outer ramus densely fringed with plumose setae.

Colour (as preserved) dull horny, with indications of darker oval markings laterally on the peraeon segments, as in *picta* Nierstr., the bulbous parts of the side-plates being also darker.

Remarks.—Amongst the described species, this specimen is comparable with only three forms, viz., *bidentata* M. Edw., 1840, *aspericaudata* Miers, 1884, and *intermedia* Baker, 1926. That the two latter forms should be regarded as varieties of *tridentata* M. Edw. rests partly on the fact that probably Miers had at that time not seen Haswell's descriptions (1882, *Proc. Linn. Soc. N. S. W.*, VI), and on Hansen's (1905) statement that *bidentata* is a ♀. Hansen was careful, however, to say a ♀ either of *tridentata* "or a closely allied species" *C. bidentata* and the two varietal forms, and the present specimen are the only ones which have a pair of elevations (tubercular or cariniform) on the telson. Although he does not mention it, Miers' figure shows a V-shaped line distal to the two bosses but not reaching the apical notch, which seems to be comparable with the median process in Baker's figure of *intermedia*, slightly more distal and projecting into (or overlapping) the notch. Whether the respective artists viewed their specimens from slightly different angles, or Baker's specimen represents a more mature example, I

think there is little doubt that they are forms of the same species, and that the name *intermedia* ought to go into synonymy. Miers' specimen from Prince of Wales Channel, Torres Straits, was a ♂ (12 mm.), and Baker's specimens from the Gulf of Carpentaria and Queensland comprised ♀♀ and an immature ♂ (size not stated).

One would like to identify our specimen as *aspericaudata*, but I do not think the evidence warrants that course, and I therefore propose to regard it as a new species.

From personal inspection of examples of *acuticaudata*, *trispinosa*, *trilobata* and *ovata*, for which I am indebted to the kindness of Mr. Baker, it seems that the shape of the 7th side-plate can be used as an additional specific character (Baker, 1910, *l.c.*, p. 85, mentions the hooked shape in *trispinosa*); and also that the dark markings so conspicuous in *picta*, and to a lesser degree in our present specimen, may occur in other species, and is not therefore specific.

Family IDOTEIDAE.

Tattersall, 1921. *Mem. Asiat. Soc. Bengal*, VI, p. 424.

Synidotea Harger.

Synidotea variegata Cllge.

Collinge, 1917, *Rec. Ind. Mus.* XIII, p. 2, pl. i.

Chilton, 1924, *Mem. Ind. Mus.* V, p. 891, fig. 10, and pl. lx, fig. 6.

Omer-Cooper, 1927, *Trans. Zool. Soc. London*, XXII, p. 205. (? *S. hirtipes*).

Barnard, 1935, *Rec. Ind. Mus.* XXXVII, p. 313.

Locality.— $\frac{2372-2380}{7}$ St. 74, Ganjam coast, $7\frac{1}{2}$ - $9\frac{1}{2}$ fathoms

40 ♂♂, ovig. ♀♀ and juv.

Remarks.—The ♂♂ measure up to 12 mm. in length; there are 2 ovigerous ♀♀ 8.5 and 9 mm., and 10 ovigerous ♀♀ 4.5-5 mm., but none of an intermediate size.



TEXT-FIG. 16.—*Synidotea*, fused penial processes of 1st pleon segment in *a. variegata* Cllge., and *b. hirtipes* (M. Edw.).

The ♂ has a *single* penial process on the 1st pleon segment. Among the species of Idoteidae known to me, *Synidotea hirtipes* is the only one which exhibits the same peculiarity, all the other species, having a pair of penial processes (see Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 380).

I have seen seven specimens from the Suez Canal which Omer-Cooper doubtfully identified as the South African *hirtipes*. They are certainly not this species, and I think they should be identified as *variegata*. The specimens include 3 ovigerous ♀♀ 5.5-6 mm. in length.

Distribution.—Gulf of Manaar; Chilka Lake; Travancore; Suez Canal.

Cleantis Dana.

Tattersall, 1921, *l.c.*, p. 425 seq. (discussion).

Hale, 1924, *Tr. Roy. Soc. S. Austr.* XLVIII, p. 223 (*Zenobiana*).

Barnard, 1925, *Ann. S. Afr. Mus.* XX, p. 393 (references).

Cleantis natalensis Brnrd.

Barnard, 1925, *l.c.*, p. 394.

Localities.—

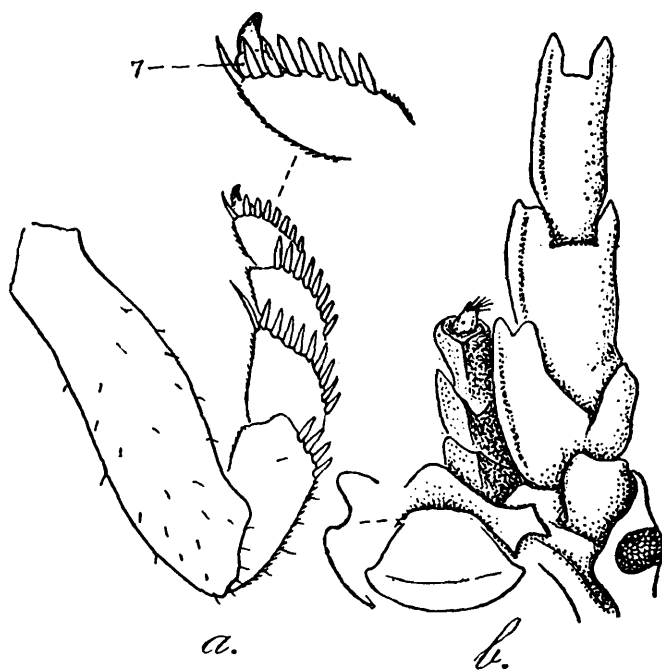
- | | |
|---------|--|
| 3847-48 | Off Puri, mouth of Devi River, about 8 fathoms. |
| 9 | 24. xii. 88 (Orissa). |
| | 1 ♀ 16mm., 1 ovig. ♀ in tube 17mm. |
| 3850 | Tanda, 19° 52' N. 86° 15' E., about 8 fathoms. |
| 9 | 19. xii. 88. (Orissa). |
| | 1 ♀ 18mm., 1 juv. ♀ 11mm. |
| 2381 | St. 74, Ganjam coast, 7½-9½ fathoms. 1 ovig. ♀ |
| 7 | 15 mm. |
| 9305 | Bassein River estuary, 30. x. 09. (Lower Burma). |
| 10 | 1 juv. 7 mm. |
| | Off Haingyi Is., off Bassein River, 14. xi. 09. Townt. (Lower Burma). 1 juv. 4 mm. |

Remarks.—This species is closely related to *planicauda* and *japonica* (for description of latter see Richardson, 1912, *Proc. U. S. Nat. Mus.* XLII, p. 27, fig. 1). Although the hinder part of the telson is slightly convex between the curved raised rims, there is no trace of the conical tubercle found in *japonica*. The 4th pleon segment, which is partially separated from the 5th segment (telson) by the incomplete suture, does not extend to the lateral profile but is pinched out by the approximation of the 3rd and 5th segments, as in *annandalei* Tattersall (1921, *l.c.*, pl. xvii, fig. 1). The figure of *japonica* shows segment 4 as wide as the other segments, as does Collinge's figure of *Zenobiana prismatica* (1917, *Tr. Roy. Soc. Edinb.* LI, pl. x).

The antennae were referred to in the original description. A figure is given here showing the character of the 2nd joint of antenna 2, which may prove to be a specific character. In the 18 mm. specimen the 2nd antennae are 6 mm. in length (incl. 1st joint), and extend back to end of 3rd peraeon segment, but in the 16 mm. specimen they are only 4 mm. in length and extend back only to the middle of the 2nd segment.

Maxilliped with 3 coupling hooks on inner plate. The suture between 2nd and 3rd joints of the palp is rather obscure, and is best seen on the outer margin.

Peraeopod 4 (Tattersall: 5th) short, 2nd joint as long as the rest together, 3rd-6th joints with stout spines on anterior, posterior and



TEXT-FIG. 17.—*Cleantis natalensis* Brnrd. a. peraeopod 4, posterior surface, with 6th and 7th joints further enlarged. b. ventral view of head showing 1st and 2nd antenna, epistome and upper lip, with profile of epistome and upper lip.

lower distal margins, less numerous on 3rd joint, 5th and 6th joints with an additional row of spines in the middle of the lower margin. 7th joint very short, with short stout unguis which, owing to its strong chitination and brown colour, is distinguishable from the paler spines of the 6th joint. Although the 7th joint (dactylus) is absent in *annandalei* Tattersall (1921) it will probably be found to be present in those species which appear to be more closely allied to *natalensis*, viz., *planicauda* Bened., *occidentalis* Rich., *japonica* Rich., and *prismatica* (Risso). The peculiar structure of this peraeopod seems to be an adaptation to a tubicolous habitat.

The larger specimens, collected in 1888, no doubt owing to the length of time they have been in preservative, show very little if any trace of longitudinal stripes. They are brownish, paler on the middle part of the body and medio-dorsally, becoming slaty on the head and telson, the latter with 4 semicircular creamy patches on the rounded apical margin (cf. the figure of *japonica*). The ♀ from St. 74 is pale brown, with 4 pale patches around end of telson. The 7 mm. juvenile is uniform pale buff, and the 4 mm. juvenile is white with faint grey speckling. The eyes in all specimens are black.

The tube, in which the ovigerous ♀ is ensconced, is about 18 mm. in length, and 7-8 mm. in external diameter; the diameter of the lumen is 4 mm. and just wide enough to accommodate the animal. The tube appears to be a partially decomposed portion of a monocotyledonous stem, from which the pith has completely rotted. Externally it is covered with Hydroid hydrorhiza and three flat disc-like chitinous capsules, probably egg-capsules of a Gastropod mollusc.

Distribution.—Natal coast, on sea-weed.

Family MUNNOPSIDAE.

Hansen, 1916, *Dan. Ingolf Exp.* III, 5, Crust. Malacostr. 3.

Remarks.—Hansen divides the Asellota into a number of Groups (e.g., Eurycopini, p. 129) and does not use family names.

Eurycope G. O. Sars.

Stephensen, 1913, *Vid. Medd. Naturh. For. Copenhagen* LXIV, p. 99 (*Munneurycope*).

Id., 1915, *Rep. Dan. Ocean Exp.* II D. 1, p. 23 (*Munneurycope*).

Hansen, 1916, *l.c.*, p. 137.

Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 420 (references).

Eurycope murrayi (Wlkr.).

Walker, 1903, *Ann. Mag. Nat. Hist.* (7) XII, p. 227, pl. xviii, figs. 1-6 (*Munnopsis m.*)

Tattersall, 1905, *Fish. Irel. Sci. Invest.* 1904, pp. 24, 73, pl. v, fig. 8 (mandible) (*Munnopsis m.*).

Vanhöffen, 1914, *Deutsch Südpol. Exp.* XV, p. 581 (*Munnopsis m.*).

Stephensen, 1915, *l.c.*, p. 23, figs. 12, 13 (*Munneurycope tjalfiensis*).

Hansen, 1916, *l.c.*, p. 137, pl. xii, figs. 7a, b (mxp. plp. 2 ♂).

Locality.—St. 462A, 9° 8' N. 87° 25' E. (Bay of Bengal). 1 ♂, 2 non-ovig. ♀♀, ca. 6-7 mm.

Remarks.—The specimens are mutilated, the antennae and peraeopods being missing except the basal joints, and show no trace of dark colouration.

The mandibles and other details, however, leave no doubt that the specimens belong to this or a very closely allied species. Compared with Stephensen's figures there are two differences: the 1st pleopods ♂, of which a figure is given here, and the uropods. The latter are more elongate than in Stephensen's figure, the ramus being $4\frac{1}{2}$ times



TEXT-FIG. 18.—*Eurycope murrayi* (Wlkr.). 1st pleopods ♂, with apex of one lobe further enlarged.

the length of peduncle; no outer ramus is traceable in any of our specimens. These two features, if constant, might well characterize a

distinct species, but I do not propose to base a new species on the present material. Moreover Vanhöffen has recorded Walker's species from the Southern Indian Ocean, without however, giving any details. His material should be re-examined to see whether there is any variation in the two characters mentioned above.

The maxillipeds agree with Hansen's figure.

The character of the uropods seems to me to be a good reason for not including this species in the genus *Eurycope*, as Hansen has done, but on the contrary for accepting Stephensen's genus. In this respect it bears considerable resemblance to *Paramunnopsis*, a genus which Hansen places in a different group (Munnopsini).

Distribution.—North Atlantic (Walker, Tattersall, Stephensen); Middle and South Atlantic, Southern Indian Ocean (Vanhöffen).

Family LIGIIDAE.

Ligia Fabr.

van Name, 1925 *Zoologica*, VI, p. 497.

Barnard, 1932, *Ann. S. Afr. Mus.* XXX, p. 184 (references)

Ligia exotica Roux.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 718.

Id., 1905, *Herdman's Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 57.

Chilton, 1916, *Mem. Ind. Mus.* V, p. 462, figs. 1-22.

Tattersall, 1921, *Mem. Asiat. Soc. Bengal*, VI, p. 430.

Jackson, 1922, *Proc. Zool. Soc. Lond.*, p. 693, pl. ii, fig. 10.

Chilton, 1924, *Mem. Ind. Mus.*, V, p. 894.

Id., 1926, *Rec. Ind. Mus.*, XXVIII, p. 185.

Jackson, 1927, *Ann. Mag. Nat. Hist.* (9), XIX, p. 134.

Id., 1927, *Insects Samoa, Brit. Mus.*, pt. 8, p. 11.

Id., 1931, *Res. Sci. Voy. Ind. Or. Neerland.* III, 9, p. 4.

Barnard, 1932, *l.c.*, p. 192, figs. 1b, 2d, 3c.

Localities.—

3968 Off Godavari (Sacraments mouth), 6 fathoms. 1 ♂
10 28 mm., 4 ♀♀.

St. 503, Elphinstone Is., Mergui Archipelago. 1 ♂, 2 juv. ♂♂,
5 juv. (probably ♀♀).

St. 560, Parker Island, Mergui. 1 juv. ♂, 1 juv.

St. 571, Jack and Una Islands, Mergui. 2 juv. ♂♂, 2 juv.
(probably ♀♀).

St. 625, Nancouri Harbour, Nicobars. 1 juv. ♂.

Remarks.—The stylet on pleopod 2 of the juvenile ♂ is somewhat different from that of the adult (figured by Chilton, 1916, and Barnard, 1932), being subapically geniculate and sharply pointed. The largest specimen showing this feature is 18 mm. in length, the smallest 12 mm.

The specimens from Godavari were in the same tube with one *Nerocila sundaica*. As it is extremely unlikely that *Ligia* should be captured at a depth of 6 fathoms, some error in labelling must be presumed to have occurred.

Distribution.—Although widely distributed on the warmer shores of the Indo-Pacific Ocean (and Atlantic), there do not seem to be any actual records from India except the Chilka Lake record (Chilton).

Family DETONIDAE.

(SCYPHACIDAE auct.)

Barnard, 1932, *l.c.*, p. 219, (with key to genera).

Remarks.—The diagnosis of the family must be slightly emended to include the following new genus, *viz.*, flagellum of 2nd antenna 3-4-jointed, or *multiarticulate*. Inner plate of 1st maxilla *usually* with 2 plumose setae.

Camorta, gen. nov.

Closely allied to *Scyphacella* S. I. Smith (see Richardson, 1905, *Bull. U. S. Nat. Mus.*, No. 54, p. 671).

Eyes rather small, subcircular, ocelli 6-7.

Pleon abruptly narrower than peraeon; telson very short, laterally overlapped by hind corners of 5th pleon segment.

Flagellum of 2nd antennae multiarticulate.

Mandible with an elongate seta in place of the molar (appearing like a single seta under a low power, but really composed of 3-4 setae graduated in length). Maxilla 1, outer plate with 4 apical spines, which are blunt and somewhat recurved; inner plate apically acute, with a few fine setules. Maxilla 2 slender and apically setose, without apical notch. Maxilliped resembling those of the other genera of the family, rather than the figure given in Richardson (*l.c.*, fig. 712 b), epipod only half as long as 2nd (basal) joint, which is shortly produced at outer apex.

Peraeopods alike, without special armature in ♂.

Pleopods without air-cavities.

Uropods exposed, outer ramus longer than peduncle, inner ramus attached near base.

Remarks.—At once distinguished from all the other genera by the multiarticulate flagellum of 2nd antenna. This feature and the abruptly narrowed pleon give the animal a resemblance to a *Ligia*, though the general shape of the body is more like that of a *Philoscia*.

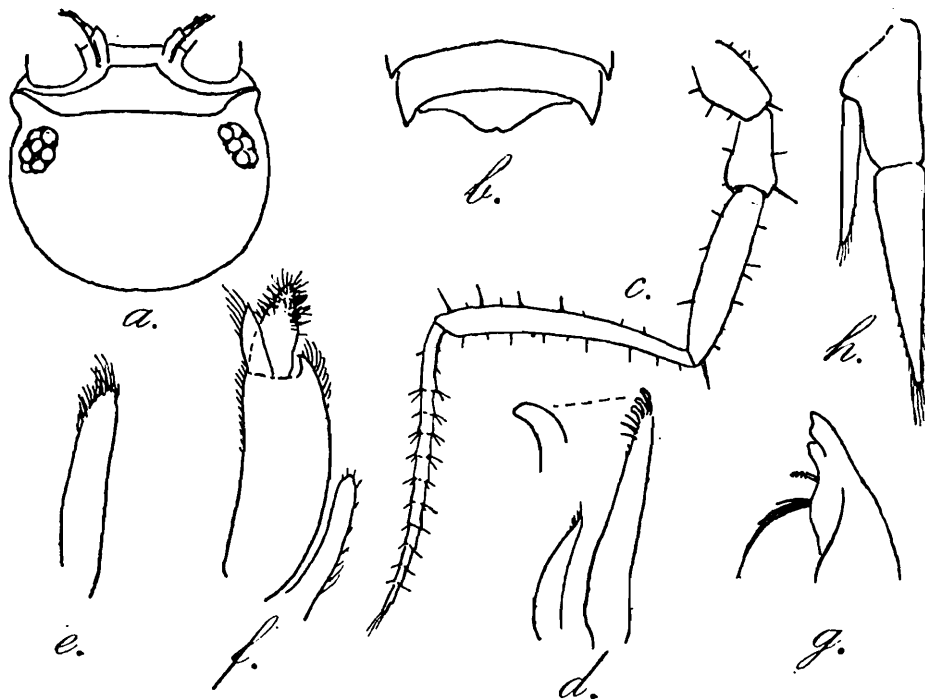
If the figures given in Richardson (*l.c.*, fig. 710 is stated to be "after Harger", but the other figures are not thus qualified) are correct, the present form has a more normal shape; but there would probably be a close resemblance in the outer plate of 1st maxilla if the fig. 712 c of that of *Scyphacella* had not been so diagrammatically sketched.

Camorta nicobarica, sp. nov.

Locality.—St. 619, Camorta Is., Nicobars, (west of jetty). 1 ♂, 5.3 mm., 1 non-ovig. ♀ 5 mm.

Description.—Surface smooth, minutely shagreened, glabrous. The slightly raised frontal line extending laterally on to the antero-lateral angles. Eyes rather small, subcircular, with 6-7 ocelli. Epimera not demarcated. Pleon segments with short postero-lateral points. Telson very short, sub-triangular, but apex rather broadly rounded, with a minute median indent.

Antenna 1, 1st joint rather elongate, 2nd and 3rd much shorter and narrower, the latter with apical tuft of setae. Antenna 2 reaching back nearly to end of 6th peraeon segment, flagellum *ca.* 12-jointed.



TEXT-FIG. 19.—*Camorta nicobarica*, gen. et sp. nov. a. dorsal view of head. b. 4th and 5th pleon segments and telson. c. 2nd antenna. d. maxilla 1, with apical spine further enlarged. e. maxilla 2. f. maxilliped. g. apex of mandible. h. uropod.

Mandibles alike on both sides, a single penicil between the secondary cutting-plate and the long composite seta. Maxilla 1, outer plate with 4 somewhat recurved apical spines, and 3-4 slender spine-setae.

Peraeopods closely resembling those of *Scyphax ornatus* as figured by Chilton (1901, *Tr. Linn. Soc. Lond.* VIII, pl. xv, fig. 1), most of the spines on lower margins of 4th-6th joints apically trifid.

Pleopods without noteworthy features. Uropod, see fig. 19h.

Colour (as preserved) greyish, with pale dorsal mottling, eyes black.

Family BOPYRIDAE.

Chopra, 1923, *Rec. Ind. Mus.* XXV, p. 411 seq.

Id., 1930, *ibid.*, XXXII, p. 113 seq.

Parathelges Bonnier.

Bonnier, 1900, *Trav. Stat. Zool. Wimereux*, VIII, p. 215.

Nierstrasz and Brandis, 1923, *Siboga Exp. Monogr.* XXXII, b, p. 104.

Id., 1931, *Vid. Medd. Dansk. Naturh. For.* XCI, p. 200.

Parathelges weberi Nierstr. & Brand.

Nierstrasz and Brandis, 1923, *l.c.*, p. 105. figs. 28 a-d.

Locality.— $\frac{2972}{7}$ Gt. Coco Is., Andamans. 1 ♀ 9 mm.

Remarks.—Host not recorded. *P. aniculi* (Whitel.) was found on the Hermit-crab *Aniculus*, and *whiteleggei* Nierstr. & Brand. on a *Pagurus*.

No parasites (see Nierstrasz & Brandis, 1923, *l.c.*, p. 116) in brood chamber.

Distribution.—East Indies (exact locality and host not recorded).

STUDIES ON INDIAN ITONIDIDAE (CECIDOMYIDAE : DIPTERA).

III. ON A COLLECTION OF MIDGES FROM SOUTH INDIA.¹

By M. S. MANI, *Zoological Survey of India, Indian Museum, Calcutta.*

Mr. M. C. Cherian, Government Entomologist, Agricultural College and Research Institute, Coimbatore, recently sent me for identification a small collection of gall midges from South India. The material comprises eight species, four of which are new to science. Of particular interest is the finding of a male of *Neolasioptera cephalandrae* Mani, originally described from females only.

My thanks are due to Mr. M. C. Cherian for giving me an opportunity of studying this interesting collection.

Tribe LASIOPTERARIAE.

***Neolasioptera cephalandrae* Mani.**

1934. *Neolasioptera cephalandrae*, Mani, *Rec. Ind. Mus.*, XXXVI, pp. 397-399, figs. 8-9.

One male of this species found in the material before me is described below :

Length 1.25 mm. in the dry specimen. General colour of body brownish black. Antennae two ninth the length of body, brownish, moderately setose ; segments 15 ; segments three to six subequal, length in each case one tenth greater than diameter ; segments seven to ten subequal, each about three fourths the length of sixth segment ; segments eleven and twelve almost equal ; the two penultimate segments short and pyriform ; terminal segment subglobose. Palpi rather long, quadri-articulate, moderately setose ; first segment short ; second segment stout, its length about twice its diameter ; third segment somewhat longer ; fourth segment slender. Mesonotum densely clothed with whitish scales, these appear golden brown when viewed from certain angles. Scutellum covered with white scales. Halteres light brownish. Post-scutellum naked and somewhat darker than scutellum. Claw unidentate, slightly curved ; legs reddish brown. Abdomen thickly scaled, black, dorsally with five transverse whitish bands on either side of a median black region, the basal bands are rather broad laterally and almost contiguous with each other. Genitalia rather densely setose ; dorsal plate roundly divided ; ventral plate longer than dorsal plate ; harpes short ; basal clasp segment emarginate ; terminal clasp segment about three fourths the length of the basal clasp segment.

¹ Part II of this series was published in *Rec. Ind. Mus.*, XXXVII, pp. 425-454 (1935).

Allotype.—Partly dissected on slide No. 1131/H6. Coll. C. V. S., Coimbatore, 24-vi-1935. In the collections of the Zoological Survey of India, Indian Museum, Calcutta. Forming galls on shoots of *Cephalandra indica*.

Tribe ASPHONDYLARIAE.

Schizomyia cheriani, sp. nov.

I associate with this new species the name of Mr. M. C. Cherian. It is easily separated from the known Indian species of the genus *Schizomyia* by its relatively longer empodium.

Female.—Length of the dry specimen 1.5 mm. Body dark brown, densely clothed with black setae. Antennae three fourths the length of body; except the scape and pedicel black in colour; fourth segment fused with third segment, one seventh shorter than third; fifth segment one seventh shorter than fourth, also two and a half times its own diameter and with a very short stem; sixth and seventh segments nearly equal to fifth; eighth, ninth and tenth segments equal, each about one sixth shorter than seventh; eleventh one fifth shorter than tenth; twelfth segment about three fourths the length of eleventh; thirteenth segment about half the length of twelfth; terminal segment subglobose. First segment of palpus short, moderately stout; second segment twice the length of first, somewhat stouter; third segment as long as second, stouter and more densely setose; fourth segment slender and rather long. Mesonotum brown. Submedian lines densely setose. Scutellum grayish brown, thickly setose. Claw as long as empodium. Abdomen dark brown, thickly setose. Ovipositor moderately long, with a rudimentary dorsal pouch at the base of ovipositor.

Male.—Unknown.

Cotypes.—Two examples dissected on slide No. 1133/H6. One example on pin No. 1132/H6. In the collections of the Zoological Survey of India, Indian Museum, Calcutta. One example on pin in the collections of the Agricultural Research Institute, Coimbatore. Coll. M. C. Cherian, Madras, 24-vii-1935. Bred from galls on "Blue Bells"

Galls.—The galls are produced on *Ipomea carica* Sw. (Blue Bell). The parts attacked are the flowers, and the galls resemble those on flowers of *Ipomea sepiaria* Koen. and *Rivea hypocrateriformis* Choisy described in an earlier paper¹.

Asphondylia morindae Mani.

1934. *Asphondylia morindae*, Mani, *Ann. Mag. Nat. Hist.*, (10), XIII, pp. 134-137.

1934. *Asphondylia morindae*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 409, pl. vii, fig. 2, text-fig. 13-14.

This species is known so far from Tanjore, South India. Several midges labelled as having been bred from "fruits" (really the inflorescence galls) of *Morinda tinctoria* Roxb. at Coimbatore, are referred to this species.

¹ Mani, *Rec. Ind. Mus.*, XXXVI, pp. 406-407 (1934); also, *id.*, *ibid.*, XXXVII, p. 452 (1935).

Tribe ITONIDIDINARIAE.

***Stictodiplosis moringae*, sp. nov.**

This new species is readily distinguished from the only known Indian species *S. pulcherrima* Kieff.¹ by its much smaller size, paler colour and other characters.

Female.—Length 1.5 mm. General colour of body brownish black. Mesonotum brown. Scutellum brownish black. Abdomen brownish black, two thirds the length of body. Submedian lines densely setose. Head with long setae. Palpi densely setose, terminal segment rather very long. Antennae short, third segment longest, its stem short, stout; fourth segment fused with third, somewhat shorter, with a very short stem, of a length about one and two thirds the diameter: fifth segment with a somewhat longer stem; sixth, seventh and eighth segments, shorter than fifth, their stems more slender and somewhat dilated apically. Claw as long as empodium.

Male.—Generally resembling the female. Terminal palpal segment longest. Antennae somewhat longer than body; stems of third segment half the length of the basal and apical enlargements; fourth segment fused with third, basal stem two thirds the length of basal enlargement, apical stem three fourths the length of apical enlargement; stems of fifth segment equal to the enlargements; basal stem of sixth segment a little shorter than basal enlargement, apical stem equal to apical enlargement. Terminal clasp segment of genitalia slender, bidentate apically; basal clasp segment apically emarginate on the inner side.

Cotypes.—One female dissected on slide No. 1134/H6. One male dissected on slide No. 1135/H6, one female on pin No. 1136/H6. In the collections of the Zoological Survey of India, Indian Museum, Calcutta. Two females on pin in the collections of the Agricultural Research Institute, Coimbatore. On *Moringa* buds. Coll. Basheer, Coimbatore, 7-ii-1936.

***Mycodiplosis indica* Felt.**

1934. *Mycodiplosis indica*, Mani, *Rec. Ind. Mus.* XXXVI, p. 423.

This species was described from midges bred from the Fungus rust spores on leaves of *Pennisetum typhoideum* Gaertn. In the material before me this species is represented by several females labelled as bred from the Fungus rust spores on leaves of *Lucerne*, at Coimbatore.

***Raodiplosis orientalis* Felt.**

I provisionally refer to this species a few females labelled as bred from galls on ear-heads of *Andropogon annulatus* by Y. R. Rao at Coimbatore. The species was originally described from midges taken on mango leaves at Thaton, Burma, by A. G. Rao. The specimens agree in most respects with *Raodiplosis* Felt but until both the sexes are available the identification cannot be considered as final.

¹ Mani, *Rec. Ind. Mus.*, XXXVI, p. 419 (1934); also see Kieffer, *Rec. Ind. Mus.*, III, p. 130 (1909).

***Itonida paspalumi*, sp. nov.**

This new species differs from *I. penniseti* Felt and *I. seminis* Felt, recorded in an earlier paper¹. in the much larger size of the female, shorter claws and the relatively shorter stem of fifth antennal segment of female.

Male.—Length about 1.75 mm. Reddish brown, densely hairy. Mesonotum dark reddish brown. Palpi long; first segment stout, globose; second and third segments slender, their lengths about thrice their diameters; fourth segment more slender, about one and three fourths as long as the third. Antennae equal in length to body; fourth segment about three fourths the length of third segment with which it is fused, stem about half the length of apical enlargement, which is separated from the basal enlargement by a very short stem; fifth segment almost equal in length to fourth, with the stems one sixth and one half of the basal and apical enlargements; sixth segment equal to fifth, basal stem somewhat longer, apical stem similar to that of fifth segment; eighth segment somewhat shorter, basal stem half the basal enlargement, apical stem about half the apical enlargement; terminal segment with a transverse basal enlargement, apical enlargement long, conically produced at apex. Empodium well-developed, longer than claw.

Female.—Length about 2.5 mm. Dark reddish brown. Abdomen densely setose. Mesonotum dark brown. Antennae black, a little less than three fifths the length of body; third antennal segment fused with fourth, the stem of latter two and a half times that of the former; stem of fifth antennal segment about one fifth its cylindrical enlargement; stem of twelfth segment one third the cylindrical enlargement. Claw shorter than empodium. Ovipositor short.

Cotypes.—One male dissected, with head and genitalia on slide No. 1137/H6, rest of its body on slide No. 1138/H6. One female dissected on slide No. 1139/H6. In the collections of the Zoological Survey of India, Indian Museum, Calcutta. Two females on pin in the collections of the Agricultural Research Institute, Coimbatore. Bred from galls of *Paspalum scrobiculatum*. Coll. A. G. Rao, Cannanore, 20-30-viii-1928.

***Cecidomyia eragrostisae*, sp. nov.²**

I am erecting this new species for a midge bred by Y. R. Rao from galls in ear-heads of *Eragrostis amabilis*. This species runs in Felt's³ key to genera between *Orseoliella* Kieff. and *Isodiplosis* Rubs. It differs from the former in the divided ventral plate, short and stout terminal clasp segment, long style and in the lobe of the basal clasp segment being broad and median instead of basal. From the latter it differs in the ventral plate not being very deeply lobed, dorsal plate divided by a slight incision and the terminal clasp segment pectinate at apex. With additional material, especially of females, this species may have to be referred to a new genus.

¹ Mani, *Rec. Ind. Mus.*, XXXVI, p. 438 (1934).

² *Cecidomyia* is employed here as a group name and not in the sense of *Itonida* Meig., vide Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 15 (1925); *Mem. Dept. Agric. Ind., Ent. Ser.* VII, pp. 11, 27, (1920-1); X, pp. 2-3 (1927).

³ Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 167 (1925).

Male.—Length 2 mm. Body brownish and moderately setose in the dry specimen. Antennae somewhat longer than body, segments 14; third segment with an oval basal enlargement about one third the length of segment, an apical subcylindrical enlargement about half the length of segment and stems one fifth and one third the basal and apical enlargements respectively; fourth segment not fused with third, somewhat shorter, basal enlargement globose, basal stem equal in length to basal enlargement, apical enlargement subcylindrical, constricted in the middle, broader apically than basally, over one and a half times the basal enlargement; fifth nearly equal to fourth, basal enlargement globose, stem three fourths its length, apical enlargement about twice the basal enlargement, more distinctly constricted, apical stem a little over half the apical enlargement; sixth somewhat shorter than fifth, basal enlargement and stem equal, apical enlargement broader apically than basally, not greatly constricted, its stem two thirds its length; tenth segment somewhat shorter than sixth, apical enlargement cylindrical, not constricted, length about twice the thickness, apical stem about one fourth longer than the basal stem; eleventh segment somewhat longer than tenth, apical stem much longer than that of tenth; twelfth equal to tenth, apical stem longer; thirteenth almost equal to twelfth; terminal segment equal to thirteenth, stem equal in length to diameter of basal globose enlargement, apical enlargement half the length of segment, cylindrical, with a short apical prolongation. Palpal segments almost equal, basal segment somewhat stout. Mesonotum dark brown. Genitalia moderately hairy.

Cotypes.—Two males dissected on slides Nos. 1140-41/H6. In the collections of the Zoological Survey of India, Indian Museum, Calcutta. One male on slide and one male on pin in the collections of the Agricultural Research Institute, Coimbatore. Coll. Y. R. Rao, Mangalore, 18-viii-1922. Bred from galls on ear-heads of *Eragrostis amabilis*.

SILUROID FISHES OF INDIA, BURMA AND CEYLON.

By SUNDER LAL HORA, D.Sc., F.R.S.E., F.N.I., Assistant Superintendent, Zoological Survey of India, Calcutta.

II. FISHES OF THE GENUS *Akysis* BLEEKER.

The genus *Akysis* is invariably included¹ in the family Amblycepidae and in my recent treatment of the fishes of the genus *Amblyceps* I² subscribed to this view. Since then, through the kindness of Dr. F. P. Koumans, I have obtained material of *Akysis variegatus* (Blkr.) and *Acrochordonichthys pleurostigma* (Blkr.) from the s'Rijks Museum van Natuurlijke Historie, Leiden. A study of these fishes has convinced me that they should be included in a separate family Akysidae, as had already been done by Weber and de Beaufort.³ Unfortunately the osteology of these small fishes has never been studied and sufficient material is not available in the collection of the Zoological Survey of India to undertake this work. Regan⁴ included *Akysis* and *Acrochordonichthys* in the family Amblycepidae on account of their edentulous palate and the resemblance of their air-bladder⁵ and anterior vertebrae to those of *Amblyceps* and *Liobagrus*. The degenerate condition of the air bladder is not of much significance for considering genetic relationships as divergent forms are known to have undergone similar modifications due to a ground habit of life. The Amblycepidae (*Amblyceps* only) and the Akysidae (*Akysis*, *Acrochordonichthys* and *Breitensteinia*) can be separated by the following characters :—

Amblycepidae.

Akysidae.

- | | |
|---|---|
| 1. Nostrils close together, separated by a nasal barbel. | Nostrils remote from each other, the posterior with a nasal barbel. |
| 2. Dorsal and pectoral spines weak, articulated. | Dorsal and pectoral spines bony, strong. |
| 3. Gill-openings wide extending very far forwards, gill-membranes united with each other across the isthmus and slightly overlapping. | Gill-openings narrow or of moderate width ; gill-membranes united with each other and with isthmus. |
| 4. Skin smooth | Skin grannulated or tuberculated. |
| 5. Flap of skin in front of base of pectoral present. | Flap of skin absent. |
| 6. Air-bladder with thick walls. | Air-bladder with thin walls. |

All the characters tabulated above, except perhaps the last two, are of considerable taxonomic value ; the position of the nostrils alone has been utilised by Weber and de Beaufort in separating groups of

¹ Regan, *Ann. Mag. Nat. Hist.* (8), VIII, p. 562 (1911) ; Jordan, *Classification of Fishes*, p. 148 (1923) ; Giltay, *Mem. Mus. Roy. Hist. Nat. Belg.* Hors Série, V, p. 30 (1933).

² Hora, *Rec. Ind. Mus.*, XXXV, p. 610 (1933).

³ Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, II, p. 365 (1913).

⁴ Regan, *loc. cit.*, p. 562 (1911).

⁵ Though of similar form, the air-bladder of *Amblyceps* is much more reduced, is thick-walled and has more pronounced modifications of the anterior vertebrae.

families of Siluroid fishes. It seems reasonable, therefore, not to include *Amblyceps* in the same family with *Akysis* and *Acrochordonichthys*.

As regards *Liobagrus*, I am not in a position to discuss its relationships, for there is no material of this genus in the collection of the Zoological Survey of India. There is an undoubted similarity between its skeletal characters and those of *Amblyceps*, but the widely separated nostrils and the absence of the skin-flaps preclude its union with the Amblycepidae. Jordan¹ included *Liobagrus* in Bagridae, but this requires further confirmation.

Of the family Akysidae, only *Akysis* has so far been found from within the limits of the Indian Empire. As early as 1883, a species—*A. pictus*—was described by Günther² from Tenasserim but since then no other specimen of it has ever been collected. In 1929, Prashad and Mukerji³ referred 3 specimens from the Myitkyina District (Upper Burma) to a new subspecies of *A. variegatus* and remarked: "In the absence of any specimens of the two species referred to above [*A. variegatus* and *A. pictus*] for comparison, it is difficult to be definite about the specific position of this apparently new form" I have now compared the Myitkyina specimens with a paratype of *A. variegatus* and find that they represent a new species as already surmised by Prashad and Mukerji but unfortunately the new subspecific name—*variegatus*—they proposed cannot be retained. I now designate it as *Akysis prashadi*, sp. nov. and have thus great pleasure in associating it with the name of my chief Dr. B. Prashad. Prashad and Mukerji referred only to some salient features of the Burmese specimens and gave excellent figures of the lateral and ventral views of the type-specimen. The species is described below in detail and some additional figures are given.

For a long time the genus *Akysis* was known only from Java, Sumatra, Borneo and Tenasserim, but recent researches have shown that its range extends for a considerable distance northwards. Smith⁴ recorded *A. macronema* and *A. armatus* from Siam and recently Fowler⁵ has described two new species from the same country. Reference has already been made to Prashad and Mukerji's record of the genus from Upper Burma. It may be remarked that these small fishes are likely to be overlooked by casual collectors.

***Akysis prashadi*, sp. nov.**

1929. *Akysis variegatus* subsp. *variegatus*, Prashad & Mukerji, *Rec. Ind. Mus.*, XXXI, p. 180, pl. viii, figs. 1 & 2.

B. 6 ; D. 3/5 ; A. 11 ; P. 1/8 ; V. 6 ; C. 16.

Akysis prashadi is a small species in which the head and the anterior part of the body are flattened ; the dorsal profile is somewhat arched while the ventral profile is almost straight and horizontal. The length of the head is contained from 3·8 (in the young) to 4·4 (in the adult)

¹ Jordan, *Classification of Fishes*, p. 148 (1923).

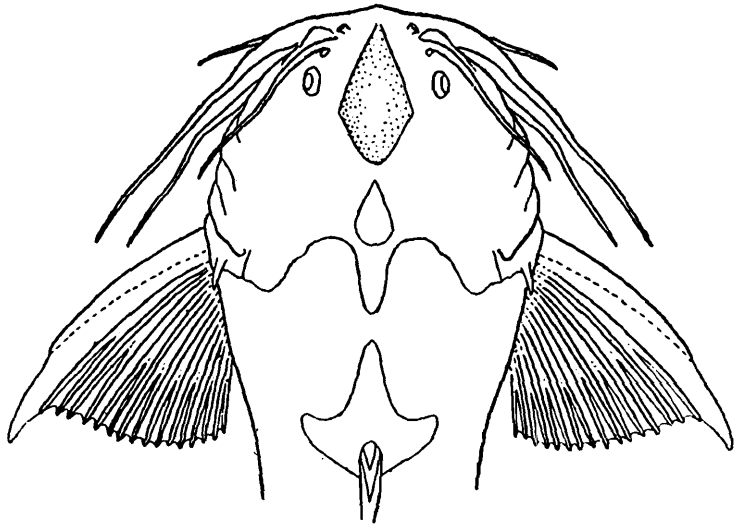
² Günther, *Ann. Mag. Nat. Hist.*, (5) XI, p. 138 (1883).

³ Prashad & Mukerji, *Rec. Ind. Mus.*, XXXI, p. 180 (1929).

⁴ Smith, *Journ. Siam. Soc. Nat. Hist. Suppl.*, VIII, p. 180 (1931).

⁵ Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, LXXXVI, p. 97 (1934).

times in the total length without the caudal. The depth of the body is contained from 4.4 (in the adult) to 5.7 (in the young) times in the total length without the caudal. The width of the head is considerably greater than its length while the height is two-thirds (in the adult) to one-half (in the young) of its length. There are two broad median fontanels on the head; the posterior is much smaller and terminates near the base of the occipital process. The eyes are small, dorsally situated and subcutaneous; they are far forward in the anterior half of the head. The interorbital distance is equal to the length of the snout. The mouth is of moderate width, transverse and slightly overhung by the upper jaw. The lips are somewhat fleshy and papillated; the labial groove is widely interrupted. There are eight barbels; the nasals are considerably longer than half the length of the head and extend to the gill-openings; the maxillary and the outer mandibular extend as far as the termination of the base of the pectorals or slightly beyond; the inner mandibular reach to the base of the pectoral spine.

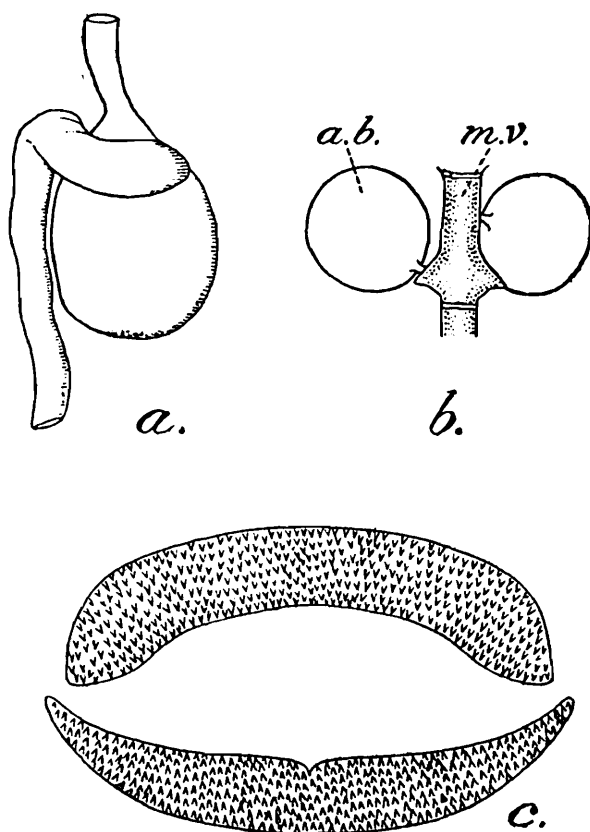


TEXT-FIG. 1.—Dorsal surface of head and anterior part of body of *Akysis prashadi*, sp. nov. $\times 2\frac{3}{4}$.

The dorsal fin commences between the pectoral and ventral fins; its long spine is preceded by 2 short spines, is grooved along the upper surface and is as long as the head behind the snout. The adipose fin is long and low; its base is twice as long as that of the rayed dorsal. The two dorsal fins are separated by a short distance. The spine of the pectoral fin is not armed; it is grooved along the upper surface and is as long as the head. The paired fins are horizontal. The ventrals extend beyond the anal opening but do not reach the anal fin. The caudal fin is emarginate, the lower lobe is slightly better developed than the upper. The caudal peduncle is twice as long as high.

The head is greyish, speckled with irregular black markings. Anteriorly the body is black in front of the ventral fins; this black mark is contracted into a narrow streak which is continuous with another black area behind the ventrals and above the anal fin. Another black band connects this area with a broad black mark at the base of the caudal fin. The ventral surface of the body is speckled with irregular black markings. The proximal portion of the dorsal fin and a considerable part of the pectoral fins and of the adipose fin are black. There

is a black band across the middle of the caudal rays. The ventral and the anal fins are also streaked with black. The barbels are variegated with black. In the young specimens the three black marks on the body are discontinuous and not so wide. The general body colour is pale-olivaceous.



TEXT-FIG. 2.—Alimentary canal, air-bladder and dentition of *Akysis* Bleeker.

a. Alimentary canal of *Akysis variegatus* (Bleeker). $\times 3\frac{3}{4}$; *b.* Air-bladder of *A. prashadi*, sp. nov. $\times 8\frac{1}{4}$; *c.* dentition of *A. prashadi*, sp. nov. $\times 25\frac{1}{2}$.

a. b. = air-bladder; *m. v.* = compound vertebra.

Length of specimen of *A. variegatus* 31 mm. without caudal.

Length of specimen of *A. prashadi* 28 mm. with caudal.

Localities.—Indawgyi Lake and round about Kamæing in the Myitkyina District, Upper Burma.

Type-specimen.—F. 10873/1, Zoological Survey of India (*Ind. Mus.*), Calcutta.

Remarks.—Prashad and Mukerji have already discussed the distinguishing features of this species. The larger number of rays in the pectoral (8 *versus* 5-7) and anal (11 *versus* 8-9) fins are very characteristic of *A. prashadi*. From *A. variegatus* it further differs in having two fontanels (instead of one) on the head. In *A. pictus* the nasal barbels are stated to be only half as long as the length of the head.

III. FISHES OF THE GENUS *Olyra* McCLELLAND.

There appears to be considerable disagreement among ichthyologists regarding the systematic position of the loach-like fishes of the genus *Olyra* McClelland¹ which was characterised as follows:—

“Body soft, long, and cylindric, with two dorsals, the first radiated, the second adipose, head elongated and flat at the snout, operculum terminates behind in an oblique

¹ McClelland, *Calcutta Journ. Nat. Hist.*, II, p. 588 (1842).

point directed towards the dorsal fins, anal long, caudal entire, teeth like velvet, confined to the jaws, no dorsal spine nor anything peculiar about the branchae ; from six to eight slender cirri."

McClelland described two species in this genus from the Khasi Hills, Assam. Gill¹ restricted *Olyra* for the first species—*O. longicaudata*—and proposed a new genus *Branchiosteus* for the second species—*O. laticeps*. The two genera were distinguished on the number of the branchiostegal rays (6 in *Olyra*, 13 in *Branchiosteus*), the number of the anal rays (more than 20 in *Olyra*, 15 in *Branchiosteus*) and the number of rays in the ventral fin (5 in *Olyra*, 7 in *Branchiosteus*). Günther² recognised this division in his *Catalogue* but had no specimen of either of the species for examination. The two genera were included by him in the group Akysina characterised by a toothless palate and six rays in the ventral fin. In 1871, Day³ described a new species of *Olyra* from the Pegu Yomas in Burma and emended the definition of the genus. According to the position assigned to this genus in his paper, it seems probable that he regarded it as a form allied to *Wallago* and *Silurus*. In his *Fishes of India*, *Olyra* is placed near *Pseudeutropius*, *Callichrous*, *Wallago* and *Silurus* ; from the last three it is separated by the character of the adipose fin. In 1883, Günther⁴ described from a number of specimens a new species of *Olyra*—*O. elongata*—from Tenasserim and emended the definition of the genus still further. He remarked that "the genus belongs to the group Silurina ; and I should be inclined to place it in the vicinity of *Saccobranchus*." Vinciguerra⁵ redescribed *O. elongata* from two examples and discussed at length the systematic position of *Olyra* and agreed with the contention of Günther. He also indicated that *O. laticeps* shows affinities with *Amblyceps* and may belong to that genus. Recent workers, such as Regan⁶ and Jordan,⁷ include *Olyra* among Bagridae and regard *Olyra* and *Branchiosteus* as synonyms. Chaudhuri⁸ still further emended the definition of *Olyra* when he described a new species with a forked tail from Assam. This species was later recorded by me⁹ from below the base of the Darjeeling Himalayas. I have already indicated that *Amblyceps horae* Prasad and Mukerji¹⁰ from the Myitkyina District, Upper Burma, is a species of *Olyra*.

It would thus appear that the precise generic limits of *Olyra* and its position in the system of genetic classification are not clear. Judging from the short descriptions and figures of McClelland's two species

¹ Gill, *Proc. Boston Soc. Nat. Hist.*, VIII, p. 52 (1862).

² Günther, *Cat. Fish. Brit. Mus.*, V, p. 97 (1864).

³ Day, *Proc. Zool. Soc. London*, p. 711 (1871).

⁴ Günther, *Ann. Mag. Nat. Hist.* (5), XI, p. 139 (1883).

⁵ Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova* (2), IX, p. 192 (1890).

⁶ Regan, *Ann. Mag. Nat. Hist.* (8), VIII, p. 561 (1911).

⁷ Jordan, *Classification of Fishes*, p. 148 (1923).

⁸ Chaudhuri, *Rec. Ind. Mus.*, VII, p. 443 (1912).

⁹ Hora, *Rec. Ind. Mus.*, XXII, p. 737 (1921).

¹⁰ Hora, *Rec. Ind. Mus.*, XXXV, p. 609 (1933) ; also Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVI, p. 819 (1933).

there seems hardly any doubt that the two forms are not congeneric. The main points of difference may be tabulated as follows :—

Olyra longicaudata.

1. Branchiostegal rays 6.
2. Pectorals 1/6.
3. Ventrals 5.
4. Anal 23. .
5. Jaws equal. .
6. Middle rays of caudal prolonged. .
7. Dorsal fin opposite ventrals.

Olyra laticeps.

- Branchiostegal rays 13.
- Pectorals 9.
- Ventrals 7.
- Anal 15.
- Lower jaw considerably longer than upper.
- Caudal entire. [Truncate].
- Dorsal fin between bases of pectorals and ventrals.

The absence of a rough spine in the pectoral fin¹, the large number of branchiostegal rays, the small number of anal rays, the unequal jaws and the forward position of the rayed dorsal in *Olyra laticeps* indicate that it is an *Amblyceps* as already surmised by Vinciguerra. The description is probably based on a young specimen of *Amblyceps mangois*, a very widely distributed and variable species², but until material of *Amblyceps* becomes available from the Khasi Hills it seems desirable to regard *O. laticeps* as a distinct species of *Amblyceps*.

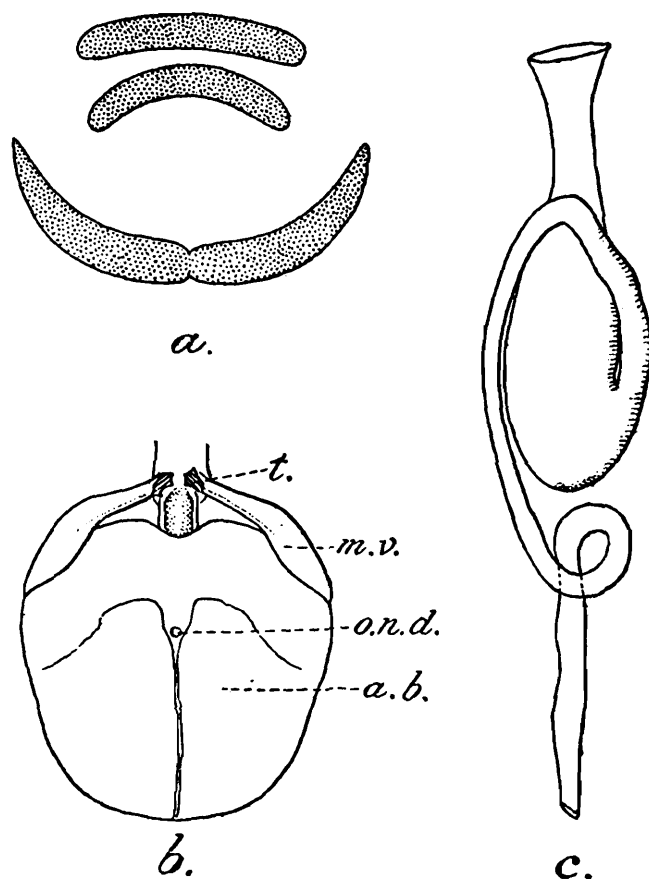
Having eliminated *O. laticeps*, it may now be possible to give a clear definition of the genus *Olyra* and to discuss its probable relationships.

The genus *Olyra* comprises small loach-like fishes in which the body is long and slender; anteriorly it is somewhat depressed but in the tail region it is greatly compressed. The eyes are small, superior and subcutaneous. The nostrils are wide apart; the anterior is tubular while the posterior is oval with a rim which is anteriorly produced into a long barbel. The mouth is small and anterior. The jaws are almost equal. The lips are thin and continuous. The labial groove is widely interrupted. Both the jaws are provided with a number of open pores. There are eight thin and long barbels; one pair nasal, one pair maxillary and two pairs mandibular. The teeth are small, villiform and arranged in bands. The palate is provided with a broad, lunate band of teeth. The gill-openings are very wide and extend as far forward as the eyes; gill-membranes are extensive and united with each other across the isthmus. There are 6-7 branchiostegal rays. The functional part of the gill-opening is greatly restricted while flaps of skins are developed along the lower edges of the gill-openings to act as valves for closing the openings. The chest is devoid of any adhesive apparatus. The dorsal fin is short with 7-8 rays but without a strong, bony spine; it is situated opposite the ventrals. The adipose fin, though present, is short and low. The pectoral fin has a strong, serrated spine and about 4-6 rays. The ventral fins are small and horizontally placed. The anal fin is of moderate length, containing 16-23 rays which increase

¹ It is interesting to note that in the list of " Newly discovered species ", McClelland (*Calcutta Journ. Nat. Hist.* II, p. 574, 1842), uses the specific name '*Olyra inermis*' for '*Olyra laticeps*'. The former name was not retained for the description of the species, but it shows all the same that the absence of an armed spine in the pectoral fins was regarded as a very characteristic feature of the species.

² Hora, *Rec. Ind. Mus.*, XXXV, pp. 607-621 (1933).

in length posteriorly. The caudal fin is long and lanceolate; usually it is forked but in some species it may be entire. The anal-opening is situated midway between the ventral fins. The lateral line is present and complete. The air-bladder is fairly extensive and lies free in the



TEXT-FIG. 3.--Dentition, air-bladder and alimentary canal of *Olyra* McClelland.

a. Dentition of *Olyra horae* (Prashad & Mukerji) $\times 5$; b. Air-bladder of *O. longicaudata* McClelland $\times 3\frac{1}{2}$; c. Alimentary canal of *O. longicaudata* McClelland $\times 2\frac{1}{2}$.

a. b.=Air-bladder; m. v.=modified vertebral element; o. n. d.=Opening of pneumatic duct; t.=tendon.

Length of specimen of *O. horae* 70 mm. without caudal.

Length of specimen of *O. longicaudata* 108 mm.

abdominal cavity though dorsally and laterally it is surrounded by thin wing-like extensions of the transverse processes of the complex vertebra. The walls of the bladder are fairly thick and a distinct pneumatic duct is present.

Type-species.—*Olyra longicaudata* McClelland.

As defined above the genus *Olyra* differs from the Bagridae in having a spineless dorsal and a peculiar type of air-bladder with the associated modifications of the anterior vertebrae. The anal fin is also relatively long. In many respects it is closely related to certain genera of the Siluridae, such as *Silurus*, *Silurichthys*, etc., but differs from them all in having a longer rayed dorsal, in the presence of an adipose dorsal and nasal barbels and in having a relatively shorter anal fin which is usually separated from the caudal by some distance. The presence of a relatively long, spineless, rayed dorsal and of an adipose fin, the depressed head and general facies indicate that *Olyra* may be a specialised hill-stream representative of the family Clariidae, especially of the section comprising *Heterobranchus*, *Dinotopterus*, etc. In view of

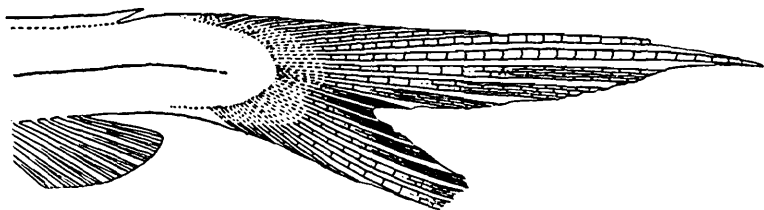
what is stated above and on account of the peculiar habitat and habits of *Olyra* it seems desirable to keep it, pending further investigation into the morphology of the so-called "degraded" genera of the Clariidae, in a separate family which may be designated as Olyridae and defined as follows :—

Body elongate, naked ; gill-membranes free from isthmus. Dorsal fin with about eight rays and without a spine ; adipose dorsal present ; anal fin of moderate length containing 16 to 23 rays, never united with caudal which is usually long and filiform ; ventrals 6-rayed. Anterior and posterior nostrils wide apart, posterior with long barbels. Barbels eight, one pair nasal, one pair maxillary and two pairs mandibular. Teeth small and villiform, arranged in bands in jaws and on palate. Vertebrae 48 to 53 (16-17 + 32-36). Lateral wing-like expansions of compound vertebra enclose air-bladder dorsally and laterally ; air-bladder of moderate size, more or less free in the abdominal cavity.

The family comprises the genus *Olyra* only.

Reference should be made here to the close superficial similarity between *Amblyceps* and *Olyra*. The two genera can be distinguished externally by the position of the dorsal fin (between bases of pectoral and ventral fins in *Amblyceps* and opposite to ventrals in *Olyra*), the nature of the pectoral fin (with a broad flexible spine in *Amblyceps* and hard, rugged spine in *Olyra*). Internally the palate is edentulous in *Amblyceps* and provided with a broad band of villiform teeth in *Olyra*. In *Amblyceps* the air-bladder is greatly reduced and is divided into two lateral chambers, whereas in *Olyra* the air-bladder is of considerable size and lies free in the abdominal cavity.

In distinguishing species of *Olyra* considerable reliance is placed on the number of rays in the anal fin. This fin is usually enclosed in thick skin and to ascertain the full compliment of rays the skin has to be removed. In this way I have found that in *O. kempi* there are about 18 to 23 rays instead of 17-18 as described by Chaudhuri. In mature specimens of *O. kempi* the bifurcation of the caudal fin is not noticeable unless the fin is properly stretched. It seems to me highly probable that McClelland not only overlooked the bifurcation of the caudal fin in describing *O. longicaudata* but probably for the sake of symmetry regarded the "middle rays of the caudal prolonged to a lengthened point." Both in geographical distribution and taxonomic characters these two species are similar and it is likely that they are synonymous.



TEXT-FIG. 4. —Posterior part of tail and caudal fin of a typical specimen of *Olyra elongata* Günther. $\times 2$.

Through the kindness of the authorities of the British Museum (Nat. Hist.), I have examined a typical specimen of Günther's *O. elongata*

from Tenasserim. The caudal fin is bifurcate, the upper lobe is considerably longer than the lower, which is due to "the prolongation of three rays of the upper half of the fin." If properly stretched, the fin is not lanceolate as described by Günther and later figured by Vinciguerra. I am convinced that this species is also identical with McClelland's *O. longicaudata*.

No specimen of *O. burmanica* Day is now available for examination either in the collection of the Indian Museum or in that of the British Museum (Nat. Hist.). As judged from its figure, it appears to represent a somewhat stouter fish. The caudal fin is shown as asymmetrically lanceolate (probably it is forked with some filiform rays in the upper lobe). *O. horae* is known from a single specimen in which the body is fairly stout and the upper lobe of the caudal fin is not very much longer than the lower.

It is thus clear that though six species have hitherto been described in this genus, only one species—*O. longicaudata* (= *O. elongata* = *O. kempfi*)—is known from a large number of specimens collected at the base of the Darjeeling Himalayas, in Assam and Tenasserim. Until further material becomes available *O. burmanica* from the Pegu Yomas and *O. horae* from the Myitkyina District, Upper Burma, have to be regarded as distinct species, though it seems likely that they may also prove to be synonymous with *longicaudata*, as they fall within its range of geographical distribution. *O. laticeps*, as shown above, is a species of *Amblyceps*.

IV ON THE USE OF THE GENERIC NAME *Wallago* BLEEKER.

Under the vernacular name *Wallago*, Russell¹ described and figured a species of "Silurus" from Vizagapatam on the Coromandel Coast, but the fish had already been christened as *Silurus attu* by Bloch and Schneider.² Without assigning any reason Bleeker³ used *Wallago* in the generic sense while describing a new species—*W. dinema*—from Borneo. Between 1851 and 1858, Bleeker⁴ employed this generic denomination, still without any definition, for as many as eleven other Silurid fishes from India, Burma and the Malay Archipelago. There seems no doubt that the name had hitherto been used in a loose sense for in his first comprehensive revision of the Siluroid fishes Bleeker⁵ restricted its use to two species—*W. russellii* Bleeker (= *W. attu* Bl. & Schn.) and *W. leerii* Bleeker—and proposed a new genus *Belodontichthys* for his *Wallago dinema*. Four years later in his *Atlas Ichthyologique*, he⁶ fixed the limits of these genera more precisely by indicating their genotypes. All later workers have accepted the genus *Wallago* as ultimately restricted by Bleeker, and according to Weber and de Beaufort⁷ the genus should date only from 1858 since "this is the first diagnosis of the genus, although the name *Wallago* was used by Bleeker since 1851, but without description."

¹ Russell, *Fish. Vizagapatam*, II, p. 50, pl. clxv (1803).

² Bloch & Schneider, *Syst. Ichth.*, p. 378 (1801).

³ Bleeker, *Nat. Tijdschr. Ned. Ind.*, II, p. 202 (1851).

⁴ Bleeker, *Nat. Tijdschr. Ned. Ind.*, II, p. 427 (1851); *ibid.*, V, p. 189 (1853); *ibid.*, V, p. 514 (1853); *Verh. Bat. Gen.*, XXV, pp. 54, 100, 108, 109 (1853).

⁵ Bleeker, *Ichth. Arch. Ind. Prodr.*, I, Siluri, p. 259 (1858).

⁶ Bleeker, *Atl. Ichth.*, II, p. 79 (1862).

⁷ Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, II, p. 200 (1913).

Jordan in his *Genera of Fishes* (pp. 247, 279) gives *Wallago dinema* Blkr. as the orthotype of *Wallago* and again the same species (*Belodontichthys macrochir* Blkr.=*Wallago dinema* Blkr.) as the orthotype of *Belodontichthys* Blkr. In accordance with the strict interpretation of the International Rules of Zoological Nomenclature *Wallago* should be used for species now included under *Belodontichthys* and a new generic name proposed for *Silurus attu* and its allies. But in view of the great familiarity of the generic name *Wallago* in its present accepted sense, I am retaining this name for *W. attu* and its allies. The matter will, however, be referred in due course to the International Congress of Zoological Nomenclature for inclusion of *Wallago* and *Belodontichthys* among the *nomina conservenda*.

The genus is represented by a single species—*Wallago attu*—in Indian waters.

V FISHES OF THE GENUS *Heteropneustes* MÜLLER.

The genus *Heteropneustes* was established by Müller¹ to accommodate *Silurus fossilis* Bloch² of which he regarded *S. singio* Hamilton³ as a synonym. Though the most important diagnostic character is stated to be the respiratory tubes as described by Taylor⁴ in *S. singio*, Müller indicated that in external features his new genus was intermediate between *Silurus* and *Heterobranchus*. In the same year, Valenciennes⁵ proposed the genus *Saccobranchus* for *Silurus singio* of which he regarded *S. fossilis* Bloch as a synonym. As the name implies, the main character of the genus is the presence of accessory respiratory sacs. Though *Saccobranchus* is a well known generic name among fishes, on grounds of priority, *Heteropneustes* must replace it, as pointed out by Müller⁶ himself. I have also looked up the original dates of publication of these genera and support this contention.

Valenciennes placed *Saccobranchus* near *Clarias* and *Heterobranchus* and remarked: "La ressemblance extérieure du crâne des Saccobranches avec les Clarias et les Hétérobranches dépend du développement des mêmes os; ainsi, le crâne est élargi en avant par l'agrandissement des sous-orbitaires; en arrière, par celui des mastoïdiens et des surtemporaux. La proéminence interpariétale fait une saillie sur l'occiput, sans qu'il y ait de casque ou de chevron sur les premiers interépineux. Les dents sont en velours aux mâchoires et sur deux plaques arquées au chevron du vomer. Les rayons branchiostèges sont au nombre de sept; les barbillons de huit. De chaque côté des apophyses supérieures, et au-dessus du corps de vertèbres, existent deux sacs coniques, s'étendant jusqu'aux deux tiers de la longueur du corps, et ouverts en avant par deux orifices pratiqués sur le haut et entre les peignes des branchies." Bleeker⁷ also regarded *Saccobranchus* a close

¹ Müller, *Arch. Anat. Physiol.*, p. 115, 1839 (1840).

² Bloch, *Naturges. Ausländ. Fische*, VIII, p. 46, pl. ccclxx, fig. 2 (1794).

³ Hamilton, *Fish. Ganges*, pp. 147, 374, pl. xxxvii, fig. 46 (1822).

⁴ Taylor, *Gleanings in Science*, p. 170 (1830).

⁵ Valenciennes, in Cuvier & Valenciennes' *Hist. Nat. Poiss.*, XV, p. 339 (1840). According to Sherborn [*Ann. Mag. Nat. Hist.* (9) XV, p. 600, 1925] volume 15 of *Hist. Nat. Poiss.* was published in November, 1840.

⁶ Müller, *Abh. Kön. Akad. Wiss. Berlin*, p. 244, 1839 (1841).

⁷ Bleeker, *Ned. Tidschr. Dierkunde*, I, pp. 119, 120 (1863).

ally of *Heterobranchus* and *Clarias* and included the three genera in his family Heterobranchioidei. At the same time he grouped these genera into two subfamilies, viz., Heterobranchiiformes for *Heterobranchus* and *Clarias* and Saccobranchiiformes for *Saccobranchus*. Günther¹, however, included *Saccobranchus* in his group Silurina (for *Silurus* and its allies) under Siluridae Heteropterae and separated it from the other two genera which he placed under Clariina of Siluridae Homalopterae. This system was adopted by Day² and other ichthyologists, but challenged by Regan³ on osteological characters. Regan brought back *Saccobranchus* under Clariidae though he kept it in a separate group within the family, as was done by Bleeker. Pape's⁴ anatomical studies of *Saccobranchus* have thrown considerable light on the systematic position of the genus. According to him the skeleton shows that the fish is not only primitive in some respects but has certain features of both *Clarias* and *Silurus*. In view of these osteological details and on account of the fact that *Clarias* and its allies possess a totally different type of accessory respiratory organ it seems desirable that *Heteropneustes* should constitute a family by itself bearing superficial relationship to the Clariidae. Externally the members of the two families can be distinguished by the extent of their dorsal fin, which is short in *Heteropneustes* and usually very long in Clariidae. The new family Heteropneustidae may be defined as follows:—

Body elongate, compressed. Head greatly depressed, its dorsal and lateral parts covered with osseous plates. Gill-cavity with an accessory air-sac extending backwards into tail region. Cranial roof with occipital and frontal fontanels; occipital part of skull prolonged into a process. Mouth small, terminal. Barbels 4 pairs, one pair nasal, one pair maxillary and 2 pairs mandibular. Nostrils wide apart, anterior tubular, posterior slit-like behind base of nasal barbel. Eyes small, lateral, with free orbital margin. Dorsal short, without spine, somewhat in advance of ventral. Adipose dorsal absent or represented by a low adipose ridge along posterior third of tail. Anal long, just reaching or united with caudal. Pectorals with a strong, osseous spine. Ventrals six-rayed. Caudal almost rounded. Branchiostegals 7. Gill-openings wide. Gill-membranes separated by a deep notch, not united with isthmus. Teeth small, arranged in broad bands in jaws; those on vomer in a patch on either side.

There is only one genus in the family represented by two species—*Heteropneustes fossilis* (Bloch) and *H. microps* (Günther). *H. singio* (Ham.) and *H. microcephalus* (Günther) are synonyms of *H. fossilis* (Bloch).

The range of the family, as known at present, extends from Ceylon, India and Burma to Cochin China. It is not found in the Malay Archipelago.

¹ Günther, *Cat. Fish. Brit. Mus.*, V, p. 30 (1864).

² Day, *Faun. Brit. Ind. Fish.*, I, pp. 101, 102 (1889).

³ Regan, *Ann. Mag. Nat. Hist.* (8), VIII, 1 p. 568, 569 (1911).

⁴ Pape, *Jenaische zs. Natw.*, LII, pp. 445-520 (1914).

SCIENTIFIC RESULTS OF THE YALE NORTH INDIA EXPEDITION.

Biological Report No. 20.*

HELMINTH PARASITES OF FISHES FROM NORTH INDIA, WITH SPECIAL REFERENCE TO ACANTHOCEPHALANS.

By M. N. DATTA, *M.Sc., Zoological Survey of India, Calcutta.*

CONTENTS.

	PAGE.
Introduction	211
Systematic Account	213
Acanthocephala	213
Echinorhynchidae	213
1. <i>Acanthocephalus kashmirensis</i> , sp. nov.	213
Neoechinorhynchidae	217
2. <i>Neoechinorhynchus rutili</i> (Müller)	217
3. <i>Neoechinorhynchus hutchinsoni</i> , sp. nov.	219
4. <i>Eosentis devdevi</i> , sp. nov.	222
5. <i>Eosentis yalei</i> , sp. nov.	225
Cestoda	226
1. <i>Ligula intestinalis</i> (Linnaeus)	226

INTRODUCTION.

This report on the Helminth parasites of fishes collected by the Yale North India Expedition (1932) deals with Acanthocephala and Cestoda only. Towards the end of 1935, my colleague, Mr. Dev Dev Mukherji, handed over to me the material under report which he found during his investigations on the intestinal contents of the fishes collected by the expedition. Dr. S. L. Hora also very kindly handed to me a couple of specimens of the loach *Nemachilus hutchinsoni* Hora, with cestodes in the body cavity. Additional material, in ten tubes, was received from Dr. G. E. Hutchinson from America in March, 1936.

Earlier work on Acanthocephala was very unsatisfactory, and up to 1892 nearly all species of these worms were assigned to the genus *Echinorhynchus*. The detailed systematic work of Lühe (1911), Van Cleave's reports on worms from Japan, America and India, Fukui's (1929) work on Acanthocephala found in Japan, Yamaguti's report on the Helminth Fauna of Japan (1935) and the latest published monograph on Acanthocephala by Meyer (1933) have placed the systematics of these worms on a sound foundation.

* Mr. G. Hutchinson, who was one of the members of the Yale North India Expedition, has informed me that on financial grounds it would not be possible to publish any further reports on the material collected by the Expedition in the "Memoirs of the Connecticut Academy of Arts and Sciences"—Yale North India Expedition Series. The present paper and others on material worked out by the Zoological Survey of India will, therefore, be published in the "Records of the Indian Museum".—Ed.

The collection under report, although small, is of considerable interest, as the genera *Acanthocephalus* and *Neoechinorhynchus* had not hitherto been recorded from India.

The genus *Eosentis* was established by Van Cleave (1928) for a new worm *E. rigidus* from *Schizothorax zarudnyi* from Seistan. His description of the genus and species was based on a female specimen that was sent to him from the collections of the Indian Museum, Calcutta, where also the holotype is deposited. The main feature of the genus is the difference in the number of sub-cuticular nuclei, but unfortunately the author does not mention their number, or any other generic differences. In the holotype I find that there are 9 sub-cuticular nuclei in the mid-dorsal and 1 in the mid-ventral line. On the basis of these I describe below two new species of this genus, *Eosentis devdevi* and *Eosentis yalei*. I may also mention that from a specimen of *Schizothorax zarudnyi*, from the same collection from Seistan as the one examined by Van Cleave, I dissected out of the intestine 35 specimens of *Eosentis rigidus*, both males and females; a detailed report on these specimens will be published later. From a preliminary study of these worms I find that the number of sub-cuticular nuclei varies slightly; the number of sub-cuticular nuclei in the generic diagnosis should, therefore, read 8-9 in the mid-dorsal line and 1-2 in the mid-ventral line.

The old species *Neoechinorhynchus rutili* (Müller), has been recorded from various fish hosts, but only once from a species of the genus *Nemachilus*, *N. barbatula* (Linn.), which is an extra-Indian species. *Neoechinorhynchus rutili* from *Nemachilus stoliczkae* and *N. vittatus* is recorded in this paper for the first time from India.

The additional material sent by Dr. Hutchinson mainly consisted of larval forms of *Ligula intestinalis*. Only in two tubes I found *Acanthocephala*. In one host, *Nemachilus vittatus*, the parasite was *Neoechinorhynchus rutili* from the Wular Lake, Kashmir. The worm in the second tube, from the fish *Diptychus maculatus* from Leh, represents a new species of *Neoechinorhynchus*. This represents an interesting new species of the genus, as it shows a marked difference in the measurements of the two sexes and also in the peculiar narrowing of the body in the male.

Ligula intestinalis, the only Cestode in this collection, has been recorded in larval form by various authors from India. Southwell (1913, 1915) recorded it from *Labeo calbasu*, *Labeo rohita*, *Danio aequipinnatus*, and *Nemachilus rupicola*. This larval form is now recorded from *Schizopygopsis* sp., *Schizothorax* sp., and *Nemachilus hutchinsoni* Hora. As Southwell (1930) remarked, it is curious that only the larval form of this worm has so far been found in India.

I am indebted to Dr. S. L. Hora and the authorities of the Yale North India Expedition, and specially to Dr. G. E. Hutchinson, for giving me the opportunity of studying this interesting collection of Helminth parasites. I am also indebted to Dr. Bains Prashad, Director, Zoological Survey of India, for his kind help in the preparation of this report. My thanks are also due to my colleague, Mr. D. D. Mukerji, for very kindly sorting out the parasites, on which the major portion of this report is based. Mr. B. Bagchi has very kindly executed the illustrations under my supervision.

SYSTEMATIC ACCOUNT.

ACANTHOCEPHALA.

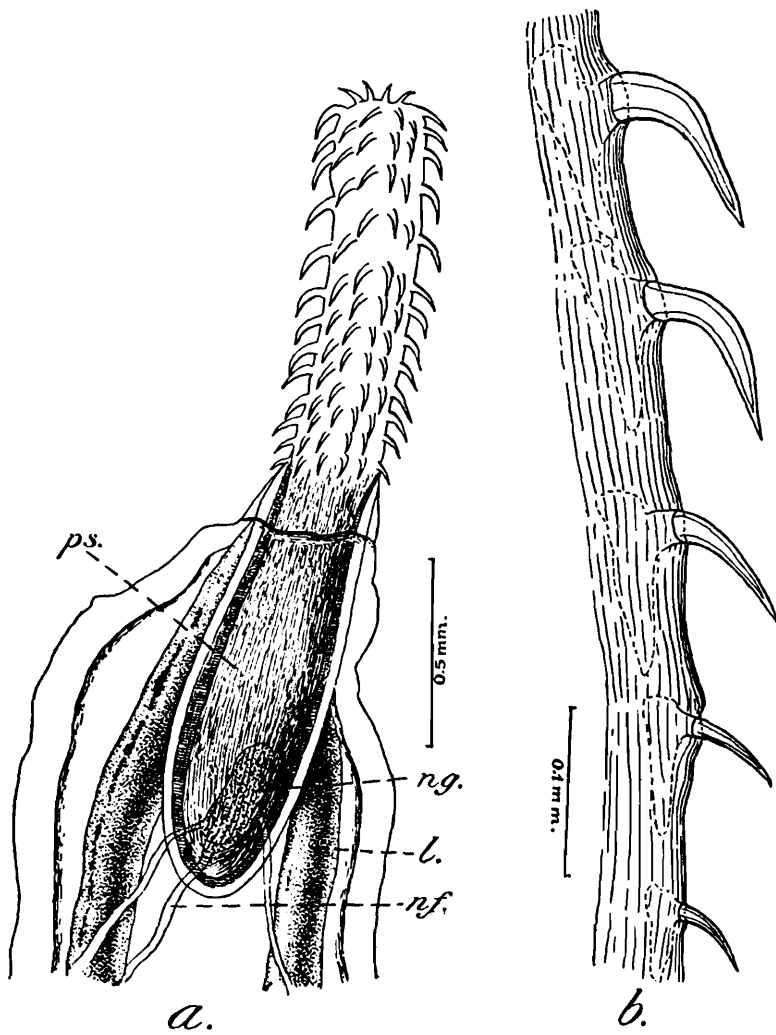
Family *ECHINORHYNCHIDAE* (Cobbold, 1879) Hamann 1892
(emend.).

Acanthocephalus Koelreuther 1771, Lühe 1911 (emend.).

Acanthocephalus kashmirensis, sp. nov.

Of this new species I have examined 19 specimens dissected from three specimens of *Schizopygopsis stoliczkae*. The worms were all dark-brown in colour and very stiff. All these were kept in a mixture of glycerine and alcohol, and, after softening, 17 of them were stained and mounted permanently in Canada Balsam.

They showed marked sexual dimorphism, the males being comparatively small and more slender than the females. The body cavity of almost all the females was congested with egg-balls and ova in various stages of development; they were easily identified from the males by their longer and stouter bodies. The males measured 1.75—8.60 mm. $\times$ 0.44—0.99 mm., and the females 3.48—14.60 mm. $\times$ 0.57—1.00 mm.



TEXT-FIG. 1.—*Acanthocephalus kashmirensis*, sp. nov. (a) Anterior region; (b) Proboscis hooks highly magnified.

l., lemnisci; *nf.*, nerve fibres; *ng.*, central nerve gland; *ps.*, proboscis sheath.

The body is long, cylindrical and tapering near the posterior end. At the anterior end there is a proboscis with a short neck. The body is devoid of spines.

The proboscis (Fig. 1, *a*) is long and cylindrical and is continued into a short, bare neck. There are 13-18 rows of 6-8 hooks each radially and symmetrically arranged. The hooks of the anterior rows are much stouter and longer than those at the posterior rows, in the so-called basal region. The anterior ones are 0.110 mm. in length and 0.030 mm. in diameter near the base, the basal ones are 0.075 mm. in length and 0.019 mm. in diameter near the base. All the hooks have got broad and pyriform basal plates which are embedded in the wall of the proboscis (Fig. 1, *b*).

The proboscis sheath is a thick, double-layered, muscular sac which hangs from the base of the proboscis. The proboscis can be drawn into this sac by the action of the strong bands of muscles. There are two sets of muscular bands known as the retractor and protractor muscles, which form the motor system for the retraction and protrusion of the proboscis. In some cases the retraction was so great at the time of the death of the worms that even with strong pressure between two slides it was not possible to evert the proboscis for examination.

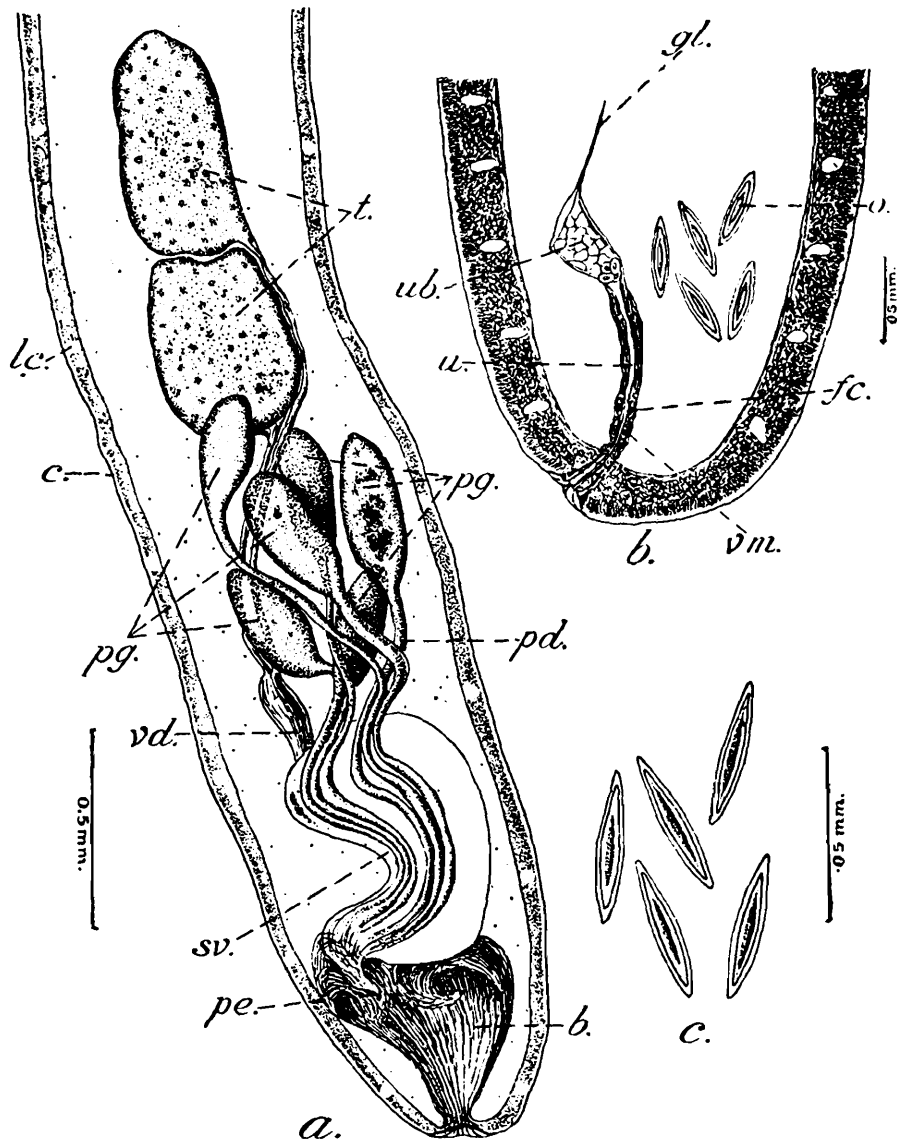
The central nervous system consists of a single ganglion embedded in the wall of the proboscis sheath near its posterior end. A few nerve branches issue out from the ganglion and supply the body wall.

The two folds of lemnisci, which hang on either side of the proboscis sheath, are equal to, or a little longer than, the sheath. There are a few nuclei embedded in them. These lemnisci are continuations of the hypodermis and of some of the muscle fibres of the body wall. The comparative length of the lemnisci and the proboscis sheath are sometimes helpful in systematic classification, and great stress is laid by some authors on this point (Southwell and Macfie, 1925). But sometimes great difficulties are encountered on account of the heavy contraction at the time of fixing the specimens, the different ages of the worms also rendering it difficult to differentiate by these measurements.

The body wall is composed of a thick layer of cuticle forming the outermost wall followed by a thick layer of subjacent hypodermis in which there are canals and canaliculi forming a network of canals of the lacunar system (Verma and Datta, 1929). Below the hypodermis there are the circular and longitudinal muscle fibres.

The male genitalia (Fig. 2, *a*) consist of a pair of ovoid testes, two vasa efferentia, a vas deferens, a seminal vesicle, six club-shaped prostatic glands, a penis and a funnel-shaped bursa. The testes, which are nearly equal in size, lie closely apposed, one behind the other. Ducts from these, the vasa efferentia, lead for a short distance along the side of the first couple of prostatic glands and then join with each other to form the vas deferens. A pear-shaped seminal vesicle lies close to the group of the prostatic glands with its opening near the base of the muscular penis. The six prostatic glands are club-shaped and are situated, apparently in pairs, close to one another. It seems as if they set themselves in two groups of three each, and the prostatic ducts from these lead to and ultimately open into the penis. These ducts also appear to run in two distinct sets before joining each other to open at the base of the penis. It appears, therefore, that all these tubes from the vas deferens, seminal vesicle, and prostatic glands open jointly at the base of the penis. The penis is a muscular cone-like organ, which hangs at the top of the retracted

bursa. The bursa is everted out as a funnel-shaped organ at the time of mating.



TEXT-FIG. 2.—*Acanthocephalus kashmirensis*, sp. nov. (a) Posterior region showing the male genitalia; (b) Posterior region showing the female genitalia; (c) Ova highly magnified.

b., bursa; c., cuticle; fc., flask-shaped cells in the uterine wall; gl., genital ligament; lc., lacunar canals; o., ova; pd., prostatic duct; pe., penis; pg., prostatic glands; sv., seminal vesicle; t., testes; u., uterus; ub., uterine bell; vm., vaginal muscles.

The female genitalia (Fig. 2, b) consist of a long funnel-shaped bell, the uterine bell. This bell is kept in position by a ligament, the genital ligament, which at the anterior end is attached to the base of the proboscis sheath. There are a few cells, the guard cells, at the base of the uterine bell which serve to sort out the mature ova and allow them to pass into the uterus while the immature ova are all returned to the body cavity. The uterus is a thick-walled, flabby tube which can expand at the time of breeding when masses of ripe eggs pass into it from the uterine bell. At the posterior end of the uterine wall there are a couple of club-shaped cells, the flask cells. The uterus leads into a short and thick-walled vagina which opens externally through the vulva. The opening of the vagina is controlled by two bands of strong muscles which serve to allow the ova to pass out in a single file. The vulva which forms the external opening of the genitalia is situated at the postero-ventral side.

Measurements.—Males 1.75–8.60 mm. $\times$ 0.44–0.99 mm.; females 3.48–14.60 mm. $\times$ 0.57–1.00 mm.; the proboscis 1.50 $\times$ 0.51 mm.; proboscis sheath 1.69 $\times$ 0.44 mm.; lemnisci 1.276 $\times$ 0.220 mm.; anterior testis 1.188 $\times$ 0.506 mm.; posterior testis 1.122 $\times$ 0.440 mm.; prostatic gland 0.550 mm. in length; seminal vesicle 1.188 $\times$ 0.484 mm.; bursa 0.594 $\times$ 0.396 mm.; ova 0.060 $\times$ 0.010 mm. The hooks of the anterior region are 0.110 mm. in length and of the basal region are 0.075 mm. in length.

TABLE I.—Characters of some closely related species of *Acanthocephalus*.*

Species.	Dimensions.	Proboscis.	Proboscis-sheath.	Hooks.	Prostatic glands.
1. <i>A. anguillae</i> (Müller, 1780).	♂ 5.7 $\times$ 0.8–1.1 ♀ 12.20 $\times$ 2.0	1.0 $\times$ 0.65	1.7 $\times$ 1.3	10 rows of 6–7	6 in pairs.
2. <i>A. paroni</i> (Fr. Condo-relli, 1897).	♂ 5.6 $\times$ 0.6	0.5 $\times$ 0.23	..	10 rows of 8	6
3. <i>A. lucii</i> (Müller) Lühe, 1911.	♂ 4.5 $\times$ 1.0–1.4 ♀ 8–17	0.5–0.7 $\times$ 0.25–0.30	1.5	12–16 rows of 7–9	..
4. <i>A. gracilacanthus</i> Meyer, 1933.	♀ 9.5 $\times$ 1.0	1.4 $\times$ 0.4	1.7	12 rows of 8–9	..
5. <i>A. gotoi</i> Van Cleave, 1925.	♂ 5.0 ♀ 7.2	0.6 $\times$ 0.2	..	15–17 rows	..
6. <i>A. acerbus</i> Van Cleave, 1931.	♀ 5.1–8.8 $\times$ 0.94–1.25	0.48–0.85 $\times$ 0.19–0.25	..	12 rows of 6–8	6 in 3 pairs.
7. <i>A. echigoensis</i> Fugita, 1920.	♂ 2.2–4.0 $\times$ 0.5 ♀ 5.0–12.0 $\times$ 0.6–1.0	0.6 $\times$ 0.15–0.20	..	10–13 rows of 6–10	6 in 3 pairs.
8. <i>A. kashmirensis</i> , sp. nov.	♂ 1.75–8.60 $\times$ 0.44–0.99 ♀ 3.48–14.60 $\times$ 0.57–1.00	1.5 $\times$ 0.51	1.69 $\times$ 0.44	13–18 rows of 6–8	6 in 2 groups.

* All measurements are in millimetres.

In referring the specimens to the genus *Acanthocephalus* I have relied on (i) the shape and size of the male and female, (ii) the position of the central nervous system in the proboscis sheath, (iii) the absence of spines in the short neck and on the body, (iv) the size of the lemnisci, which are equal or a little larger than the proboscis sheath, and (v) the shape and number of prostatic glands.

From the comparative table given above it is evident that *Acanthocephalus kashmirensis* differs considerably from the allied species. The rows of hooks and the number in each row on the proboscis are very marked. The males are generally smaller than the females, and the position of the central nervous system is near the posterior end of the proboscis sheath. The prostatic glands are six in number and are club-shaped. The lemnisci are nearly equal or slightly longer than the proboscis sheath.

Type specimens are deposited in the collections of the Indian Museum, Calcutta.

Host.—*Schizopygopsis stoliczkae* Stiedachner.

Location.—Intestine.

Locality.—Sta. L. 37 (Indian Tibet, Ladak), large rapid stream between Tangste and Mugleb. Altitude, ca. 13,700 ft.

Family *NEOECHINORHYNCHIDAE* Van Cleave, 1919.

Neoechinorhynchus Hamann 1892.

Neoechinorhynchus rutili (Müller).

1776. *Echinorhynchus rutili*, Müller, *Zool. Dan.* II, p. 61.

1800. *Echinorhynchus clavaiceps*, Zeder, *Nachr. Eingeweidewurm*, p. 130.

1803. *Echinorhynchus tuberosus*, Zeder, *Anleit. Eingeweidewurm*, p. 163.

Neoechinorhynchus rutili is a very common Acanthocephalan parasite found in fishes, and recorded from time to time by various authors but not from India.

I have examined two lots, one containing six specimens from a loach, *Nemachilus stoliczkae* and another containing three specimens from *Nemachilus vittatus*. They were all very brittle and shrunken. Considerable difficulty was, therefore, experienced in taking their measurements and in making permanent mounts. Fortunately the specimens were not so dark and their internal anatomy could be easily studied.

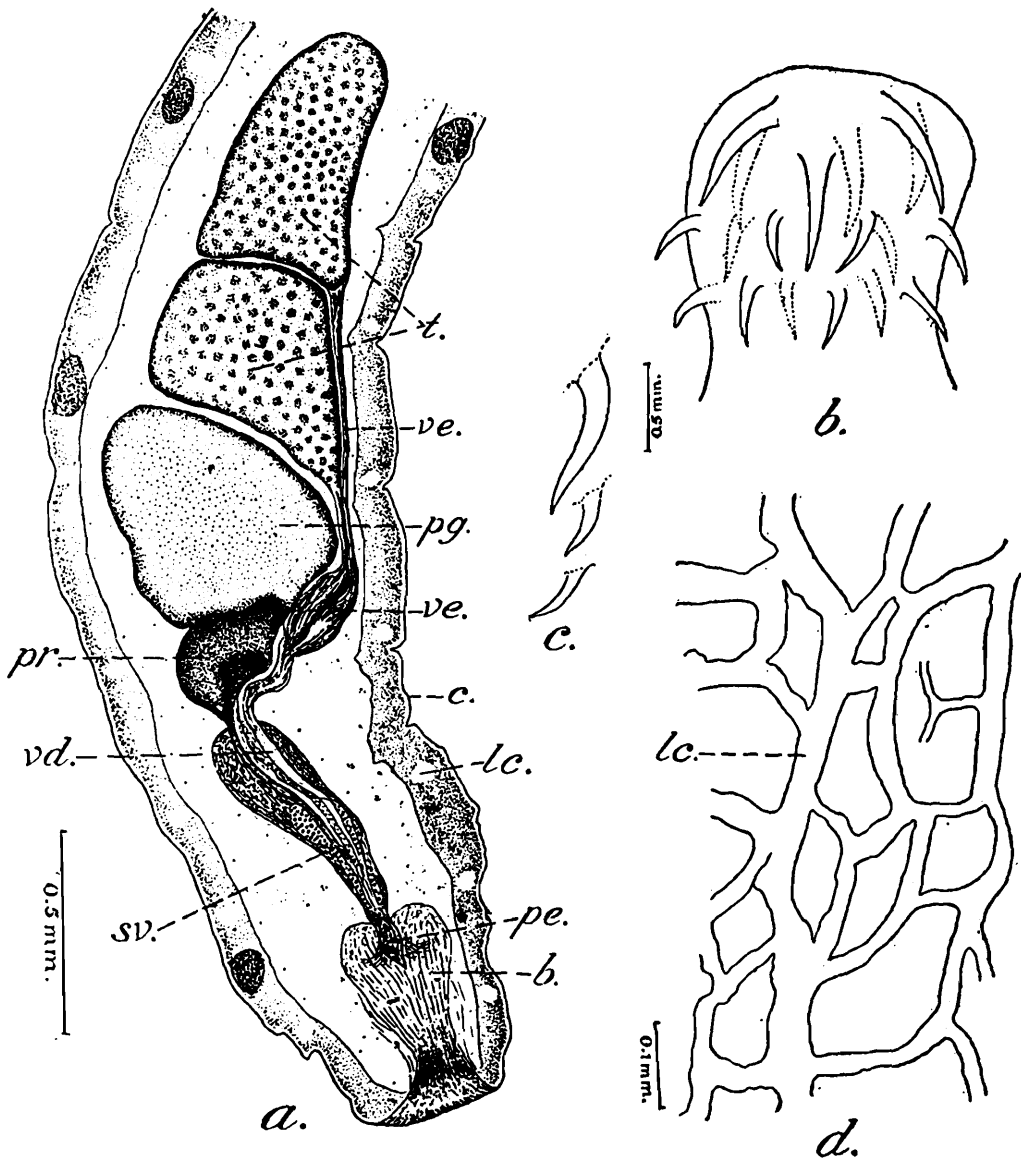
The body is fusiform and devoid of spines. Owing to its shrunken state deep furrows are visible on the body. The proboscis (Fig. 3, *b*) is globular with three circles of six hooks each. The hooks (Fig. 3, *c*) of the terminal circle are much longer and stouter than the succeeding two circles, as is generally found in this genus. The proboscis sheath is a single-walled muscular sac hanging from the base of the proboscis. The central nervous system consists of a single ganglion situated in the wall of the proboscis sheath near its posterior end, and a few nerve fibres emerge from this to supply the body wall.

A pair of muscular folds, the lemnisci, hang on the sides of the proboscis sheath. They are very long and sometimes reach up to the region of the testes. It has been definitely observed that one of them is always a little longer than the other. Nuclei are present in both the lemnisci, two in one and one in the other.

The body wall consists of a thick layer of cuticle as the outermost covering below which there is a broad layer of submucosa intermixed with bands of fibrous tissue. In the submucosa are seen numerous canals and canaliculi which form a regular network of canals of the lacunar system (Fig. 3, *d*). The very prominent transverse canals give the body wall the appearance of an internal annulation, although the depressions on the external body wall are not very deep; in fact there is no segmentation or annulation of the body wall. Below the submucosa there are a few layers of circular muscle fibres while the longitudinal muscles form the innermost layer. In the body wall there are some cuticular nuclei, five on the mid-dorsal line and one on the mid-ventral.

The male genitalia (Fig. 3, *a*) consist of a pair of ovoid testes, a pair of vasa efferentia, a vas deferens, a syncitial prostatic gland, a prostatic reservoir, a seminal vesicle, a muscular penis and a funnel-shaped bursa. The oval testes are situated near the middle of the body, lying closely one behind the other. A short tube from each testis, the vas efferens, runs for a short distance, and then swells a little, before joining with each other to form the vas deferens. This characteristic is generally observed

in *Neoechinorhynchus*. The vas deferens, which is a short muscular tube, runs for a short distance alongside the seminal vesicle and then



TEXT-FIG. 3.—*Neoechinorhynchus rutili* (Müller). (a) Showing male genitalia; (b) Proboscis showing arrangement of hooks; (c) Hooks of the terminal, middle and basal circles showing their comparative sizes; (d) A portion of the lacunar canals showing the arrangement in the body wall.

b., bursa; c., cuticle; lc., lacunar canals; pe., penis; pg., prostatic gland; pr., prostatic reservoir; sv., seminal vesicle; t., testes; vd., vas deferens; ve., vas efferens.

opens at the base of the penis. The prostatic gland is a single syncytial mass, the anterior end of which touches the posterior testes. The gland evacuates its contents into a reservoir, the prostatic reservoir, which leads to the prostatic duct. The duct is a thin long tube which opens posteriorly near the base of the penis. A thin walled sac, the seminal vesicle, also opens posteriorly near the base of the penis. So it is evident that the vas deferens, the seminal vesicle and the prostatic duct all empty their contents jointly into the penis. The penis is a short muscular cone-like organ, which hangs near the top of the eversible bursa. The bursa is a bell-shaped, muscular organ, which is capable of being everted at the time of copulation.

The female genitalia consist of the uterine bell, the uterus, the vagina and the vulva. The long, thin-walled and funnel-like uterine bell is attached at one end to the ligamentous tissue of the genital ligament,

and is kept in position in the lumen of the body by the ligament being attached to the base of the proboscis sheath. At the posterior end of the uterine bell there are a few cells, the guard cells, which serve the function of separating the mature from the immature ova. The uterus is a thick-walled flabby tube with two flask-shaped cells embedded in its wall near the posterior end just before it opens into the short muscular vagina. The vagina is a thick muscular tube with two strong bands of muscles at each end; these bands allow the ova to pass out in single file. The vulva is the external outlet of the female genitalia and is situated at the postero-ventral end.

Measurements.—Male 3.0–4.20 mm. $\times$ 0.50–0.80 mm., female 7.50–8.80 mm. $\times$ 0.60–1.50 mm.; proboscis 0.132 $\times$ 0.143 mm.; proboscis hooks terminal 0.080 mm., middle 0.040 mm., basal 0.037 mm.; proboscis sheath 0.242 $\times$ 0.176 mm.; lemnisci longer 1.584 $\times$ 0.088 mm., shorter 1.276 $\times$ 0.088 mm.; testis anterior 1.100 $\times$ 0.550 mm., testis posterior 0.770 $\times$ 0.374 mm.; prostatic gland 0.814 $\times$ 0.330 mm.; prostatic reservoir 0.286 $\times$ 0.198 mm.; prostatic duct 0.660 $\times$ 0.440 mm.; bursa 0.374 $\times$ 0.176 mm.; ova 0.050 $\times$ 0.013 mm.

From Table II (*vide* page 221) showing differences between closely allied species of *Neoechinorhynchus* it is evident that my specimens agree in all essentials with the description of *Neoechinorhynchus rutili* (Müller).

Hosts.—*Nemachilus stoliczkae* Steindachner, and *Nemachilus vittatus* (Heckel).

Location.—Intestine.

Locality.—Indian Tibet (Ladak), Sta. L. 64; altitude 16,082 ft., and Wular Lake, Kashmir, Sta. K. 43; altitude 5,160 ft.

***Neoechinorhynchus hutchinsoni*, sp. nov.**

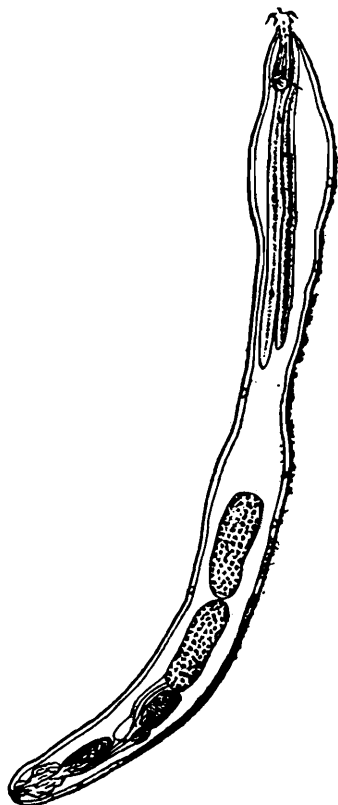
Of this species I have examined four specimens, 3 males and 1 female, from a specimen of the fish, *Diptychus maculatus*. The single female was received in three pieces, but from the shape of the broken ends it is clear that these belong to one specimen; the dimensions of the female are of the broken pieces.

In the species under description sexual diamorphism is well marked. The males are much smaller and more slender than the female. The body is cylindrical in shape with tapering ends. In the males there is a peculiar depression of the body about its middle. This peculiar narrowing of the girth of the body just above the region of the testes is constant in all the three males specimens in the collection, and I consider it to be a characteristic feature of the new species.

The proboscis is oval, but its breadth is greater than the length. Hooks on the proboscis are in three rows of six each. The hooks of the terminal row are much stouter and longer than that of the middle and basal rows.

The number of sub-cuticular nuclei on the mid-dorsal line of the body wall is five, and on the mid-ventral line two, which conforms to the number generally found in the genus.

The proboscis sheath is a single-walled muscular sac hanging from the base of the proboscis. The central nervous system consists of a single ganglion, which is situated in the posterior portion of the wall of the proboscis sheath, and sends out a few nerve retinaculi to the body wall.



TEXT-FIG. 4.—*Neoechinorhynchus hutchinsoni*, sp. nov., male specimen showing the peculiar depression of the body-wall.

The two lemnisci, one of them a little longer than the other, arise from the base of the proboscis, one on either side of the proboscis sheath, and are filamentous. In this case they do not reach the testicular region but end near the depression of the body-wall.

The male genitalia consist of a pair of elliptical testes, two vasa efferentia, a vas deferens, a single syncytial prostatic gland, a seminal vesicle, a penis and a bursa. The vasa efferentia from both the testes swell a little before they join, with each other to form the vas deferens. The elliptical testes lie closely apposed one behind the other. The prostatic mass lies close behind the posterior testis. The prostatic reservoir is spherical and gives out the prostatic duct which ends at the base of the muscular cone-like penis. The vas deferens opens in the seminal vesicle just before its opening into the penis. The penis hangs at the top of the inverted bell-shaped bursa, which is capable of being everted at the time of mating.

The female genitalia were not clearly seen in the single damaged specimen.

Measurements.—Males 7.8–8.2 mm. $\times$ 0.8–1.0 mm., female 18.9 $\times$ 1.30 mm.; proboscis 0.077–1.00 mm. $\times$ 0.099–0.110 mm.; proboscis sheath 0.264 $\times$ 0.099 mm.; lemnisci longer 2.728 $\times$ 0.176 mm., shorter 2.508 $\times$ 0.176 mm.; anterior testis 1.188 $\times$ 0.484 mm., posterior testis 1.122 $\times$ 0.484 mm.; prostatic mass 0.902 $\times$ 0.352 mm.; seminal vesicle 0.484 mm.; bursa 0.682 mm.; ova 0.154 $\times$ 0.055 mm.; proboscis hooks terminal 0.050 mm., middle 0.037 mm., basal 0.035 mm.

TABLE II.—Characters of some closely related species of *Neoechinorhynchus*.*

Species.	Dimensions.	Proboscis.	Proboscis hooks.	Number of Subcuticular nuclei.
1. <i>N. agilis</i> (Rudolphi, 1819).	♀ 45 × 0.5-1.0	Length greater than breadth.	3 rows of 6 i. 0.09-0.12 ii. 0.041-0.053 iii. 0.03-0.07	Dorsal—4. Ventral—2.
2. <i>N. australis</i> Van Cleave, 1931.	♂ 3.6-7.0 ♀ 4.0-18.0 × 0.35	0.15-0.18 × 0.12-0.15	3 rows of 6	..
3. <i>N. cylindratus</i> (Van Cleave, 1913).	♂ 4.5-8.5 × 0.5-0.7	0.172 × 0.150	i. 0.079-0.097 ii. 0.037 iii. 0.021-0.025	..
4. <i>N. tenellus</i> (Van Cleave, 1913).	♂ 2.0-8.0 ♀ 3.5-13.0 × 0.6	0.15-0.135	i. 0.09-0.11 ii. 0.038 iii. 0.027	..
5. <i>N. crassus</i> Van Cleave, 1922.	♂ 4.0-7.0 ♀ 6.0-9.0	0.27-0.325 × 0.24-0.27	i. 0.094-0.1 ii. 0.071-0.083 iii. 0.047-0.071	..
6. <i>N. magnus</i> Southwell & Macfie, 1915.	♀ 90.0 × 1.5	..	3 rows of 6. i. 0.06-0.071 ii. 0.03-0.037 iii. 0.018	..
7. <i>N. variabilis</i> (Diesing, 1856).	♂ 9.0-25.0 ♀ 9.0-50.0	..	2 rows.	..
8. <i>N. zacconis</i> Yamaguti, 1933.	1.43 × 0.37	..	6 oblique rows of 3. i. 24μ ii. 18μ iii. 12μ	..
9. <i>N. octonucleatus</i> Tubangui, 1933.	♀ 9.09 × 1.09	..	3 rows of 6. i. 88-91μ ii. ? iii. 35μ	..
10. <i>N. rutili</i> (Müller, 1780).	♂ 2.0-6.0 × 0.4-1.0 ♀ 5.0-10.0	0.038 × 0.019-0.021	..	..
11. <i>N. hutchinsoni</i> sp. nov.	♂ 7.8-8.2 × 0.8-1.0 ♀ 18.9 × 1.30	0.077-0.100 × 0.099-0.110 Breadth greater than length.	3 rows of 6. i. 0.050 ii. 0.037 iii. 0.035	Dorsal—5. Ventral—2.

* All measurements are in millimetres except where otherwise indicated.

In referring the specimens to the genus *Neoechinorhynchus* I have relied on the characters of (i) the number and rows of proboscis hooks and their relative sizes, (ii) the shape and size of the proboscis, (iii) absence of spines on the body, (iv) the position of the central nervous system in the proboscis sheath, (v) the size of the lemnisci, (vi) the genitalia and the syncytial prostatic gland, and (vii) the number of the giant sub-cuticular nuclei.

From the above table and measurements it is evident that the new species *Neoechinorhynchus hutchinsoni* differs from the closely related species in the peculiar narrowing of the body in the males, in the dimensions of the males and females, in the shape and size of the testes and the prostatic mass, in the size of the terminal hooks as compared to the middle and basal rows ; in that the lemnisci, though filamentous, are not long enough to reach to the testes.

The Type specimens are deposited in the collections of the Indian Museum.

Host.—*Diptychus maculatus* (Steindachner).

Location.—Intestine.

Locality.—Leh ; altitude 11,500 ft.

I have great pleasure in naming the species after Dr. G. E. Hutchinson.

Eosentis Van Cleave (1928).

Generic diagnosis.—Agrees with the diagnosis of the family *Neoechinorhynchidae*, except in the presence of 8-9 sub-cuticular nuclei in the mid-dorsal and 1-2 in the mid-ventral line. Body fusiform and tapering towards the posterior extremity, devoid of spines. Proboscis short and globular with three circles of six hooks each. Proboscis sheath a single-layered, thick, muscular sac. Three nuclei in each of the large lemnisci. Prostatic gland a single syncytial mass. Parasitic in the adult stage in the digestive tract of fishes.

Eosentis devdevi, sp. nov.

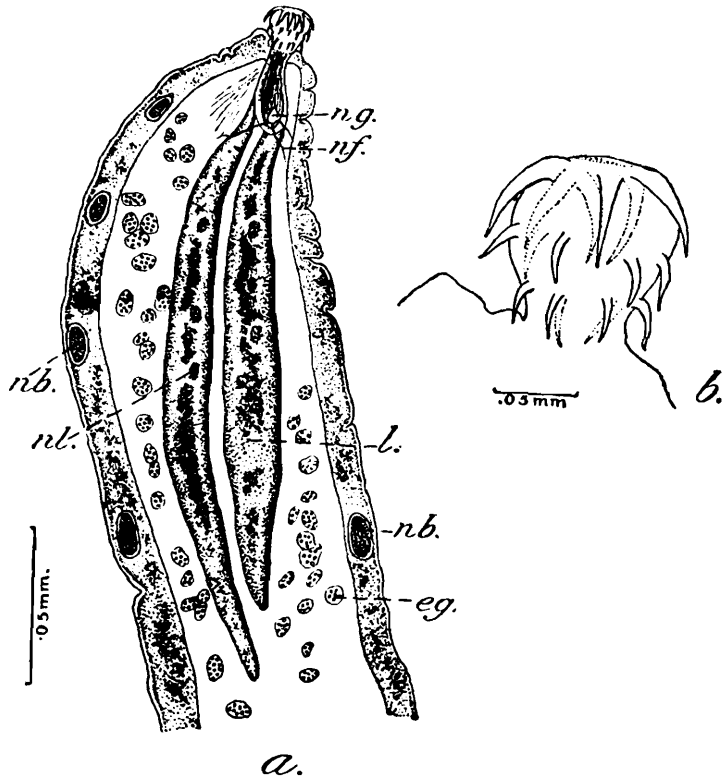
The genus *Eosentis* established by Van Cleave in 1928 is of interest as it is based on the study of one female specimen only. The genus is based mainly on the relatively large number of sub-cuticular nuclei, but the author does not mention the exact number that is generally found, although they are visible in the holotype of *Eosentis rigidus* deposited in the collections of the Indian Museum. The number of nuclei in the mid-dorsal line is 9 and in the mid-ventral line 1. This number, with slight modifications, seems to be constant in all the species belonging to this genus and distinguishes them from the species of the genus *Neoechinorhynchus*, in which there are 4-5 nuclei in the mid-dorsal and 1-2 in the mid-ventral line.

The new species is fusiform in shape and tapers moderately towards the posterior end. The external body wall is slightly furrowed giving it an annulated appearance. This condition is not a permanent feature of the species as in whole mounts the ridges disappear, and the transverse canals of the lacunar system become prominent in the body wall. The body is devoid of spines.

The proboscis (Fig. 5, *b*) is short and globular with three circles of six hooks each. The hooks of the terminal circle are much longer and stouter than those of the other two circles. The proboscis is, in most cases, found tucked in in the short, thin, proboscis sheath, provided with a single-layered muscular wall. The retraction and protrusion of the proboscis is controlled by sets of strong bands of retractor and protractor muscles.

The two lemnisci are long filamentous structures which hang on either side of the proboscis sheath. There are three nuclei in each of these lemnisci as compared to *Neoechinorhynchus*, where we find two in one and one in the other.

The central nervous system consists of a single nerve ganglion situated near the base of the proboscis sheath. It gives out a few fine nerve branches which emerge through the wall of the proboscis sheath and supply the body wall. (Fig. 5, *a.*)



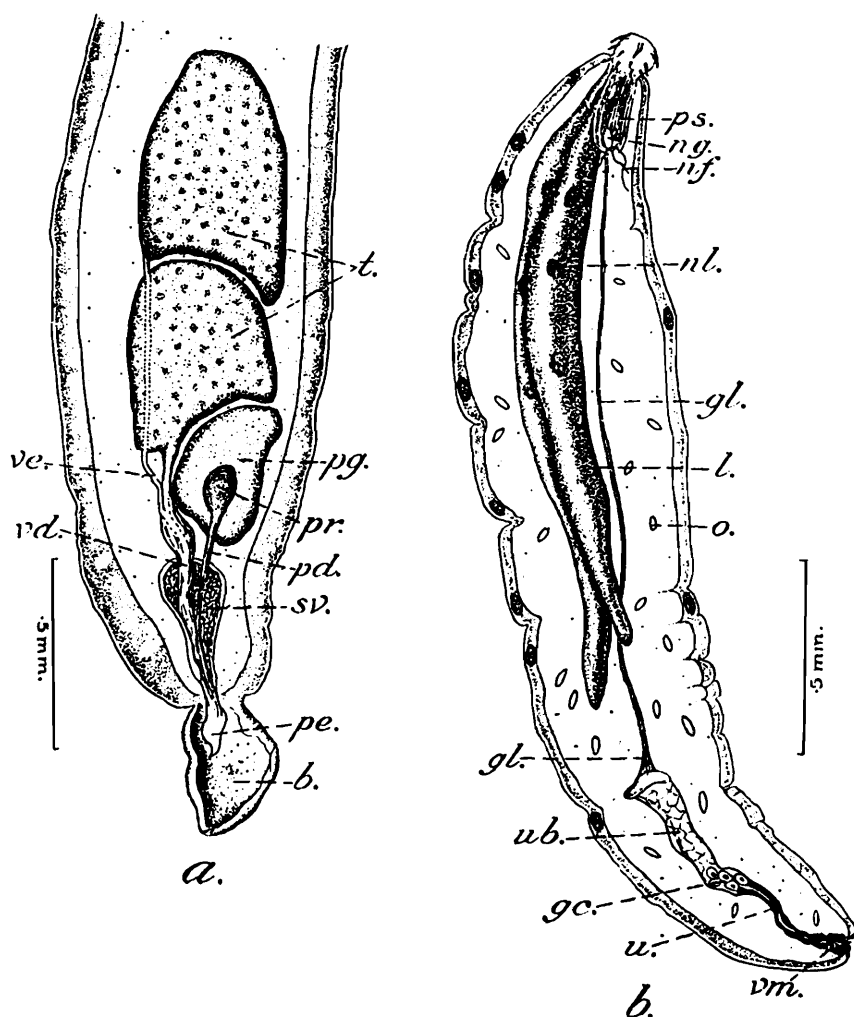
TEXT-FIG. 5.—*Eosentis devdevi*, sp. nov. (*a.*) Anterior region; (*b.*) Proboscis highly magnified showing arrangement of hooks.

eg., egg balls; *l.*, lemnisci; *nb.*, subcuticular nuclei; *nf.*, nerve fibres; *ng.*, central nerve gland; *nl.*, nuclei of the lemnisci.

The male genitalia consist of two ovoid testes, almost equal in size, lying closely one behind the other. Each of the testes gives out a vas efferens, which runs by the side of the prostatic gland and meets the other to form the thick vas deferens, which opens with the opening of the seminal vesicle, at the base of the penis. The prostatic gland is a single syncytial mass which opens into a thick prostatic reservoir. The prostatic fluid is taken by the prostatic duct which ends at the base of the penis. The seminal vesicle is a thick-walled sac, which opens near the base of the penis to deliver the genital contents stored in it. The penis is a short, thick, muscular cone-like structure which hangs at the top of the funnel-shaped inverted bursa. The bursa can be everted (Fig. 6, *a.*) out of the body with slight pressure or at the time of mating.

The female genitalia consist of the funnel-shaped uterine bell kept in position by the genital ligament attached at the anterior end to the base of the proboscis sheath. The guard cells, which are rather large in size, lie at the base of the bell. The uterus is flabby and short; there are two flask-shaped cells situated near the posterior end of the uterine wall where it opens into the vagina. The vagina is a short, thick-walled muscular tube and is guarded by two bands of strong muscles, which control the exit of the ova in a single file through the vulva; the external opening of the genitalia is situated at the postero-ventral end.

Measurements.—Males 2.290–3.300 mm. $\times$ 0.730–1.080 mm.; females 2.970–7.590 mm. $\times$ 0.616–1.276 mm.; proboscis 0.132 $\times$ 0.099 mm.; pro-



TEXT-FIG. 6.—*Eosentis devdevi*, sp. nov. (a) Posterior region showing the male genitalia; (b) Young specimen showing fully developed female genitalia.

b., bursa; gc., guard cells; gl., genital ligament; l., lemnisci; nf., nerve fibres; ng., central nerve gland; nl., nuclei of the lemnisci; o., ova; pd., prostatic duct; pe., penis; pg., prostatic gland; pr., prostatic reservoir; ps., proboscis sheath; sv., seminal vesicle; t., testes; u., uterus; ub., uterine bell; vd., vas deferens; ve., vas efferens; vm., vaginal muscles.

proboscis sheath 0.264 $\times$ 0.132 mm.; longer lemnisci 1.870 $\times$ 0.132 mm., shorter 1.782 $\times$ 0.132 mm.; anterior testis 0.704 $\times$ 0.440 mm., posterior testis 0.616 $\times$ 0.440 mm.; prostatic gland 0.440 $\times$ 0.308 mm.; seminal vesicle 0.374 $\times$ 0.198 mm. at the broadest end; uterine bell 0.415 $\times$ 0.070 mm.; uterus 0.250 $\times$ 0.035 mm.; vagina 0.050 $\times$ 0.040 mm.; ova 0.020 $\times$ 0.005 mm.; proboscis hooks terminal 0.090 mm., middle 0.045 mm., basal 0.040 mm.

Eosentis devdevi differs from *Eosentis rigidus* in the length and shape of the body, in the exact number of sub-cuticular nuclei in the body wall, and in the presence of a heavy network of lacunar canals.

All type specimens are deposited in the collections of the Indian Museum, Calcutta.

Host.—*Schizothorax planifrons* Heckel.

Location.—Intestine.

Locality.—Kashmir valley; canal to Dal Lake, Srinagar (Sta. K. 6); Dal Lake, Srinagar (Sta. K. 11); altitude ca. 5,200 ft.; channels to Mansbal Lake, Srinagar (Sta. K. 48), altitude 5,196 ft.

I have great pleasure in associating this species with the name of my colleague, Mr. Dev Dev Mukerji.

Eosentis yalei, sp. nov.

The four specimens which I refer to this new species, were in a poor condition, and great difficulties were experienced in taking their measurements and making permanent stained preparations. They were deep brown in colour and very tender. There was only one male specimen in the collection, and the remaining three were gravid females. The main anatomy tallies with the description of *Eosentis devdevi*, except in measurements and in the number of sub-cuticular nuclei in the mid-dorsal and mid-ventral line of the body wall.

Measurements.—Male 5.390×0.880 mm.; females $5.00-8.00$ mm. $\times$ $0.990-1.100$ mm.; proboscis 0.132×0.110 mm.; proboscis sheath 0.242×0.132 mm.; longer lemnisci 2.090×0.242 mm., shorter 1.870×0.242 mm.; anterior testis 1.144×0.616 mm., posterior testis 1.100×0.528 mm.; prostatic gland 0.396×0.242 mm.; seminal vesicle 0.286×0.196 mm. at the broadest end; uterine bell 0.308×0.132 mm.; uterus 0.484×0.055 mm.; vagina 0.110×0.088 mm.; ova 0.028×0.008 mm.; proboscis hooks terminal 0.080 mm.; middle 0.040 mm.; basal 0.040 mm.

TABLE III.—Comparative table of the species of the genus *Eosentis*.*

Species.	Dimensions.	Proboscis.	Proboscis hooks.	Number of sub-cuticular nuclei.
1. <i>Eosentis rigidus</i> Van Cleave, 1928.	$\text{♀ } 9.0 \times 0.87$	0.192×0.153	i. 70μ ii. 47μ iii. 41μ	8-9 & 1-2.
2. <i>Eosentis devdevi</i> , sp. nov.	$\text{♂ } 2.29-3.30 \times 0.73-1.08$ $\text{♀ } 2.970-7.590 \times 0.616-1.276$	0.132×0.099	i. 0.090 ii. 0.045 iii. 0.040	9 & 2.
3. <i>Eosentis yalei</i> , sp. nov.	$\text{♂ } 5.390 \times 0.880$ $\text{♀ } 5.00-8.00 \times 0.990-1.110$	0.132×0.110	i. 0.080 ii. 0.040 iii. 0.040	8 & 1.

* All measurements are in millimetres except where otherwise indicated.

From the above table it is evident that the two new species, *Eosentis devdevi* and *Eosentis yalei*, differ from each other as also from *Eosentis rigidus*, mainly in the dimensions of the body in both the sexes, and in the number of cuticular nuclei. The proboscis in both the new species is smaller than in *E. rigidus*.

All type specimens of *E. yalei* are deposited in the collections of the Indian Museum, Calcutta.

Host.—*Schizothorax esocinus* Heckel.

Location.—Intestine.

Locality.—Kashmir valley, Srinagar (Sta. K. 7), altitude *ca.* 5,200 ft.; Jhelum river (Sta. K. 14), altitude *ca.* 5,200 ft.; channel to Mansbal Lake, Srinagar (Sta. K. 48), altitude 5,196 ft.

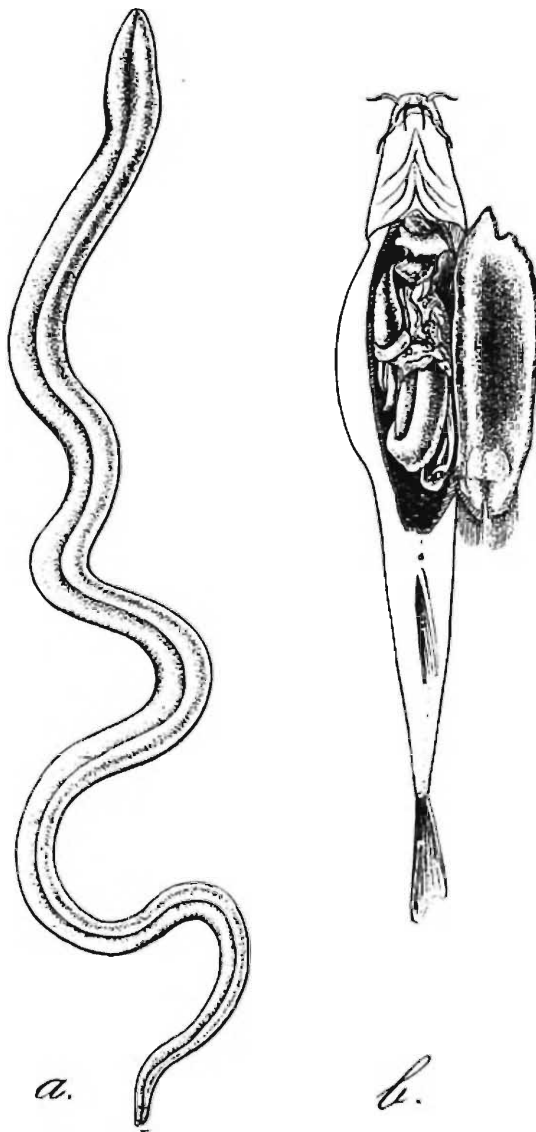
I have great pleasure in associating this species with the name of the Expedition which collected the material under report.

CESTODA.

Subfamily *LIGULINAE* Monticelli & Crety.**Ligula** Bloch 1782.**Ligula intestinalis** (Linnaeus, 1758).1930. *Ligula intestinalis*, Southwell, *Fauna Brit. Ind.*, *Cestodes* I, p. 63.

The collection of Cestoda received from Dr. G. E. Hutchinson in several tubes, and the collection in a single tube from Dr. S. L. Hora consisted of larvae of *Ligula intestinalis* (*vide infra* p. 227), in various stages of development.

Ligula intestinalis in the larval form is found very commonly in fishes all over the world. In the present collection, all the parasites are from hosts in which they have not been recorded so far.



TEXT-FIG. 7.—*Ligula intestinalis* (Linnaeus), (larval form). (a) Entire specimen from the body cavity of *Nemachilus hutchinsoni*; (b) Showing the position of the parasite within the body cavity of the host, *Nemachilus hutchinsoni*.

The parasites are light cream in colour except in some cases where they had been kept in preservatives for a long time when they appear somewhat brownish. They are lanceolate in form with blunt tapering ends. The maximum breadth is at a point just about one third the

distance of the total length from the anterior extremity. There is no sign of bothridea or external segmentation. They vary in length sometimes attaining a length of about a metre, the breadth also varies from 5 mm. to 15 mm. Throughout the entire length of the worm a channel-like depression is seen in the middle of the body. Slightly irregular notches are seen about the margins of the body. The smallest specimen in the collection is 4 mm. $\times$ 0.98 mm. from Tube No. 476-A.

Material examined.

- Tube No. 209.* Host—?. Locality—Tso Nyak; altitude ca. 14,100 ft.; 7 specimens. Dimensions 16.0–55.0 mm. $\times$ 2.5–6.8 mm.
- Tube No. 474.* Host—*Schizopygopsis* sp. Locality—L. 74. Pangur Tso, altitude ca. 14,203 ft. 1 specimen. Dimensions 168.0 mm. $\times$ 8.0 mm.
- Tube No. 474.* Host—*Nemachilus* sp. Locality—L. 74. Pangur Tso, altitude ca. 14,203 ft. 2 specimens. Dimensions 41.5–48.0 mm. $\times$ 4.5–7.0 mm.
- Tube No. 476 (A).* Host—?. Locality—L. 74. Pangur Tso, stream west end; altitude ca. 14,203 ft. 5 specimens. Dimensions 4.0–72.0 mm. $\times$ 0.98–6.00 mm.
- Tube No. 522.* Host—Smaller fish No. F. 151. Locality—L. 74, Pangur Tso altitude ca. 14,203 ft. 2 specimens. Dimensions 52.0–54.0 mm. $\times$ 2.2–5.0 mm.
- Tube No. 713.* Host—*Schizothorax* sp. Locality—K. 6 J-N. Ganjibal, Dal Lake, Srinagar; altitude ca. 5,200 ft. 1 specimen. Dimensions 24.0 mm. $\times$ 2.5 mm.
- Tube No. 723.* Host—*Chush* Locality—K. 12-A. Below bridge canal, Srinagar; 2 specimens. Dimensions 39.8–41.5 mm. $\times$ 2.1–2.2 mm.
- Tube No. ?.* Host—*Nemachilus* sp. Locality—L. 74, Pangur Tso; altitude ca. 14,203 ft. 1 specimen. Dimensions 27.0 mm. $\times$ 2.0 mm.
- Tube No. ?.* (From Dr. S. L. Hora). Host—*Nemachilus hutchinsoni* Hora Locality—L. 40. Pool isolated from river near Pangur Tso; altitude ca. 14,164 ft. 1 specimen. Dimensions 152.0 mm. $\times$ 7.5 mm.

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23. Stiles, C. W.—A revision of the adult tapeworms of hares and rabbits. *Proc. U. S. N. Mus.* XIX, pp. 145-235 (1897).
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ON THE SIPUNCULOIDEA FROM INDIAN WATERS IN THE INDIAN MUSEUM, CALCUTTA.

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(Plate IX.)

The present paper deals with the Sipunculoidea belonging to the genera *Sipunculus* Linn. and *Siphonosoma* Spengel, represented in the collections of the Indian Museum, Calcutta. *Sipunculus nudus* Linn., *S. aequabilis* Sluiter, and *Siphonosoma australe* (Keferstein) are recorded from the Indian waters for the first time, while descriptive notes are added on *Sipunculus porrectus* Selenka and *S. robustus* Keferstein.

The specimens under report are mainly from the collections made by the Surgeon-Naturalists attached to the Marine Survey of India, and formed part of the material which was sent to the late Prof. J. W. Spengel of Giessen for his monographic revision of the group. A few specimens collected during the survey seasons 1924-1926, and a number of specimens collected by Dr. H. S. Rao in the Andamans during his investigations of the *Trochus* fisheries in the area are also dealt with in this paper. In addition, a series of specimens, of *Sipunculus robustus* Keferstein was received from Dr. R. Gopala Aiyar, Director of Zoological Laboratories, Madras University, Madras, for identification; the record of this species found floating in the coastal waters round Madras, is of special interest.

Sipunculus Linn.

- 1767. *Sipunculus*, Linné, *Systema Naturae* (XII ed.), p. 1078.
- 1865. *Sipunculus*, Keferstein, *Nachricht. Königl. Gesell. Wiss. Gottingen*, No. 7, p. 196.
- 1865. *Sipunculus*, Keferstein, *Zeitschr. Wiss. Zool.* XV, pp. 418, 419.
- 1883. *Sipunculus*, Selenka, de Man and Bülow, *Semper's Reisen im Archipel Philippinen*, II Tl., IV (i), p. 88.
- 1897. *Sipunculus*, Delage and Herouard, *Traité Zool. Conc.* V, p. 20.
- 1931. *Sipunculus*, Baltzer in *Kükenthal Handbuch Zool.* II (ii), p. 57 (9).

The earlier definitions of the genus by Keferstein, Selenka and his colleagues, and Delage and Herouard have to be modified in view of the restriction by Spengel¹ of the generic name *Sipunculus* to such species as do not bear any hooks on the introvert, and have short thick tentacles arranged in a circle round the mouth. The dorsal and ventral retractor series of muscles in this genus arise from the same level, and the integumental canals are longitudinally directed as opposed to the transversely directed canals in *Siphonosoma* Spengel (*vide infra*, p. 237.)

¹ Spengel, J. W.—*Verhandl. Deutsch. Zool. Gesell.* XXII, pp. 261-272 (1912).

Sipunculus nudus Linn.

(Plate IX, fig. 1.)

1767. *Sipunculus nudus*, Linné, *Systema Naturae* (XII ed.), p. 1078.
 1861. *Sipunculus nudus*, Keferstein and Ehlers, *Zool. Beiträg.* pp. 32-52, pls. vi-viii.
 1865. *Sipunculus nudus*, Keferstein, *Nachricht. Königl. Gesell. Wiss. Göttingen*, No. 7, p. 196.
 1865. *Sipunculus nudus*, Keferstein, *Zeitschr. Wiss. Zool.* p. 419.
 1868. *Sipunculus nudus*, Baird, *Proc. Zool. Soc. London*, p. 77.
 1870. *Sipunculus nudus*, Brandt, *Mém. Acad. Imp. St. Petersbourg*, XVI (7), pp. 1-46, pls. i, ii (anatomy).
 1881. *Sipunculus nudus*, Andrae, *Zeitschr. Wiss. Zool.* XXXVI, pp. 201-258, pls. xii, xiii (anatomy).
 1883. *Sipunculus nudus*, Selenka, de Man and Bülow, *Semper's Reisen im Archipel Philippinen*, II Tl., IV (i), pp. 92, 93.
 1891. *Sipunculus nudus*, Ward, *Bull. Mus. Comp. Zool. Harvard*, XXI, pp. 143-184, pls. i-iii (anatomy).
 1899. *Sipunculus nudus*, Shipley in *Willey's Zool. Results*, p. 158.
 1900. *Sipunculus nudus*, Metchnikoff, *Zeitschr. Wiss. Zool.* LXVIII, pp. 261-322, pls. xvii-xxii (anatomy).
 1902. *Sipunculus nudus*, Sluiter, "*Siboga*" *Exped.* XXV, p. 5.
 1903. *Sipunculus nudus*, Augener, *Archiv Naturgesch.* Jahrg. 69, Bd. I, p. 344.
 1904. *Sipunculus nudus*, Ikeda, *Journ. Coll. Sci. Imp. University, Tokyo*, XX, pp. 31, 32.
 1904. *Sipunculus nudus*, Hérubel, *Bull. Mus. d'Hist. Nat. Paris*, X, p. 563.
 1905. *Sipunculus nudus*, Ikeda, *Annot. Zool. Japon.* V, p. 169.
 1907. *Sipunculus nudus*, Hérubel, *Mém. Soc. Zool. France*, XX, pp. 224, 225.
 1913. *Sipunculus nudus*, Southern, *Sci. Inv. Ireland Fish. for 1912*, No. 3, p. 8.
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 1914. *Sipunculus nudus*, Fischer, *Mitteil. Nat. Hist. Mus. Hamburg*, XXXI, p. 1.
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 1922. *Sipunculus nudus*, *Arkiv Zool.* XIV, No. 19, p. 5.
 1925. *Sipunculus nudus*, Fischer, *Tierwelt Nord-u. Ostsee*, I, 26 vi d.
 1925. *Sipunculus nudus*, Brocke, *Bijdr. Dierkund.* XXIII, p. 82.
 1930. *Sipunculus nudus*, Sato, *Sci. Rept. Tohoku Imp. Univ.* V (4), 17. 2-5, pl. i, fig. 1.
 1934. *Sipunculus nudus*, Sato, *ibid.* IX (4), pp. 1, 2, pl. i, fig. 1.
 1935. *Sipunculus nudus*, Sato, *ibid.* X (4), p. 300.

S. nudus, the earliest known representative of the Sipunculoidea, is a cosmopolitan species with an almost world-wide distribution.

In the Indian Museum collection the species is represented by the following specimens :—

- | | |
|--|---|
| 1. Andamans ; purchased from G. H. Booley, Esqr. | 1 specimen ($\frac{8445}{9}$). |
| 2. Andamans, Port Blair, north of Corbyn's Cove.
7.i.34 ; Dr. H. S. Rao | 1 specimen (ZEV $\frac{7506}{7}$). |
| 3. Andamans, Port Blair, Dr. H. S. Rao | 2 specimens (ZEV $\frac{7504}{7}$). |
| 4. Andamans ; without definite data | 1 young specimen
(ZEV $\frac{7503}{7}$). |
| 5. Nicobars ; between Jetty and Naval point (St.
621). Col. R. W. G. Hingston. 8.iii.25 | 3 specimens (ZEV $\frac{7502}{7}$). |

The above listed specimens agree with the detailed description of *S. nudus* by Selenka and his collaborators, and I have no doubt about their identification.

The young specimen from the Andamans (No. 4) is 42 mm. long, while the others from Port Blair (Nos. 1-3) vary from 90-170 mm. in length.

They are of a creamy white to yellowish colour. The introvert in most specimens is retracted, but in one specimen (Plate IX, fig. 1) it is partially everted; its surface is covered with many rows of closely placed, leaf-like, inverted triangular papillae. The mouth opening is surrounded by a tentacular membrane which appears to be divided into a dorsal and a ventral lobe, each of which is cut into tentacular flaps; the flaps of the dorsal lobe are larger than those of the ventral.

The number of longitudinal muscles, which rarely anastomose, varies from 31-34 in the different specimens. The four retractor muscles arise at the same level, and are connected at their origin with 6-7 longitudinal muscles. Owing to the well developed circular muscles of the body wall its surface is cut up into deeply impressed quadratic areas; these are almost squarish in the anterior region, somewhat rectangular in the middle of the body, while near the posterior end some of them appear nearly triangular. The spindle-muscle arises somewhat in front of the anal opening, and is not connected posteriorly with the body wall.

The anal opening is situated dorsally about 15 mm. behind the origin of the introvert, and there are always at least 2 distinct longitudinal muscle bands bounding it both anteriorly and posteriorly.

The intestine consists of 10-12 double spirals; a large number of transverse muscular strands attach it to the body wall on either side. A rectal diverticulum was found in all the specimens, and "büschelförmige Analdrüsen" as described by Augener, were found attached to the mesenteries on the side of the anal opening.

The segmental organs are moderately long, extending posteriorly to the roots of the retractors or slightly beyond. They are only attached along the anterior one-fourth to one-third of their length. Their openings lie between the 4th and 5th longitudinal muscle bundles, about 10 mm. in front of the anal opening.

Distribution.—*S. nudus* is, as noted above, a cosmopolitan species. It has been recorded from the Atlantic Ocean, the North Sea, the Mediterranean, the Red Sea, the Indian and the Pacific Oceans. A detailed list of its distribution is given in Hérubel's paper (1907), while the localities from which it has been recorded since this date are listed by Fischer, Sato and others. It is recorded here from the Andaman and Nicobar waters in the Bay of Bengal for the first time.

***Sipunculus robustus* Keferstein.**

(Plate IX, fig. 2.)

- 1865. *Sipunculus robustus*, Keferstein, *Nachricht. Königl. Gesell. Wiss. Göttingen*, No. 7, p. 196.
- 1865. *Sipunculus robustus*, Keferstein, *Zeitschr. Wiss. Zool.* XV, p. 421.
- 1868. *Sipunculus robustus*, Baird, *Proc. Zool. Soc. London*, p. 80.
- 1883. *Sipunculus robustus*, Selenka, de Man and Bülow, *Semper's Reisen im Archipel Philippinen*, II Tl., IV (i), pp. 97-99, pl. xii, fig. 170.
- 1886. *Sipunculus robustus*, Sluiter, *Naturkund. Tijds. Neerland. Ind.* XLV, p. 482, pl. ii, figs. 8, 9.
- 1887. *Sipunculus robustus*, Selenka, *Journ. Linn. Soc. London, Zool.* XXI, p. 221.
- 1890. *Sipunculus robustus*, Sluiter, *Naturkund. Tijds. Neerland. Ind.* L, p. 122.
- 1895. *Sipunculus robustus*, Fischer, *Abhandl. Gch. Naturwiss. Hamburg*, XIII, p. 7.
- 1896. *Sipunculus robustus*, Fischer, *Denkschr. Med.-Nat. Ges. Jena*, VIII, p. 337.

1902. *Sipunculus robustus*, Sluiter, "Siboga" Exped. XXV, p. 4.
 1903. *Sipunculus robustus*, Augener, *Archiv Naturgesch.* Jahrg. 69, Bd. I, pp. 313-315, 345.
 1905. *Sipunculus robustus*, Lanchester, *Proc. Zool. Soc. London*, p. 27.
 1907. *Sipunculus robustus*, Hérubel, *Mém. Soc. Zool. France*, II, p. 225.
 1922. *Sipunculus robustus*, Fischer, *Arkiv Zool.* XIV, No. 19, p. 7.
 1925. *Sipunculus robustus*, Broeke, *Bijdrag. Dierkund.* XXIV, p. 2.
 1935. *Sipunculus robustus*, Sato, *Sci. Rept. Tohoku Imp. Univ.* X, p. 301, pl. ii, fig. 1, text-fig. 1.

This widely distributed species is represented in the collection before me from the following localities¹ :—

- | | |
|--|--|
| 1. Mergui Archipelago ; Dr. J. Anderson Coll. | 1 specimen ($\frac{8797}{6}$). |
| 2. Paye or Paway Island, Mergui Archipelago ;
Marine Survey Coll. (St. 593) ; March, 1914 | 1 specimen ($\text{ZEV} \frac{7501}{7}$). |
| 3. Nicobars, north side of Nancowry Harbour
amongst submerged coral reef ; Marine
Survey Coll. (St. 700) ; 11.i.1926 | 1 specimen ($\text{ZEV} \frac{7500}{7}$). |
| 4. Andamans | 1 specimen ($\frac{8779}{6}$). |
| 5. Madras ; R. G. Aiyar ² Coll. ; 5.vii.1935 | 4 specimens ($\text{ZEV} \frac{7499}{7}$). |

The fresh specimens from the Madras coast preserved in formalin are of a purplish pink colour. The largest specimen, a photograph of which is reproduced on plate IX, is 128 mm. long excluding the introvert, and 12 mm. in maximum thickness. The partially everted introvert is 12 mm. long.

The number of longitudinal muscular bundles in the specimens examined varies from 24-31. The circular muscles are also well developed, and the surface of the comparatively thin body-wall appears cut up into well impressed quadratic areas. Selenka and his colleagues remarked that in all the specimens of the species there are two muscle bundles in front of and one posterior to the anal opening. Augener (*op. cit.*, p. 314) while confirming this statement remarked that this condition is also to be found in *S. nudus*. In all the Indian specimens of *S. robustus* examined by me I have always found 2 bundles in front of and 1 behind the anus, but none of the specimens of *S. nudus* examined by me showed this condition. Broeke also mentions this peculiarity in the specimens of *S. robustus* from the West Indies, but not in the case of *S. nudus* from the same area. The spindle-muscle, which arises somewhat in front of the anal opening, is not attached to the body-wall posteriorly.

The retractor muscles show a great deal of variation in regard to their origin. The ventral retractors were found to originate from the muscle bands 1-6, 2-5 or 2-6 in different specimens, while the dorsal retractors were connected with the muscles 7-11, 7-12 or 9-12. Such variation has also been observed by other authors.

¹ In addition to the specimens listed here there is a specimen from Hongkong in the collection of the Indian Museum which belongs to this species.

² Prof. R. G. Aiyar wrote as follows regarding these specimens : " They turned up in large numbers in the Madras coastal waters about the middle of June and also at the end of July, 1935. They were caught in the townet as well as in the fishing nets of fishermen."

Two Polian canals were observed on the sides of the oesophagus. A rectal diverticulum and "büschelförmige Analdrüsen" were found in all specimens.

Distribution.—The species appears to be widely distributed in the Indo-Pacific and has also been recorded from the West Indies. Sluiter's remark (1902, p. 4) that the species "scheint aber nur an bestimmten Localitäten in grösseren Menge vorkommen" is confirmed by the large number of specimens which were found by Prof. R. G. Aiyar in the Madras coastal waters.

***Sipunculus porrectus* Selenka.**

1887. *Sipunculus porrectus*, Selenka, *Journ. Linn. Soc. London, Zool.* XXI, pp. 221, 222.

1907. *Sipunculus porrectus*, Hérubel, *Mém. Soc. Zool. France*, XX, p. 225.

Selenka based the description of this new species on two specimens collected in the Mergui Archipelago by the late Dr. J. Anderson during 1881-82. Only one of the specimens, the type of the species, is now available in the collections of the Indian Museum, Calcutta. It is the larger of the two specimens identified by Selenka, and is 32 cm. in length. The specimen was sent to the late Dr. J. W. Spengel of Giessen in connection with his revision of the Sipunculoidea, and bears a label "*Sipunculus edulis* Pallas—J. W. Spengel det. 1913."

The internal organs of this specimen are, as was also noted by Selenka, somewhat macerated, but I cannot agree with Spengel's view that it is a specimen of *S. edulis* Pallas.

The brief description of the external characters of *S. edulis* by Pallas¹ is quite insufficient for the identification of the worm. Later authors like Lamarck, Blainville and Cuvier did not add materially to this earlier account and the first detailed description of the species was published by Sluiter.² This description was included by Selenka, de Man and Bülow in their monograph. Spengel³ in his preliminary paper regarded Sluiter's *S. edulis* as distinct from Pallas' species of this name, and included it in his new genus *Siphonosoma*. As unfortunately Spengel's detailed work was never published, it is impossible to surmise his reasons either for considering the two as distinct species or for including *S. porrectus* Selenka in the synonymy of *S. edulis* (Pallas).

As noted above, the only available specimen of *S. porrectus* is in a poor state of preservation and it is not possible, therefore, to add to the earlier description of the species by Selenka. I have, however, examined this specimen carefully and am able to confirm Selenka's description. A comparison of the descriptions of *S. edulis* by Sluiter and of *S. porrectus* by Selenka leaves no doubt whatsoever that the two worms are distinct, and in the absence of any other information about Pallas' *S. edulis* it appears best to accept the species as defined by Sluiter.

¹ Pallas, P. S.—*Spicilegium Zoologicum*, I, Fasc. 10, pp. 10-12 (1774).

² Sluiter, C. Ph.—*Naturkund. Tijds. Neerland. Ind.* XLI, pp. 148-150, pl. i, fig. 1, pl. ii, figs. 1-3, pl. iii, fig. 1 (1881), and *ibid.* XLV, pp. 484, 485 (1886).

³ Spengel, J. W.—*Verhandl. Deutsch. Zool. Gesell.* XXII, p. 263 (1912).

Sipunculus aequabilis Sluiter.

(Plate IX, fig. 3.)

1902. *Sipunculus aequabilis*, Sluiter, "Siboga" Exped. XXV, p. 7.1907. *Sipunculus aequabilis*, Hérubel, Mém. Soc. Zool. France, XX, p. 222.

This deep-sea species is represented in the collection before me from the following localities :—

1. Laccadive Sea, Lat. 12° 47' N., Long. 73° 44' 45" E.; 870-827 fathoms; Marine Survey of India Coll. 2 specimens ($ZEV\frac{5550.1}{7}$).
2. Laccadive Sea, Lat. 13° 47' 49" N., Long. 73° 7' E.; 637 fathoms; Marine Survey Coll. (St. 177); 5.v.1894 4 specimens ($ZEV\frac{5553}{7}$ & $\frac{5564.65}{7}$).
3. Bay of Bengal, Lat. 18° 18' N., Long. 93° 25' E.; 843 fathoms; Marine Survey Coll. (St. 325); 22.xii.1903 3 specimens ($ZEV\frac{2089}{7}$).
4. Bay of Bengal 2 specimens ($ZEV\frac{7505}{7}$).

All the specimens recorded above are more or less similar in form and are of a dirty whitish colour, with a somewhat translucent skin-covering. All of them, owing to direct preservation in alcohol, are greatly contracted. The largest specimen is about 80 mm. long and in all of them 21 fairly well marked longitudinal areas corresponding to the longitudinal muscle bundles can be distinguished; the outlines of the muscle bundles become less sharply marked in the anterior region, and, as noted by Sluiter, cannot be distinguished from the introvert. The circular muscle bands are not well impressed, and the surface of the body-wall is not distinctly cut up into quadratic areas, such as are present in *S. nudus*, *S. robustus* and most other species. In the posterior region of the body a transverse ring-shaped thickening of the body-wall, as described by Sluiter in the types of the species and as is present in the case of the deep-sea form *S. norvegicus* Dan. and Kor., marks off a conical region from the rest of the body. The introvert is retracted in most specimens, but on dissection it was possible to count ten tentacular processes or "Fühlerlappen"; two of these on the dorsal side are larger than the others.

The internal structure agrees with the description given by Sluiter. The ventral retractors were found to originate from the 3rd, and the dorsal from the 8th and 9th longitudinal muscles. All the retractors originate at the same level. The two segmental organs are about 15 mm. long; they are free in the greater part of their length and do not extend quite up to the origin of the retractor muscles. The segmental organs open between the 4th and 5th longitudinal muscle bands about 10-11 mm. in front of the anus. No genital glands could be distinguished.

Distribution.—Sluiter's specimens of the species were collected by the "Siboga" Expedition from depths of 330-959 meters. The specimens recorded above are from the Laccadive Sea in the Arabian Sea and from the Bay of Bengal from a maximum depth of 870 fathoms.

Remarks.—The development of a ring-shaped thickening of the body-wall near the posterior end in the case of some of the deep-sea species of the genus *Sipunculus* is of interest. It is possible that this structure helps in anchoring the species in a vertical position, and is an adaptation to life on a muddy bottom. I¹ described a similar structure in the case of *Thalassema arkati* Prashad which was found at Sandheads, off the mouth of the River Hooghly.

Siphonosoma Spengel.

1912. *Siphonosoma*, Spengel, *Verhandl. Deutsch. Zool. Gesell.* XXII, p. 264.
 1913. *Siphonosoma*, Spengel, *ibid.* XXIII, pp. 71-77.
 1914. *Siphonosoma*, Fischer, *Beiträge Kennt. Meeresfauna Westafrikas*, I, pp. 59-61.
 1931. *Siphonosoma*, Baltzer, *Sipunculida in Kükenthal Handbuch Zool.* II (ii), p. 58 (9).

Spengel did not publish a detailed description of the genus *Siphonosoma*, but Fischer gave a generic diagnosis based on Spengel's observations. A short description with a key for its differentiation from *Sipunculus* Linn. is also included in Baltzer's work.

The main differences of *Siphonosoma* from *Sipunculus* Linn. consist in its longer tentacles arranged in groups round the mouth opening, the introvert bearing distinct hooks, the dorsal and ventral retractor muscles arising at different levels, and the presence of transverse canals in the skin.

Neither Spengel nor Fischer designated any genotype for the genus *Siphonosoma*, but *S. australe* (Keferstein), the first species in Spengel's list, may be taken as its type.

Siphonosoma australe (Keferstein).

(Plate IX, figs. 4-6.)

1865. *Phascolosoma australe*, Keferstein, *Nachricht. Königl. Gesell. Wiss. Göttingen*, No. 7, p. 197.
 1865. *Phascolosoma australe*, Keferstein, *Zeitschr. Wiss. Zool.* XV, p. 422, pl. xxxii, figs. 12, 13.
 1865. *Sipunculus (Phascolosomum) australis*, Quartrefages, *Hist. Nat. Annel. Marin. et d'eau douce*, II, p. 619.
 1883. *Sipunculus australis*, Selenka, de Man and Eulow, *Senyer's Reisen im Archipel Philippinen*, II, Tl. IV (i), pp. 90, 91, pl. xiii, figs. 180-182.
 1895. *Sipunculus australis*, Fischer, *Abhandl. Geb. Naturwiss. Hamburg*, XIII, p. 8.
 1899. *Sipunculus australis*, Shipley in *Wiley's Zool. Results*, II, p. 156, pl. XVIII, figs. 4, 5.
 1902. *Sipunculus australis*, Sluiter, "*Siboga*" *Expéd.* XXV, p. 5.
 1903. *Sipunculus australis*, Augener, *Archiv Naturgesch.* Jahrg. 69, Bd. I, p. 346.
 1905. *Sipunculus australis*, Ikeda, *Annot. Zool. Japon.* V, p. 169.
 1905. *Sipunculus australis*, Lanchester, *Proc. Zool. Soc. London*, I, p. 30.
 1907. *Sipunculus australis*, Hérubel, *Mém. Soc. Zool. France*, XX, p. 222.
 1912. *Siphonosoma australis*, Spengel, *Verhandl. Deutsch. Zool. Gesell.* XXII, p. 263.
 1922. *Siphonosoma australe*, Fischer, *Arkiv Zool.* XIV, No. 19, pp. 2-4.

The specimen (ZEV $\frac{7507}{7}$) on which the present record is based was collected at Krusadai Island in the Gulf of Manaar by Dr. F. H. Gravely, Superintendent of the Madras Museum. I identified the specimen as

¹ Prashad, B.—*Rec. Ind. Mus.* XXXVII, pp. 41, 42, pl. i, figs. 1, 4 (1935).

Sipunculus australis, and it was recorded under this name by Gravelly.¹ He reported that only one or two specimens of it were found "in mud exposed at low water on the west side of the Porites Bay"

The specimen is of a dirty yellowish brown colour, about 230 mm. long, and with a maximum thickness of 9-10 mm.; the introvert, which is almost fully everted, is about 35-36 mm. in length.

In this specimen I counted 18-19 longitudinal muscle bundles near the anal opening and 19 bundles near the region of attachment of the ventral retractor muscles. According to Selenka and his collaborators (*op. cit.*, p. 91) there are 15-20 bundles, while Fischer (*op. cit.*, p. 4) found 19 just above the "Wurzeln der ventralen Retraktoren", 17-18 close to the anus and 14 near the end of the body. Keferstein recorded about 15 bundles only. The differences in the numbers of the bundles is due to frequent anastomoses between the adjacent bundles.

The retractor muscles originate at very different levels. The dorsal retractors originate about 9-10 mm. behind the anal opening, while the origin of the ventral retractors is about 30 mm. posteriorly.

The spindle-muscle originates about 7 mm. in front of the anal opening; in Fischer's specimen this was found to be 20 mm. in front of the anus, while Keferstein stated its origin to be behind the anus. This muscle with two other muscular connectives of the intestine, which originate near the region of attachment of the dorsal retractors, are, as had been described by Fischer, connected with the intestinal windings just near the intestinal diverticulum.

The two segmental organs are very long, about 55 mm., and of a deep purplish brown colour. Their openings are situated about 6 mm. in front of the anus. They hang free posteriorly about the greater part of their length.

The introvert (Plate IX, fig. 5) bears 56-60 rows of hooks. Shipley (*op. cit.*, p. 156) was of the opinion that it was incorrect to describe these structures as hooks, and he figured what he described as "a roll of paper so folded as to form a half cylinder rather rounded at both ends" from his specimens from Lifu. Fischer confirming the views of Selenka and Augener described them as "schwach gekrümmten Rüsselhaken", resembling those of *Phascolosoma*, and figured an elongated, slightly curved, spine-like structure. I figure four of these hooks from two different rows (Plate IX, fig. 6). Two of these almost resemble Fischer's figure, but the other two which are not so long, have a much broader base, and a much more curved hook-like appearance.

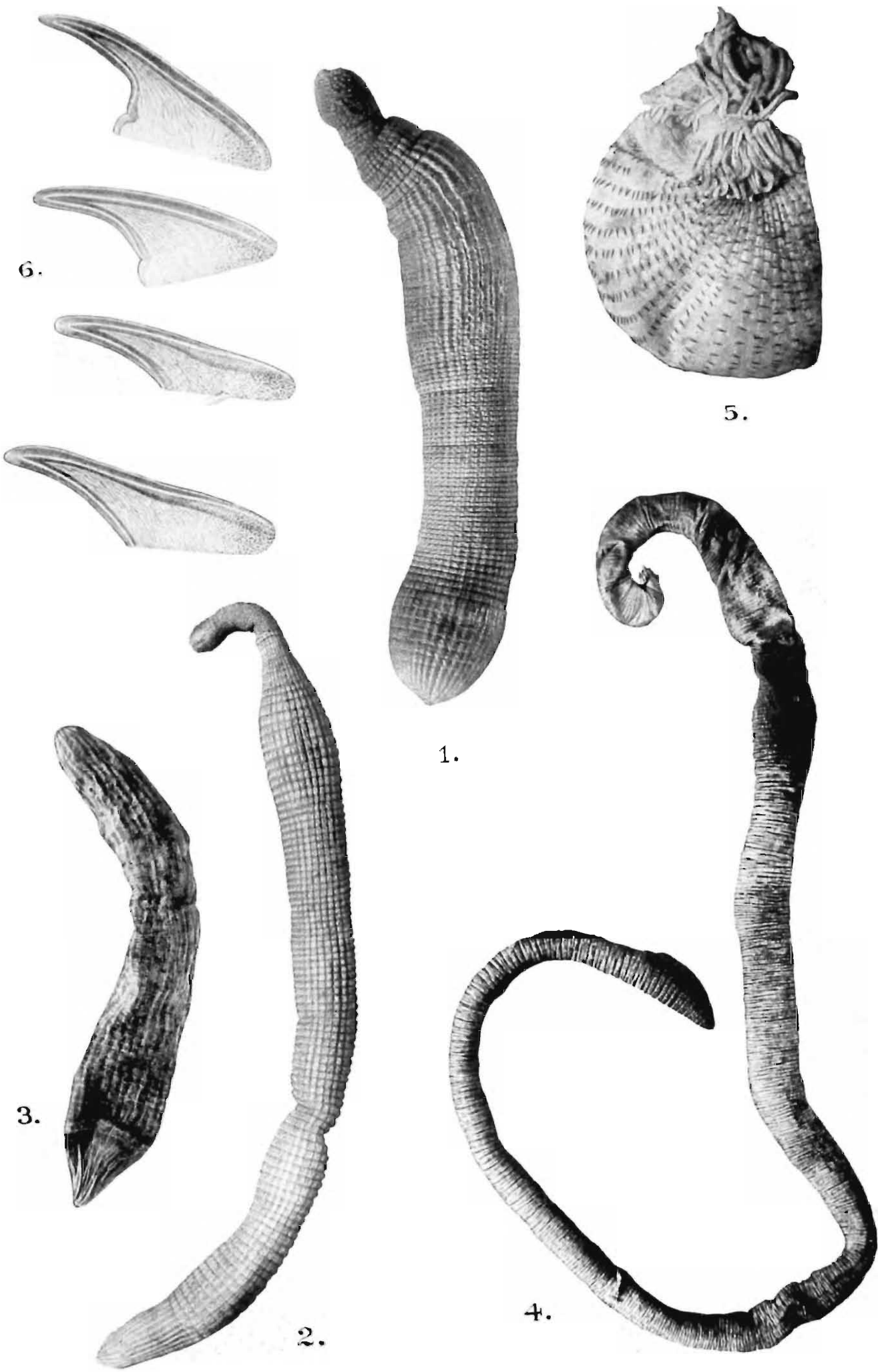
Distribution.—The species was originally described from Sydney, Australia. It has since been recorded from the Philippines; Fiji Islands; Lifu, Loyalty Islands; Amboina; and Zanzibar. The present record from the Gulf of Manaar confirms the wide distribution of the species in the Indo-Pacific Region.

¹ *Bull. Madras Govt. Museum* (N. S.), *Nat. Hist. Sec. I* (i), p. 87 (1927).

EXPLANATION OF PLATE IX.

- FIG. 1.—*Sipunculus edulis* Linn. Photograph of a specimen from Port Blair, Andamans.
- FIG. 2.—*Sipunculus robustus* Keferstein. Photograph of a specimen from Madras.
- FIG. 3.—*Sipunculus aequabilis* Sluiter. Photograph of a specimen from the Laccadive Sea.
- FIG. 4.—*Siphonosoma australe* (Keferstein). Photograph of a specimen from Krusadai Island, Gulf of Manaar.
- FIG. 5.—*Siphonosoma australe* (Keferstein). Photograph of a part of the introvert enlarged six times to show the arrangement of the hooks.
- FIG. 6.—*Siphonosoma australe* (Keferstein). Four hooks from two rows. $\times 125$.

(Figs. 1-4 are of natural size.)



R. Bagchi, Photo.

Indian Sipunculoidea.

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Vol. XXXVIII, Part II

JUNE, 1936

	Page
Ueber einige Isopoda aus Süd-Indien. <i>K. W. Verhoeff</i>	97
Ueber einige Indische Chilognathen gesammelt von Herrn S. Jones, Madras. <i>K. W. Verhoeff</i>	103
Chalcids (<i>Parasitic Hymenoptera</i>) from India. <i>M. S. Mani</i>	125
A New Encyrtid Parasite (<i>Chalcidoidea : Hymenoptera</i>) of a Cockroach from India. <i>M. S. Mani</i>	131
Fish of the Eastern Doons, United Provinces. <i>Sunder Lal Hora & Dev Dev Mukerji</i>	133
Isopods collected by the R. I. M. S. "Investigator". <i>K. H. Barnard</i>	147
Studies on Indian Itonididae (<i>Cecidomyiidae : Diptera</i>). III. On a Collection of Midges from South India. <i>M. S. Mani</i>	193
Siluroid Fishes of India, Burma and Ceylon. <i>Sunder Lal Hora</i>	199
II. Fishes of the genus <i>Akysis</i> Bleeker.	
III. Fishes of the genus <i>Olyra</i> McClelland.	
IV. On the use of the generic name <i>Wallago</i> Bleeker.	
V. Fishes of the genus <i>Heteropneustes</i> Müller.	
Scientific Results of the Yale North India Expedition. <i>Biological Report No. 20. Helminth Parasites of Fishes from North India, with special reference to Acanthocephalans. M. N. Datta</i>	211
On the Sipunculoidea from Indian Waters in the Indian Museum, Calcutta. <i>B. Prashad</i>	231

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