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# NOTES SUR DES CYCLOPIDES D'EAU DOUCE DE L'INDE, AVEC DESCRIPTIONS D'UNE ESPÈCE NOUVELLE ET DE DEUX VARIÉTÉS NOUVELLES.

K. LINDBERG.

(Planch VIII.)

En abordant des études épidémiologiques sur la draconculose dans le Deccan l'absence jusqu'à présent presque complète d'information sur la systématique des cyclopidés indiens m'a obligé de faire une étude succincte des espèces rencontrées au cours de mes pêches dans la région du chemin de fer de Barsi.

Dans le travail de Kiefer, paru en 1928 dans les "Records of the Indian Museum", des notes ont été réunies sur 18 espèces indiennes, mais parmi elles, il n'y en a guère que 4 qui soient décrites d'une façon suffisante, les autres étant des espèces douteuses ou représentant des identifications de groupes.

Dans la région où j'ai étudié la draconculose, 3 espèces et 2 variétés ont été rencontrées jusqu'à ce jour, et le présent travail traite de 4 d'entre elles, la cinquième, un membre du groupe *Serrulatus*, devant faire l'objet d'une note ultérieure.

## ***Eucyclops multicolor*, sp. nov.**

*Description.* Très petite espèce. Un peu moins que 3 fois aussi longue que large, la largeur maxima se trouvant près du milieu du céphalothorax. Division antérieure du corps de forme ovale. Cinquième segment thoracique aux ailes latérales accentuées et arrondies, portant des poils latéraux bien développés, dont la longueur atteint 16 $\mu$ . Queue (abdomen + furca) courte, formant un peu plus du tiers de la longueur totale du corps. Premier segment abdominal élargi à sa partie proximale ; il se rétrécit distalement d'une façon assez brusque. Dernier segment abdominal garni sur la face ventrale d'une rangée distale de très fines épines. Furca courte, à branches légèrement divergentes, un peu plus de 3 fois aussi longues que larges. La longueur de la furca dépasse le quatrième segment abdominal, mais n'égale pas la longueur combinée des troisième et quatrième segments abdominaux. Il n'y a pas de "serra" sur le bord externe des branches de la furca et le bord interne est glabre.

Soies apicales externe et interne très courtes, bien moins longues que les branches de la furca. Elles sont de longueur à peu près égale, mais la soie apicale interne est beaucoup plus grêle que la soie apicale externe qui a le caractère d'une épine. Soie médiane externe environ 4 fois aussi longue que la soie externe et interne ; soie médiane interne 5 ou plus de 5 fois aussi longue que les soies externe et interne. Soie latérale externe insérée un peu au-dessous de la moitié de la longueur de la furca.

Première antenne à 12 articles, atteignant, lorsqu'elle est rabattue, le cinquième segment du thorax, et le dépassant même souvent, 1 atteignant alors le premier segment abdominal. Les 3 derniers articles sont munis d'une membrane hyaline étroite mais bien distincte et entière. Le huitième est l'article le plus long et le troisième et le sixième sont les articles les plus courts.

Pattes natatoires à branches triarticulées garnies d'épines. Le nombre des épines et des soies de l'article terminal des exopodites est le suivant :

Première paire 3 épines 5 soies.  
Deuxième paire 4 épines 5 soies.  
Troisième paire 4 épines 5 soies.  
Quatrième paire 3 épines 5 soies.

Article terminal de l'endopodite des pattes de la quatrième paire portant 2 épines apicales dont l'interne est plus de 2 fois aussi longue que l'épine apicale externe, et environ 2 fois aussi longue que l'article lui-même. Celui-ci est environ 3 fois aussi long que sa largeur maxima à la base.

Cinquième patte à un segment aplati, portant une forte épine barbelée interne, et 2 soies grêles : une soie médiane et une soie externe ciliée. La pièce portant les appendices de la cinquième patte est garnie sur le bord interne de 4 ou 5 fins et courts poils.

Ovisacs étroitement appliqués contre l'abdomen. Oeufs gros, arrondis au nombre de 6 à 12 par ovisac.

Réceptacle séminal le plus souvent obscurci par des taches de couleur encre, qui sont particulièrement foncées au niveau du segment génital. Il ressemble un peu à un H renversé, étant composé de deux parties bien distinctes reliées par une courte tige médiane ; les deux canaux ou sacs proximaux sont légèrement courbés et moins gros que ceux de la partie distale.

Couleur bigarrée, du vert noirâtre au bleu encre. Les bords ventraux du thorax et de l'abdomen et le rebord postérieur du premier segment céphalothoracique sont surtout très fortement colorés en noir, vert ou bleu encre. Les bords dorsaux du thorax et de l'abdomen sont moins colorés. Milieu du thorax plus clair, gris-jaunâtre. Abdomen verdâtre ; le segment génital tacheté fortement et d'une façon diffuse de bleu ou vert noirâtre. Les deux paires d'antennes sont jaune-saumon ; la furca jaunâtre ; l'oeil est rouge ; les oeufs brunâtre.

*Mâle*, porte 3 appendices génitaux, dont le médian est le plus long et peut atteindre ou dépasser légèrement la longueur du deuxième segment abdominal.

#### *Mensurations.*

*Femelle* : Longueur de 480 $\mu$  à 700 $\mu$ . Largeur de 170 $\mu$  à 250 $\mu$ .  
Femelle adulte de taille moyenne :

|                                       |   |           |                   |
|---------------------------------------|---|-----------|-------------------|
| Longueur totale (sans soies apicales) | . | 580 $\mu$ | Largeur 228 $\mu$ |
| Premier segment céphalothoracique     | . | 234 $\mu$ |                   |
| Segments thoraciques II à V           | . | 144 $\mu$ |                   |
| Abdomen + furca                       | . | 220 $\mu$ |                   |

*Segments abdominaux* (deux autres femelles adultes) :

|                   | Longueur. |    |    | Largeur.                                     |
|-------------------|-----------|----|----|----------------------------------------------|
| Premier segment   | 72 $\mu$  | .. | .. | 66 $\mu$ (Proximale).<br>54 $\mu$ (Distale). |
| Deuxième segment  | 45 $\mu$  | .. | .. | 52 $\mu$                                     |
| Troisième segment | 40 $\mu$  | .. | .. | 45 $\mu$                                     |
| Quatrième segment | 36 $\mu$  | .. | .. | 38 $\mu$                                     |
| Premier segment   | 81 $\mu$  | .. | .. | 81 $\mu$ (Proximale).<br>66 $\mu$ (Distale). |
| Deuxième segment  | 45 $\mu$  | .. | .. | 59 $\mu$                                     |
| Troisième segment | 39 $\mu$  | .. | .. | 54 $\mu$                                     |
| Quatrième segment | 39 $\mu$  | .. | .. | 46 $\mu$                                     |

*Furca* :

|                              |            |           |           |           |
|------------------------------|------------|-----------|-----------|-----------|
| Longueur                     | 45 $\mu$   | 52 $\mu$  | 60 $\mu$  |           |
| Largeur                      | 14.5 $\mu$ | 16 $\mu$  | 18 $\mu$  |           |
| Soie apicale externe         | 30 $\mu$   | 30 $\mu$  | 30 $\mu$  | 27 $\mu$  |
| Soie apicale médiane externe | 140 $\mu$  | 130 $\mu$ | 115 $\mu$ | 126 $\mu$ |
| Soie apicale médiane interne | 180 $\mu$  | 164 $\mu$ | 160 $\mu$ | 162 $\mu$ |
| Soie apicale interne         | 32 $\mu$   | 30 $\mu$  | 34 $\mu$  | 27 $\mu$  |

*Première antenne* : Longueur des articles de 2 petites femelles adultes :

|      |          |          |
|------|----------|----------|
| I    | 43 $\mu$ | 45 $\mu$ |
| II   | 18 $\mu$ | 16 $\mu$ |
| III  | 7 $\mu$  | 7 $\mu$  |
| IV   | 27 $\mu$ | 22 $\mu$ |
| V    | 16 $\mu$ | 14 $\mu$ |
| VI   | 9 $\mu$  | 11 $\mu$ |
| VII  | 27 $\mu$ | 30 $\mu$ |
| VIII | 50 $\mu$ | 50 $\mu$ |
| IX   | 42 $\mu$ | 38 $\mu$ |
| X    | 39 $\mu$ | 32 $\mu$ |
| XI   | 34 $\mu$ | 34 $\mu$ |
| XII  | 34 $\mu$ | 34 $\mu$ |

*Article terminal de l'endopodite de la quatrième paire des pattes natatoires* :

|                                  |          |          |          |          |
|----------------------------------|----------|----------|----------|----------|
| Longueur de l'article            | 32 $\mu$ | 30 $\mu$ | 30 $\mu$ | 27 $\mu$ |
| Largeur de l'article (à la base) | 11 $\mu$ | 10 $\mu$ | 10 $\mu$ | 12 $\mu$ |
| Epine apicale interne            | 68 $\mu$ | 63 $\mu$ | 61 $\mu$ | 60 $\mu$ |
| Epine apicale externe            | 28 $\mu$ | 27 $\mu$ | 25 $\mu$ | 22 $\mu$ |

*Cinquième patte natatoire* :

|                             |          |          |          |
|-----------------------------|----------|----------|----------|
| Epine interne               | 20 $\mu$ | 27 $\mu$ | 21 $\mu$ |
| Soie médiane                | 43 $\mu$ | 54 $\mu$ | 52 $\mu$ |
| Soie externe                | 30 $\mu$ | 45 $\mu$ | 45 $\mu$ |
| Longueur de l'article basal | 14 $\mu$ | 16 $\mu$ |          |
| Largeur de l'article basal  | 11 $\mu$ | 9 $\mu$  |          |

*Mâle* : Longueur 420 $\mu$  à 570 $\mu$ . Largeur 140 $\mu$  à 170 $\mu$ .

*Appendices génitaux* :

|         |    |          |          |          |
|---------|----|----------|----------|----------|
| Externe | .. | 20 $\mu$ | 12 $\mu$ | 13 $\mu$ |
| Médian  |    | 29 $\mu$ | 29 $\mu$ | 31 $\mu$ |
| Interne |    | 11 $\mu$ | 12 $\mu$ | 13 $\mu$ |

*Habitats.* Très divers. Cette espèce a été trouvée dans des puits à eau assez claire et à température relativement basse à Kurduvadi et à Pandharpour ; dans des mares d'un *nala* (rivière desséchée pendant une partie de l'année) à Kurduvadi, à eau à température élevée ; dans des étangs formés près du bord de la rivière de la Bhima à Pandharpur, ainsi que dans la rivière même ; dans le réservoir municipal à Pandharpour et dans de petits étangs près de ce réservoir.

Des femelles portant des ovisacs ont été présentes pendant les mois de mars, avril, mai et juin, qui étaient cependant les seuls mois de l'année pendant lesquels ce cyclope ait été recherché. Il n'a été trouvé qu'à la surface même de l'eau, menant une existence strictement euplanctique. Il se déplace par des espèces de sauts courts mais très soudains.

Je n'ai pas trouvé de spécimens infestés naturellement par les embryons du *Dracunculus medinensis*. L'infestation expérimentale m'a réussi, mais le cyclope infesté a succombé en peu de jours et je n'ai pas observé de développement de l'embryon.

*Remarques.* Le *E. multicolor* se distingue du *E. indicus* (Kiefer), par la longueur des premières antennes et par la formule des épines de l'article terminal des exopodites I à IV qui chez *E. indicus* est de 2. 3. 3. 3 ; et par la longueur respective de l'épine apicale interne du segment terminal de l'endopodite de la quatrième paire et de l'article.

Le *E. multicolor* se différencie nettement du *E. prasinus* par la longueur des premières antennes et aussi par la formule des épines, qui chez *E. prasinus* est de 3. 4. 3. 3. tandis qu'elle est de 3. 4. 4. 3. chez *E. multicolor*. Cette formule est cependant celle du groupe *Serrulatus* (*Eucyclops* s. str.) et non pas celle du groupe *Tropocyclops*, et la configuration de la cinquième patte se rapproche aussi plus de celle présente chez les membres du groupe *Serrulatus*, l'épine interne étant forte et courte et n'a pas le caractère d'une longue soie grêle, comme chez *E. prasinus*. Les épines apicales de l'endopodite de la quatrième paire sont du reste aussi moins élancées que chez *E. prasinus*. Sa taille est plus petite que celle de *E. prasinus*, ne dépassant guère 700 $\mu$  de longueur.

Comme on le voit l'espèce en question est très distincte de *E. prasinus* et se rapproche par plusieurs caractères du groupe *Serrulatus* ; cependant, je crois qu'elle doit être rangée dans le sous-genre *Tropocyclops* de Kiefer (c'est-à-dire dans le groupe *Prasinus*) par suite de la configuration du réceptacle séminal et de sa couleur caractéristique. D'autre part, il serait peut-être préférable de créer un sous-genre nouveau pour *E. multicolor*, par suite de la formule des épines qui diffère de celle du sous-genre *Tropocyclops*.

#### **Mesocyclops leuckarti deccanensis, subsp. nov.**

*Description.* Grande espèce ; de forme assez élancée ; 3 fois ou moins de 3 fois aussi longue que large. Largeur maxima à la partie postérieure du premier segment céphalothoracique. Longueur de ce segment dépassant considérablement celle des segments thoraciques suivants. Rangée de 6 à 8 poils sur le bord latéral du cinquième segment thoracique. Celui-ci est petit, sans ailes latérales accentuées,

Queue, formant un peu moins que le tiers de la longueur totale. Premier segment abdominal pouvant atteindre et même dépasser la longueur des segments abdominaux suivants. Bord postérieur du dernier segment abdominal garni d'une rangée de petites dents, dont la longueur peut dépasser  $7\mu$ .

Furca à branches très légèrement divergentes, de 3 fois, à un peu plus de 3 fois et demi, aussi longues que larges. Soie apicale interne de longueur considérable, 2 fois et demi, ou plus de 2 fois et demi, aussi longue que la soie apicale externe. La soie apicale médiane interne est la plus longue de toutes, environ 2 fois aussi longue que la soie apicale interne. Ces soies sont pennées d'une façon homonyme. Soie latérale externe insérée à peu près à l'union des deux tiers proximaux avec le tiers distal.

Première antenne à 17 articles, atteignant, lorsqu'elle est rabattue, le bord postérieur du troisième segment thoracique ou le quatrième segment thoracique. Aux 2 derniers articles il y a une membrane hyaline qui présente sur l'article terminal à sa partie distale une grande échancrure semi-circulaire et une fine indentation du restant du bord libre.

Pattes natatoires à branches triarticulées. Le nombre des épines et des soies de l'article terminal de l'exopodite est le suivant :

Première paire 2 épines 4 soies.

Deuxième paire 3 épines 4 soies.

Troisième paire 3 épines 4 soies.

Quatrième paire 3 épines 4 soies.

Article terminal de l'endopodite de la quatrième paire des pattes natatoires portant une épine apicale interne assez grêle déviée du côté interne, de la même longueur ou légèrement plus courte que l'épine apicale externe, qui est plus forte et se trouve en ligne droite avec l'article. Article terminal plus long que les épines et en général un peu plus de 3 fois aussi long que large ; il peut aussi être moins que 3 fois aussi long que large.

Bord libre de la lamelle basale, reliant la quatrième paire des pattes, droit, et portant de chaque côté une forte épine.

Cinquième patte à deux articles. Article basal, portant du côté externe une soie pennée qui est presque toujours l'appendice le plus court. Article terminal à deux appendices : une soie externe insérée apicalement, qui est toujours le plus long des appendices, et une épine insérée sur le côté interne à une certaine distance de l'extrémité de l'article terminal. Cette épine peut égaler en longueur ou ne dépasser que légèrement la longueur de la soie externe de l'article basal.

Ovisacs dirigés en dehors, formant un angle aigu avec l'abdomen. Nombre des oeufs de 16 à 40 dans chaque sac.

Réceptacle séminal ressemblant à celui du *M. leuckarti* typique. Le segment génital de la femelle est pourvu de chaque côté de 3 appendices, dont le plus externe a le caractère d'un long et fin poil et dépasse en général en longueur la longueur du segment qui le porte. Les deux autres appendices ont le caractère de dents minuscules.

Couleur grisâtre, gris-jaunâtre ou gris-brunâtre. Oeil noir ou brun-rougeâtre.

*Mâle.* De taille bien plus petite. La soie dorso-externe est l'appendice génital le plus long, dépassant la longueur du deuxième segment abdominal; l'épine médiane est la plus petite et l'épine ventro-interne la plus forte.

### Mensurations.

#### Femelle adulte :

Longueur de 1050 $\mu$  à 1490 $\mu$ .

Largeur de 360 $\mu$  à 510 $\mu$ .

#### Mensurations détaillées de deux femelles adultes :

|                                   |            |            |
|-----------------------------------|------------|------------|
| Longueur . . .                    | 1100 $\mu$ | 1490 $\mu$ |
| Largeur                           | 380 $\mu$  | 510 $\mu$  |
| Premier segment céphalothoracique | 420 $\mu$  | 520 $\mu$  |
| Segments thoraciques II à V       | 280 $\mu$  | 420 $\mu$  |
| Queue (abdomen + furca)           | 400 $\mu$  | 550 $\mu$  |

#### Mensurations de l'abdomen de 4 femelles adultes :

|                             | Longueur. |           |           |           | Largeur.             |                       |                        |                            |
|-----------------------------|-----------|-----------|-----------|-----------|----------------------|-----------------------|------------------------|----------------------------|
|                             | I.        | II.       | III.      | IV.       | I.                   | II.                   | III.                   | IV.                        |
| Premier segment abdominal   | 110 $\mu$ | 205 $\mu$ | 225 $\mu$ | 216 $\mu$ | 95 $\mu$<br>70 $\mu$ | 133 $\mu$<br>97 $\mu$ | 162 $\mu$<br>126 $\mu$ | 209 $\mu$ *<br>171 $\mu$ † |
| Deuxième segment abdominal  | 50 $\mu$  | 72 $\mu$  | 90 $\mu$  | 93 $\mu$  | 58 $\mu$             | 91 $\mu$              | 108 $\mu$              | 153 $\mu$                  |
| Troisième segment abdominal | 36 $\mu$  | 54 $\mu$  | 65 $\mu$  | 72 $\mu$  | 52 $\mu$             | 86 $\mu$              | 104 $\mu$              | 135 $\mu$                  |
| Quatrième segment abdominal | 31 $\mu$  | 43 $\mu$  | 60 $\mu$  | 65 $\mu$  | 49 $\mu$             | 79 $\mu$              | 92 $\mu$               | 104 $\mu$                  |

\* Proximale.

† Distale.

#### Furca :

|                              |           |           |           |           |
|------------------------------|-----------|-----------|-----------|-----------|
| Longueur . . .               | 72 $\mu$  | 90 $\mu$  | 100 $\mu$ | 117 $\mu$ |
| Largeur                      | 25 $\mu$  | 25 $\mu$  | 34 $\mu$  | 29 $\mu$  |
| Soie apicale externe         | 81 $\mu$  | 94 $\mu$  | 100 $\mu$ | 100 $\mu$ |
| Soie apicale médiane externe | 342 $\mu$ | 333 $\mu$ | 390 $\mu$ | 390 $\mu$ |
| Soie apicale médiane interne | 540 $\mu$ | 450 $\mu$ | 580 $\mu$ | 580 $\mu$ |
| Soie apicale interne         | 210 $\mu$ | 210 $\mu$ | 280 $\mu$ | 250 $\mu$ |
| Soie latérale externe        | ..        | 54 $\mu$  | 48 $\mu$  | 50 $\mu$  |
| Soie dorsale interne         | ..        | 90 $\mu$  | 100 $\mu$ | ..        |

#### Insertion de la soie latérale :

|                             |                                  |
|-----------------------------|----------------------------------|
| à 25 $\mu$ de l'extrémité   | longueur de la furca 72 $\mu$ .  |
| à 32 $\mu$ de l'extrémité . | longueur de la furca 90 $\mu$ .  |
| à 34 $\mu$ de l'extrémité   | longueur de la furca 100 $\mu$ . |
| à 39 $\mu$ de l'extrémité   | longueur de la furca 117 $\mu$ . |

*Première antenne :*

## Longueur des articles.

|      |          |           |           |           |
|------|----------|-----------|-----------|-----------|
| I    | 90 $\mu$ | 112 $\mu$ | 126 $\mu$ | 126 $\mu$ |
| II   | 23 $\mu$ | 16 $\mu$  | 29 $\mu$  | 27 $\mu$  |
| III  | 18 $\mu$ | 14 $\mu$  | 18 $\mu$  | 16 $\mu$  |
| IV   | 40 $\mu$ | 45 $\mu$  | 54 $\mu$  | 54 $\mu$  |
| V    | 32 $\mu$ | 27 $\mu$  | 36 $\mu$  | 36 $\mu$  |
| VI   | 16 $\mu$ | 18 $\mu$  | 18 $\mu$  | 18 $\mu$  |
| VII  | 52 $\mu$ | 47 $\mu$  | 61 $\mu$  | 68 $\mu$  |
| VIII | 22 $\mu$ | 20 $\mu$  | 25 $\mu$  | 27 $\mu$  |
| IX   | 23 $\mu$ | 29 $\mu$  | 29 $\mu$  | 34 $\mu$  |
| X    | 27 $\mu$ | 36 $\mu$  | 36 $\mu$  | 36 $\mu$  |
| XI   | 32 $\mu$ | 38 $\mu$  | 38 $\mu$  | 39 $\mu$  |
| XII  | 34 $\mu$ | 32 $\mu$  | 32 $\mu$  | 39 $\mu$  |
| XIII | 29 $\mu$ | 36 $\mu$  | 36 $\mu$  | 39 $\mu$  |
| XIV  | 34 $\mu$ | 32 $\mu$  | 32 $\mu$  | 39 $\mu$  |
| XV   | 56 $\mu$ | 63 $\mu$  | 63 $\mu$  | 64 $\mu$  |
| XVI  | 81 $\mu$ | 90 $\mu$  | 90 $\mu$  | 90 $\mu$  |
| XVII | 68 $\mu$ | 72 $\mu$  | 72 $\mu$  | 68 $\mu$  |

*Article terminal de l'endopodite de la quatrième paire des pattes natatoires :*

|                       |          |          |          |          |          |
|-----------------------|----------|----------|----------|----------|----------|
| Longueur de l'article | 99 $\mu$ | 94 $\mu$ | 84 $\mu$ | 77 $\mu$ | 74 $\mu$ |
| Largeur de l'article  | 29 $\mu$ | 34 $\mu$ | 27 $\mu$ | 21 $\mu$ | 27 $\mu$ |
| Epine apicale interne | 72 $\mu$ | 72 $\mu$ | 70 $\mu$ | 72 $\mu$ | 72 $\mu$ |
| Epine apicale externe | 75 $\mu$ | 74 $\mu$ | 72 $\mu$ | 72 $\mu$ | 72 $\mu$ |

*Cinquième patte :*

|                                   |           |          |           |           |           |
|-----------------------------------|-----------|----------|-----------|-----------|-----------|
| Soie de l'article basal           | 75 $\mu$  | 79 $\mu$ | 86 $\mu$  | 103 $\mu$ | 108 $\mu$ |
| Soie apicale externe              | 126 $\mu$ | 90 $\mu$ | 116 $\mu$ | 129 $\mu$ | 148 $\mu$ |
| Epine apicale interne             | 108 $\mu$ | 90 $\mu$ | 90 $\mu$  | 83 $\mu$  | 108 $\mu$ |
| Longueur de l'article terminal .. | ..        | ..       | ..        | 20 $\mu$  | 32 $\mu$  |

*Mâle :*

|                                        |           |           |
|----------------------------------------|-----------|-----------|
| Longueur                               | 700 $\mu$ | 720 $\mu$ |
| Largeur                                | 210 $\mu$ | 220 $\mu$ |
| Soie dorso-externe                     | 54 $\mu$  |           |
| Epine médiane                          | 16 $\mu$  |           |
| Epine ventro-interne                   | 20 $\mu$  |           |
| Longueur du deuxième segment abdominal | 40 $\mu$  |           |

*Habitat.* Cette espèce est la plus commune de toutes de la région du Deccan dans laquelle j'ai fait des pêches. On la trouve dans la plupart des puits, dans des réservoirs, ainsi que dans des trous d'eau, dans des citernes et des mares.

Avec le *M. rylovi* var. *vermifer* c'est l'hôte intermédiaire principal du *Dracunculus medinensis*, dans la région où mes recherches ont été faites.

J'ai rencontré des femelles à ovisacs pendant tous les mois de l'année.

*Remarques.* La configuration de la cinquième patte avec épine de l'article terminal insérée sur le bord interne à une certaine distance de l'extrémité de l'article, la présence d'une forte épine en forme de dent de chaque côté sur le bord libre de la lamelle basale reliant la quatrième

paire des pattes, et la configuration du réceptacle séminal, montrent que cette espèce est un membre du groupe *Mesocyclops leuckarti*.

Elle se rapproche beaucoup plus de l'espèce type que de la variété *aequatorialis*, décrite par Kiefer.

De l'espèce typique elle diffère par les caractères suivants :

- (1) Le segment génital est considérablement plus large à sa partie proximale qu'à la partie distale, tandis que chez *M. Leuckarti* la largeur proximale n'excède que de peu la largeur de la partie distale.
- (2) La soie latérale externe des branches de la furca est insérée plus près de l'extrémité chez la variété *deccanensis* que chez l'espèce typique.
- (3) La longueur de la femelle peut dépasser la longueur maxima donnée par Kiefer pour *M. leuckarti*.

De la variété *aequatorialis* elle se différencie par les caractères suivants :

- (1) Les branches de la furca sont chez *deccanensis*, de 3 à 3 fois et demi et même plus, aussi longues que larges ; tandis qu'elles ne sont que de 2 fois et demi à 3 fois aussi longues que larges chez *aequatorialis*.
- (2) L'article terminal de l'endopodite de la quatrième paire des pattes est en général environ 3 fois aussi long que large chez *deccanensis* ; tandis que ce rapport est de 2 et demi à 2 et trois quart chez *aequatorialis*.
- (3) Les épines apicales de cet article sont de longueur égale ou l'épine interne est un peu plus courte que l'épine externe chez *deccanensis*, tandis que l'épine interne surpasse en longueur l'épine externe chez *aequatorialis*.

### **Mesocyclops rylovi, Smirnov.**

Je n'ai trouvé des specimens identifiés comme appartenant à cette espèce que dans une seule localité. Ne connaissant pas la description originale de Smirnov, l'identification a été faite d'après les notes succinctes données par Kiefer (in " Das Tierreich ").

Comme cette espèce ne semble jamais avoir été signalée en dehors du Caucase, il semble nécessaire de donner quelques notes sur des specimens que j'ai trouvés dans l'Inde.

*Description.* Assez grande espèce. Plus fortement bâtie, plus longue et plus large que le *M. rylovi* var. *vermifer*. Environ 3 fois aussi longue que large. Longueur du premier segment céphalothoracique dépassant considérablement celle des segments thoraciques suivants. Je n'ai pas observé de poils sur les bords externes du cinquième segment thoracique. La queue ne forme en général qu'environ un quart de la longueur totale du corps ou un peu plus d'un quart.

Furca à branches légèrement divergentes, 3 fois, ou plus de 3 fois, aussi longues que larges. Soie apicale externe la plus courte. Soie apicale interne bien plus de 2 fois aussi longue que la soie apicale externe. Soie apicale médiane interne la plus longue, mais n'atteint pas une

longueur de 2 fois celle de la soie apicale interne. Soie apicale médiane externe plus de 3 fois aussi longue que la soie apicale externe. Soie latérale externe insérée aux environs du tiers distal.

Première antenne à 17 articles, atteignant, lorsqu'elle est rabattue, le milieu ou le bord postérieur du troisième segment thoracique. Membrane hyaline entière, assez large, aux deux derniers articles.

Pattes natatoires triarticulées. Le nombre des épines et des soies de l'article terminal des exopodites est le suivant :

- Première patte 2 épines 4 soies.
- Deuxième patte 3 épines 4 soies.
- Troisième patte 3 épines 4 soies.
- Quatrième patte 3 épines 4 soies.

Article terminal de l'endopodite de la quatrième paire des pattes portant une épine apicale interne arquée et déviée en dedans, environ 2 fois aussi longue que l'épine apicale externe et n'atteignant pas la longueur de l'article qui la porte. Celui-ci est environ 4 fois aussi longue que large à la base ; mais la largeur maxima à la base de l'article présente de notables variations.

Les expansions latérales de la lamelle basale reliant la quatrième paire des pattes sont munies de 5 à 9 petites épines.

Cinquième patte à deux articles ; article basal portant une soie latérale qui est le plus court des 3 appendices ; article terminal muni d'une longue épine barbelée interne et d'une soie externe, toutes les deux insérées apicalement, l'épine étant la plus longue.

Premier segment abdominal de longueur considérable, atteignant et pouvant même excéder la longueur combinée des segments abdominaux suivants. Le bord postérieur du dernier segment abdominal porte sur la moitié interne de 5 à 7 petits poils très fins.

Ovisacs avec de 15 à 20 oeufs ou plus dans chaque sac.

Réceptacle séminal en forme de marteau, assez variable selon le degré de remplissage.

Couleur grisâtre ou jaunâtre, plus sombre que celle de *M. rylovi* var. *vermifer*. Les spécimens adultes montrent en général la présence de gouttelettes de graisse jaune.

*Mâle.* Trois appendices génitaux. La plus longue est l'épine dorso-externe qui atteint la longueur des 2 segments abdominaux suivants. La plus épaisse et la plus forte des 3 appendices est l'épine ventro-interne, mais elle ne dépasse que légèrement en longueur l'appendice médian.

#### *Mensurations.*

##### *Femelles adultes :*

|                                   |   |   |   |   |   |   |   |           |            |
|-----------------------------------|---|---|---|---|---|---|---|-----------|------------|
| Longueur                          | . | . | . | . | . | . | . | 930 $\mu$ | 1000 $\mu$ |
| Largeur                           | . | . | . | . | . | . | . | 300 $\mu$ | 340 $\mu$  |
| Premier segment céphalothoracique | . | . | . | . | . | . | . | 324 $\mu$ | 380 $\mu$  |
| Segments thoraciques II à V       | . | . | . | . | . | . | . | 261 $\mu$ | 350 $\mu$  |
| Queue (abdomen + furca)           | . | . | . | . | . | . | . | 349 $\mu$ | 270 $\mu$  |

*Segments abdominaux :*

|                   | Longueur. |           |           | Largeur.  |           |                                                                     |
|-------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------------------------------------------|
|                   | I.        | II.       | III.      | I.        | II.       | III.                                                                |
| Premier segment   | 126 $\mu$ | 138 $\mu$ | 162 $\mu$ | 108 $\mu$ | 118 $\mu$ | 108 $\mu$<br>(Proximale)<br>84 $\mu$ 92 $\mu$ 92 $\mu$<br>(Distale) |
| Deuxième segment  | 68 $\mu$  | 45 $\mu$  | 72 $\mu$  | 72 $\mu$  | 73 $\mu$  | 72 $\mu$                                                            |
| Troisième segment | 54 $\mu$  | 36 $\mu$  | 54 $\mu$  | 65 $\mu$  | 68 $\mu$  | 45 $\mu$                                                            |
| Quatrième segment | 38 $\mu$  | 37 $\mu$  | 39 $\mu$  | 57 $\mu$  | 63 $\mu$  | 57 $\mu$                                                            |

*Furca :*

|                              |   |   |           |           |           |
|------------------------------|---|---|-----------|-----------|-----------|
| Longueur                     | . | . | 64 $\mu$  | 72 $\mu$  | 72 $\mu$  |
| Largeur                      | . | . | 22 $\mu$  | 25 $\mu$  | 23 $\mu$  |
| Soie apicale externe         |   |   | 46 $\mu$  | 72 $\mu$  | 68 $\mu$  |
| Soie apicale médiane externe |   |   | 200 $\mu$ | 270 $\mu$ | 252 $\mu$ |
| Soie apicale médiane interne |   |   | 270 $\mu$ | 365 $\mu$ | 360 $\mu$ |
| Soie apicale interne         |   | . | 136 $\mu$ | 203 $\mu$ | 189 $\mu$ |
| Soie latérale externe        |   |   | 26 $\mu$  | ..        | 30 $\mu$  |
| Soie dorsale interne         |   |   | 88 $\mu$  | ..        | 63 $\mu$  |

*Insertion de la soie latérale externe :*

|                                       |   |                                    |          |
|---------------------------------------|---|------------------------------------|----------|
| à 22 $\mu$ de l'extrémité de la furca | . | longueur de la branche de la furca | 64 $\mu$ |
| à 25 $\mu$ de l'extrémité de la furca |   | longueur de la branche de la furca | 72 $\mu$ |

*Article terminal de l'endopodite de la quatrième paire des pattes natatoires :*

|                                  |          |          |          |          |
|----------------------------------|----------|----------|----------|----------|
| Longueur de l'article            | 68 $\mu$ | 70 $\mu$ | 72 $\mu$ | 73 $\mu$ |
| Largeur de l'article (à la base) | 16 $\mu$ | 18 $\mu$ | 16 $\mu$ | 23 $\mu$ |
| Epine apicale externe            | 27 $\mu$ | 25 $\mu$ | 27 $\mu$ | 34 $\mu$ |
| Epine apicale interne            | 54 $\mu$ | 63 $\mu$ | 57 $\mu$ | 70 $\mu$ |

*Cinquième patte :*

|                                 |   |          |          |          |
|---------------------------------|---|----------|----------|----------|
| Soie externe de l'article basal | . | 36 $\mu$ | 39 $\mu$ | 50 $\mu$ |
| Soie externe apicale            |   | 57 $\mu$ | 50 $\mu$ | 54 $\mu$ |
| Soie interne apicale            |   | 77 $\mu$ | 68 $\mu$ | 81 $\mu$ |

*Première antenne :*

|      | Longueur des segments. |
|------|------------------------|
| I    | 83 $\mu$               |
| II   | . 21 $\mu$             |
| III  | 12 $\mu$               |
| IV   | 36 $\mu$               |
| V    | 21 $\mu$               |
| VI   | . 16 $\mu$             |
| VII  | . 36 $\mu$             |
| VIII | 12 $\mu$               |
| IX   | 20 $\mu$               |
| X    | . 20 $\mu$             |
| XI   | 23 $\mu$               |
| XII  | 23 $\mu$               |
| XIII | . 21 $\mu$             |
| XIV  | 25 $\mu$               |
| XV   | 25 $\mu$               |
| XVI  | . 38 $\mu$             |
| XVII | . 45 $\mu$             |

*Mâle* : Longueur 209 $\mu$ .

*Armature génitale* : Epine dorso-externe 90 $\mu$ , Epine médiane 27 $\mu$ , Epine ventro-interne 29 $\mu$ .

*Habitat* : Cette espèce n'a été rencontrée que dans un puits hors d'usage près du réservoir municipal à Pandharpour.

*Remarques* : Comme on le voit cette espèce se conforme à la description donnée par Kiefer de *M. rylovi* Smirnov.

***Mesocyclops rylovi vermifer*, subsp. nov.**

*Description* : Espèce de taille moyenne. Corps étroit, de forme élancée ; en général plus de 3 fois aussi long que large ; dans certaines localités on rencontre des spécimens, qui sont peut-être des variétés, dont la largeur dépasse un peu le tiers de la longueur du corps. Largeur maxima à la partie postérieure du céphalothorax. Premier segment céphalothoracique plus long que les 4 segments suivants. Cinquième segment thoracique petit, sans ailes latérales accentuées ; il est garni de fins poils sur le bord latéral. Queue, formant environ un tiers ou un peu plus d'un tiers de la longueur totale du corps. Longueur du segment génital excédant la longueur combinée des 2 segments suivants, mais n'atteignant pas la longueur totale des 3 segments suivants. Le bord postérieur du dernier segment abdominal porte sur la face ventrale une rangée de fines épines qui sont plus longues sur la moitié interne que sur la moitié externe, où elles peuvent même manquer.

Furca courte, à branches très divergentes, le plus souvent moins de 3 fois aussi longues que larges. Soie apicale interne toujours plus de 2 fois aussi longue et parfois jusqu'à 3 fois aussi longue que la soie apicale externe. Soie apicale médiane externe ne dépassant la soie apicale interne que d'environ un quart de la longueur. Soie médiane interne la plus longue de toutes. Le tiers distal de la soie médiane interne est arqué. Soie médiane externe arquée dans presque toute sa longueur. Ces soies sont pennées d'une façon homonyme. Soie latérale externe insérée au-dessous de la moitié distale des branches de la furca et parfois près du tiers distal. Bord interne des branches de la furca glabre.

Première antenne à 17 articles, dont les 2 derniers portent une membrane hyaline très étroite et entière. Lorsqu'elle est rabattue, la première antenne atteint le milieu ou le bord postérieur du quatrième segment thoracique. Le premier et le penultième articles sont les plus longs ; le sixième et le troisième les plus courts.

Pattes natatoires à branches triarticulées garnies d'épines. Le nombre des épines et des soies de l'article terminal des exopodites est le suivant :

Première paire 2 épines 4 soies.

Deuxième paire 3 épines 4 soies.

Troisième paire 3 épines 4 soies.

Quatrième paire 3 épines 4 soies.

Article terminal de l'endopodite des pattes de la quatrième paire portant deux épines apicales dont l'interne est arquée et plus de 2 fois

aussi longue que l'épine apicale externe. L'épine apicale interne est en général plus courte que l'article qui la porte ; elle peut l'égaliser en longueur mais ne le dépasse jamais. La largeur à la base de l'article terminal est d'environ un quart de la longueur.

Les expansions latérales de la lamelle basale reliant les pattes de la quatrième paire sont semi-circulaires et garnies de chaque côté de 3 à 5 épines petites, mais assez fortes ; le bord libre de la lamelle est droit.

Cinquième patte à deux articles. Premier article assez large à angle externe un peu prolongé distalement et portant une soie pennée qui est toujours le plus court des 3 appendices ; l'article terminal porte du côté interne un long poil qui a l'aspect d'une étroite épine finement barbelée et qui est le plus long des 3 appendices ; du côté externe il y a une soie pennée un peu moins longue. Ces deux appendices sont insérés apicalement et sont parallèles ou légèrement divergents.

Ovisacs avec 6 à 9 gros oeufs dans chaque sac, de couleur foncée.

Réceptacle séminal de forme assez variable, en marteau, mais la longueur totale des canaux latéraux semble toujours être à peu près égale à la longueur totale du réceptacle dans le sens vertical. Latéralement le segment génital porte de chaque côté 3 appendices, dont l'externe a le caractère d'un long et fin poil et les deux autres celui d'épines minuscules.

Couleur un peu variable. Corps plus ou moins hyalin gris-jaunâtre, gris-rosé, couleur saumon ou blanc-grisâtre. Les nuances jaunâtres et roses tiennent à la présence de globules de graisse, qui sont en général en évidence chez les spécimens adultes. Oeil noirâtre ou brun-rougeâtre.

*Mâle* : L'armature génitale comprend de chaque côté 3 appendices de longueur variable. Celui placé au milieu a le caractère d'une épine et est le plus court, tandis que la soie dorso-externe est la plus longue. Celle-ci dépasse la longueur du deuxième segment abdominal.

### Mensurations.

*Femelle* : Longueur de 630 $\mu$  à 970 $\mu$ . Largeur de 200 $\mu$  à 330 $\mu$ .

|                                   |           |           |           |           |
|-----------------------------------|-----------|-----------|-----------|-----------|
| Premier segment céphalothoracique | 360 $\mu$ | 310 $\mu$ | 350 $\mu$ | 350 $\mu$ |
| Segments thoraciques II à V       | 180 $\mu$ | 300 $\mu$ | 260 $\mu$ | 250 $\mu$ |
| Abdomen + furca                   | 297 $\mu$ | 280 $\mu$ | 310 $\mu$ | 370 $\mu$ |

Segments abdominaux :

|                   | Longueur. |           |           | Largeur. |          |              |
|-------------------|-----------|-----------|-----------|----------|----------|--------------|
| Premier segment   | 99 $\mu$  | 126 $\mu$ | 144 $\mu$ | 90 $\mu$ | 99 $\mu$ | 93 $\mu$     |
|                   |           |           |           |          |          | (Proximale). |
|                   |           |           |           | 68 $\mu$ | 75 $\mu$ | 72 $\mu$     |
|                   |           |           |           |          |          | (Distale).   |
| Deuxième segment  | 65 $\mu$  | 68 $\mu$  | 72 $\mu$  | 56 $\mu$ | 63 $\mu$ | 65 $\mu$     |
| Troisième segment | 48 $\mu$  | 48 $\mu$  | 54 $\mu$  | 50 $\mu$ | 52 $\mu$ | 61 $\mu$     |
| Quatrième segment | 36 $\mu$  | 36 $\mu$  | 37 $\mu$  | 47 $\mu$ | 52 $\mu$ | 54 $\mu$     |

*Furca* :

|                              |           |           |           |           |           |           |           |           |
|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Longueur                     | 45 $\mu$  | 50 $\mu$  | 54 $\mu$  | 59 $\mu$  | 59 $\mu$  | 60 $\mu$  | 63 $\mu$  | 70 $\mu$  |
| Largeur                      | 16 $\mu$  | 21 $\mu$  | 20 $\mu$  | 20 $\mu$  | 20 $\mu$  | 20 $\mu$  | 22 $\mu$  | 25 $\mu$  |
| Soie apicale externe         | 30 $\mu$  | 54 $\mu$  | 66 $\mu$  | 63 $\mu$  | 72 $\mu$  | 60 $\mu$  | 52 $\mu$  | 58 $\mu$  |
| Soie apicale médiane externe | 165 $\mu$ | 220 $\mu$ | 200 $\mu$ | 234 $\mu$ | 234 $\mu$ | 210 $\mu$ | 210 $\mu$ | 234 $\mu$ |
| Soie apicale médiane interne | 234 $\mu$ | 261 $\mu$ | 266 $\mu$ | 306 $\mu$ | 324 $\mu$ | 240 $\mu$ | 270 $\mu$ | 279 $\mu$ |
| Soie apicale interne         | 144 $\mu$ | 151 $\mu$ | 160 $\mu$ | 176 $\mu$ | 198 $\mu$ | 144 $\mu$ | 150 $\mu$ | 162 $\mu$ |
| Soie latérale externe        | ..        | ..        | 26 $\mu$  | 36 $\mu$  | ..        | ..        | 20 $\mu$  | ..        |
| Soie dorsale interne         | ..        | ..        | ..        | ..        | ..        | ..        | 68 $\mu$  | ..        |

## Insertion de la soie latérale externe :

|                           |                                             |
|---------------------------|---------------------------------------------|
| à 23 $\mu$ de l'extrémité | longueur de la branche de la furca 59 $\mu$ |
| à 20 $\mu$ de l'extrémité | longueur de la branche de la furca 59 $\mu$ |
| à 20 $\mu$ de l'extrémité | longueur de la branche de la furca 60 $\mu$ |
| à 18 $\mu$ de l'extrémité | longueur de la branche de la furca 58 $\mu$ |
| à 20 $\mu$ de l'extrémité | longueur de la branche de la furca 56 $\mu$ |
| à 16 $\mu$ de l'extrémité | longueur de la branche de la furca 54 $\mu$ |
| à 21 $\mu$ de l'extrémité | longueur de la branche de la furca 50 $\mu$ |
| à 20 $\mu$ de l'extrémité | longueur de la branche de la furca 70 $\mu$ |

## PREMIÈRE ANTENNE : Longueur des articles de 4 femelles adultes :

|      |          |          |          |          |
|------|----------|----------|----------|----------|
| I    | 86 $\mu$ | 81 $\mu$ | 72 $\mu$ | 77 $\mu$ |
| II   | 22 $\mu$ | 21 $\mu$ | 18 $\mu$ | 19 $\mu$ |
| III  | 14 $\mu$ | 12 $\mu$ | 11 $\mu$ | 12 $\mu$ |
| IV   | 34 $\mu$ | 32 $\mu$ | 32 $\mu$ | 30 $\mu$ |
| V    | 21 $\mu$ | 20 $\mu$ | 22 $\mu$ | 20 $\mu$ |
| VI   | 12 $\mu$ | 10 $\mu$ | 13 $\mu$ | 14 $\mu$ |
| VII  | 39 $\mu$ | 34 $\mu$ | 36 $\mu$ | 36 $\mu$ |
| VIII | 18 $\mu$ | 16 $\mu$ | 16 $\mu$ | 15 $\mu$ |
| IX   | 25 $\mu$ | 20 $\mu$ | 18 $\mu$ | 18 $\mu$ |
| X    | 21 $\mu$ | 20 $\mu$ | 20 $\mu$ | 21 $\mu$ |
| XI   | 25 $\mu$ | 27 $\mu$ | 23 $\mu$ | 25 $\mu$ |
| XII  | 27 $\mu$ | 22 $\mu$ | 23 $\mu$ | 23 $\mu$ |
| XIII | 23 $\mu$ | 21 $\mu$ | 20 $\mu$ | 20 $\mu$ |
| XIV  | 27 $\mu$ | 27 $\mu$ | 25 $\mu$ | 27 $\mu$ |
| XV   | 27 $\mu$ | 27 $\mu$ | 27 $\mu$ | 28 $\mu$ |
| XVI  | 52 $\mu$ | 50 $\mu$ | 43 $\mu$ | 44 $\mu$ |
| XVII | 39 $\mu$ | 41 $\mu$ | 40 $\mu$ | 40 $\mu$ |

ARTICLE TERMINAL DE L'ENDOPODITE DE LA QUATRIÈME PAIRE DES  
PATTES MATATOIRES :

|                                   |          |          |          |          |          |          |          |
|-----------------------------------|----------|----------|----------|----------|----------|----------|----------|
| Longueur de l'article             | 56 $\mu$ | 54 $\mu$ | 60 $\mu$ | 60 $\mu$ | 63 $\mu$ | 64 $\mu$ | 74 $\mu$ |
| Largeur de l'article (à la base). | 16 $\mu$ | 16 $\mu$ | 16 $\mu$ | 12 $\mu$ | 19 $\mu$ | 12 $\mu$ | 18 $\mu$ |
| Epine apicale interne             | 54 $\mu$ | 47 $\mu$ | 40 $\mu$ | 56 $\mu$ | 60 $\mu$ | 55 $\mu$ | 63 $\mu$ |
| Epine apicale externe             | 20 $\mu$ | 21 $\mu$ | 20 $\mu$ | 26 $\mu$ | 23 $\mu$ | 25 $\mu$ | 29 $\mu$ |

## CINQUIÈME PATTE :

|                                |          |          |          |          |          |
|--------------------------------|----------|----------|----------|----------|----------|
| Soie de l'article basal        | 26 $\mu$ | 22 $\mu$ | 28 $\mu$ | 24 $\mu$ | 40 $\mu$ |
| Soie apicale externe           | 46 $\mu$ | 44 $\mu$ | 38 $\mu$ | 40 $\mu$ | 47 $\mu$ |
| Epine apicale interne          | 68 $\mu$ | 56 $\mu$ | 52 $\mu$ | 56 $\mu$ | 54 $\mu$ |
| Longueur de l'article basal    |          |          |          |          | 10 $\mu$ |
| Longueur de l'article terminal |          |          |          |          | 18 $\mu$ |

## RÉCEPTACLE SÉMINAL :

|                                                         |          |          |
|---------------------------------------------------------|----------|----------|
| Canaux latéraux, longueur transversale                  | 80 $\mu$ | 90 $\mu$ |
| Longueur totale dans le sens vertical                   | 80 $\mu$ | 90 $\mu$ |
| Largeur dans le sens vertical des canaux latéraux       |          | 16 $\mu$ |
| Largeur maxima dans le sens horizontal du sac inférieur |          | 27 $\mu$ |

*Male* : Longueur de 495 $\mu$  à 670 $\mu$ . Largeur de 165 $\mu$  à 230 $\mu$ .

## Appendices genitaux :

|                      |          |          |          |
|----------------------|----------|----------|----------|
| Epine ventro-interne | 20 $\mu$ | 30 $\mu$ | 20 $\mu$ |
| Epine médiane        | 10 $\mu$ | 12 $\mu$ | 12 $\mu$ |
| Soie dorso-externe   | 40 $\mu$ | 65 $\mu$ | 50 $\mu$ |

*Habitat*. Cette espèce a été trouvée dans presque toutes les localités où je l'ai recherchée sur le plateau du Deccan près du chemin de fer de Barsi, tant à Miraj (Pays des Mahrattes du Sud) qu'à Latur (Etat de Haïdérabad). Ailleurs dans l'Inde je n'ai eu l'occasion de faire des pêches que dans quelques puits près du village de Ammayanakkanur (Kodaikanal Road) où je l'ai également trouvée en grand nombre, mais présentant des mensurations très légèrement aberrantes. Ce fait indiquerait que le *M. rylovi* var. *vermifer* a une distribution très étendue dans la péninsule indienne.

On la trouve de préférence dans les puits souterrains, mais elle se rencontre aussi dans des trous d'eau peu profonds au milieu des champs, ainsi que dans des réservoirs.

Dans la région du Deccan où mes observations ont été faites, cette espèce est, avec le *M. leuckarti* var. *deccanensis*, l'hôte intermédiaire principal du *Dracunculus Medinensis*. L'ayant trouvée infestée naturellement par les embryons du ver de Médine de nombreuses fois j'ai trouvé approprié à donner le nom spécifique de "vermifer" à cette variété. Pour quelques observations concernant sa biologie voir un article à paraître prochainement dans les "Bulletins de la Société de Pathologie Exotique"

*Remarques*. La cinquième patte à 2 articles, avec article terminal muni de 2 appendices, dont l'épine est de longueur considérable, montre que cette espèce appartient au genre *Mesocyclops* et elle se range dans le sous-genre *Thermocyclops* par suite de l'insertion apicale de l'épine.

Elle se différencie nettement du *M. oithonoides* par les caractères suivants :

- (1) Branches de la furca tout au plus 3 fois aussi longues que larges (jusqu'à 3 fois et demi aussi longues que larges chez *M. oithonoides*).
- (2) Expansions latérales de la lamelle basale reliant les pattes de la quatrième paire garnies seulement de 3 à 5 petites épines assez fortes (garnies de nombreuses petites épines chez *M. oithonoides*).
- (3) L'épine apicale interne de l'article terminal de l'endopodite de la quatrième paire des pattes peut atteindre la longueur de l'article qui la porte, mais ne l'excède pas (cette épine dépasse l'article en longueur chez *M. oithonoides*).
- (4) Cette épine est environ 2 fois aussi longue que l'épine apicale externe (jusqu'à 5 fois aussi longue chez *M. oithonoides*).

Du *M. hyalinus* le *M. rylovi* var. *vermifer* se distingue par les caractères suivants :

- (1) Première antenne, lorsqu'elle est rabattue, atteint le milieu du quatrième segment thoracique (elle ne dépasse pas le deuxième segment thoracique chez *M. hyalinus*).
- (2) Branches de la furca jusqu'à 3 fois aussi longues que larges (à peine 2 fois et demi aussi longues que larges chez *M. hyalinus*).
- (3) Epine apicale interne de la cinquième patte bien plus longue que la soie apicale externe (ce caractère le distingue aussi du *M. oithonoides*).

L'espèce dont s'approche le plus le *M. rylovi* var. *vermifer* est le *M. rylovi* (Smirnov). L'analogie est si grande que je la considère comme une variété de cette espèce. Elle en diffère notamment par les caractères suivants :

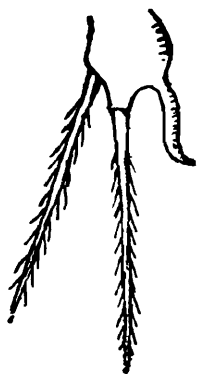
- (1) Taille bien plus petite : une femelle adulte n'atteignant que rarement une longueur de 0.97 mm. ; tandis que la longueur du *M. rylovi* a été donnée comme allant de 0.9 à 1.07 mm.
- (2) Corps plus élancé, la largeur maxima étant moins grande par rapport à la longueur.
- (3) La longueur dont le premier segment céphalothoracique dépasse les segments thoraciques suivants est moins considérable que chez *M. rylovi*.
- (4) La queue forme environ un tiers de la longueur totale, tandis que chez *M. rylovi* elle n'en forme qu'environ un quart.
- (5) Le premier segment abdominal excède la longueur des 2 segments suivants, mais n'atteint pas la longueur combinée des 3 segments suivants ; chez *M. rylovi* d'autre part, le premier segment abdominal est plus long par rapport aux 3 segments suivants, ceux-ci pouvant même être surpassés par le premier segment.
- (6) Branches de la furca en général moins de 3 fois aussi longues que larges ; mais 3 fois ou plus de 3 fois aussi longues que larges chez *M. rylovi*.
- (7) Les soies apicales interne et médiane interne de la furca sont en général bien plus courtes chez *M. rylovi* var. *vermifer* que chez *M. rylovi*.
- (8) Le nombre des oeufs atteignent et dépassent 20 chez *M. rylovi*, tandis que je n'ai pas observé plus de 9 oeufs dans chaque sac chez le *M. rylovi* var. *vermifer*.

#### BIBLIOGRAPHIE.

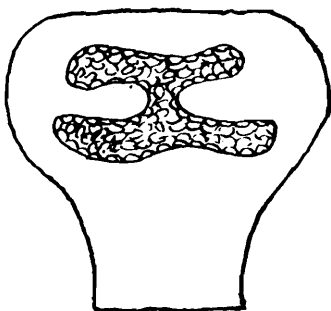
- Kiefer, F.—II Cyclopoida Gnathostoma, in " *Das Tierreich*", 53 Lieferung (Berlin und Leipzig : 1929).
- Kiefer, F.—Zur Kenntnis der Mikrofauna von Britisch Indien, IV, Copepoda Cyclopoida. *Records of the Indian Museum*, XXX, pp. 387-398 (1928).
- Lindberg, K.—Remarques sur l'épidémiologie de la draconculose dans l'Inde britannique. Un plaidoyer en faveur de recherches. *Bull. Soc. Path. Exot.* (à paraître prochainement).

### EXPLICATION DE PLANCH VIII.

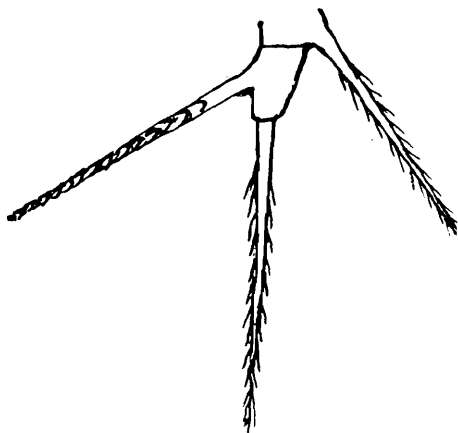
- FIG. 1. *Eucyclops multicolor*, sp. nov. Cinquième patte.
- FIG. 2. *Eucyclops multicolor*, sp. nov. Réceptacle séminal.
- FIG. 3. *Mesocyclops leuckarti deccanensis*, subsp. nov. Cinquième patte.
- FIG. 4. *Mesocyclops leuckarti deccanensis*, subsp. nov. Réceptacle séminal.
- FIG. 5. *Mesocyclops leuckarti deccanensis*, subsp. nov. Lamelle basale reliant la quatrième paire des pattes.
- FIG. 6. *Mesocyclops rylovi* (Smirnov), Lamelle basale reliant la quatrième paire des pattes.
- FIG. 7. *Mesocyclops rylovi vermifer*, subsp. nov. Réceptacle séminal.
- FIG. 8. *Mesocyclops rylovi vermifer*, subsp. nov. Lamelle basale reliant la quatrième paire des pattes.
- FIG. 9. *Mesocyclops rylovi vermifer*, subsp. nov. Cinquième patte.



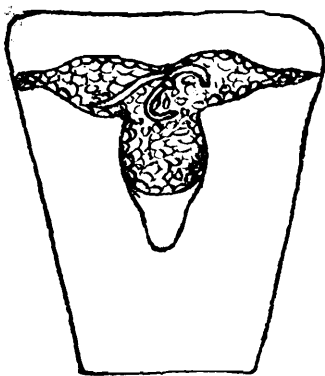
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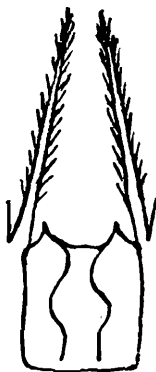
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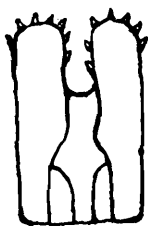
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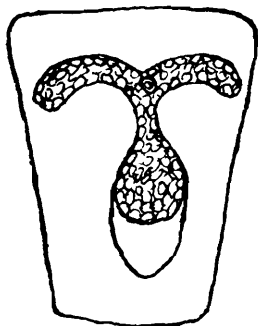
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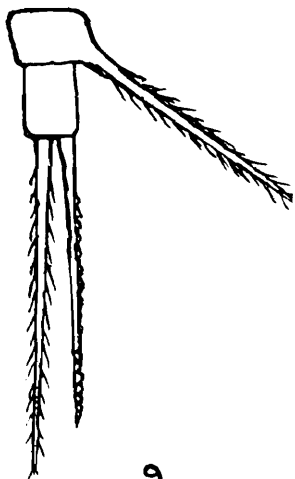
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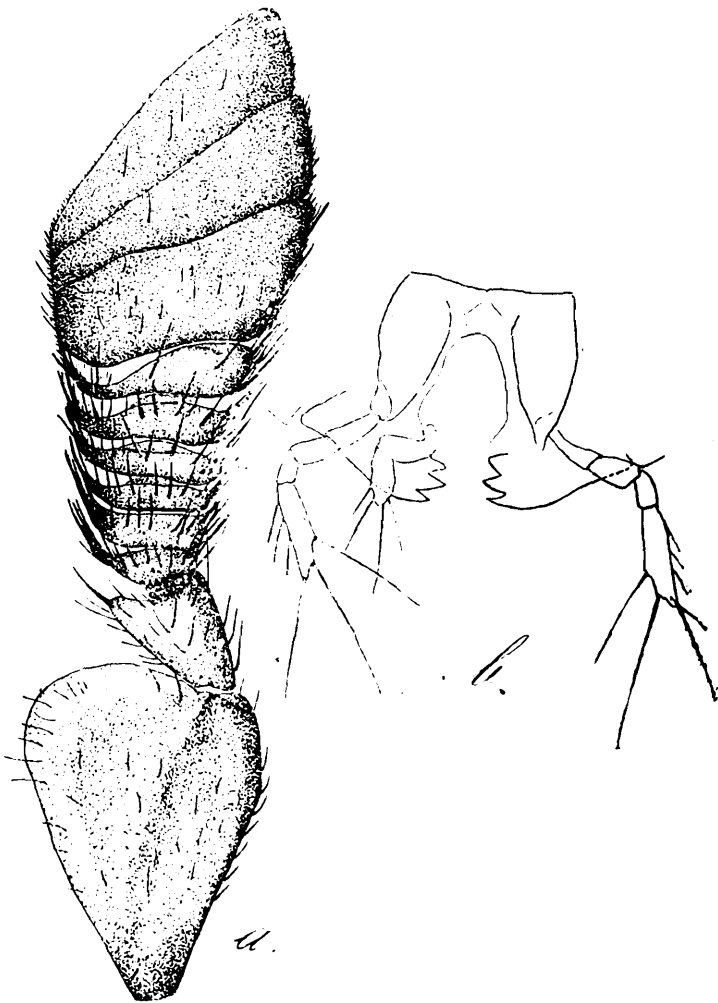
9

A NEW ENCYRTID CHALCID GENUS, *KRISHNIERIELLA*, GEN.  
NOV., FROM INDIA.

By M. S. MANI.

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

Dr. T. V. Ramakrishna Ayyar, Late Government Entomologist, Agricultural Research Institute, Coimbatore, South India, recently sent me for identification an interesting Encyrtid parasite of the scale insect *Ceroplastodes cajani* Mask. The specimens do not agree with any previously known genus of the family Encyrtidae and are described below under the generic name *Krishnieriella*<sup>1</sup>, nov. This genus comes nearest to *Comperiella* Howard in its essential antennal characters but differs materially from it in several important respects. It is distin-



*Krishnieriella ceroplastodis*, sp. nov. a. antenna; b. mandibles and palpi.

guished from *Comperiella* as follows: Fronto-vertex of head and pronotum without white bands; club of antennae much broader than the

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<sup>1</sup> From *Ramakrishnia* dim. of Ramakrishna Ayyar.

segments of funicle, at least never narrower ; labial palpi biarticulate ; fore wings of female without any fasciae and with the pubescence normal, *i.e.*, not arranged in definite areas ; submarginal vein straight and without a triangular expansion subapically ; marginal vein neither very short nor punctiform ; stigmal vein not very long ; hind leg with only one apical tibial spur, no minute second spur is present.

The following is a full description of the genus :

*Female*.—Body robust, head not oblong ; abdomen shorter than head and thorax, subglobose ; fronto-vertex of head and pronotum without any whitish bands ; pronotum rather narrow. Mandibles tridentate. Maxillary palpi quadriarticulate, labial palpi biarticulate. Antennae short, broad, flattened ; scape broadly and triangularly expanded ; pedicel with a slight oblique expansion ; funicle club-shaped, broader apically than basally, with 6 segments, which are much broader than long, compressed, expanded foliaceously and cup-shaped ; club rather large, never narrower than the funicle segments, almost as long as the total length of the funicle, somewhat obliquely ovate, triarticulate, obliquely flattened at the tip on the under side. Fore wings hyaline, devoid of any fasciae, the pubescence normal, *i.e.*, not arranged in definite areas and very much resembling that on the wings of males of the genus *Comperiella*. Submarginal vein without a triangular expansion near the apex. Marginal vein not punctiform but somewhat distinctly elongated. Post marginal vein moderately developed and almost equal to the marginal vein. Stigmal vein not extremely long and not at right angles to the costal margin of wing. Hind legs with only one apical tibial spur ; there is no minute second spur as in the genus *Comperiella*. Ovipositor exerted.

*Male*.—Unknown.

*Genotype*.—*Krishnieriella ceroplastodis*, sp. nov.

### ***Krishnieriella ceroplastodis*, sp. nov.**

*Female*.—Length about 1.25 mm. General colour of body yellowish to reddish brown ; there is no distinct sculpture on the body, which is almost uniformly smooth. Head dorsally with a thickness roughly two thirds the width, height about three fourths the width. Eyes black. Frontal ocellus somewhat larger than the posterior ocelli, which are separated from the margin of eyes by a distance less than their diameters ; the ocellar triangle equilateral. Mandibles tridentate, front tooth acute, second tooth rather blunt and the last one broadly and roundly pointed. Maxillary palpi : first segment with a length about twice its diameter ; second segment somewhat shorter ; third half the length of first ; fourth twice the length of first, somewhat attenuated beyond the basal two thirds and with long setae. Labial palpi with subequal segments, which are somewhat stouter than those of the maxillary palpi. Antennae yellowish, except the outer margins of the foliaceous expansion of the scape and the apical two segments of the club, which are dark grayish in colour ; inserted close to the mouth border and wide apart from each other, the interspace being about twice the distance from the cheek margins ; length a little greater than the height of head. Scape laminately and subtriangularly expanded ventrally, with a length

about one and a half times the greatest breadth which is in the region of the apex. Pedicel about one fourth the length of scape. Funicle roughly three fourths the length of scape; first four segments roughly of equal thickness, fifth and sixth somewhat thicker. Club about one fourth longer than the funicle and a little shorter than the combined length of funicle and the pedicel; first segment longest, second a little shorter and third shortest, obliquely truncate at apex. Thorax brownish orange, smooth and with numerous short, stiff setae. Scutellum with a length about three fourths the greatest width which is in the anterior region. Legs yellowish brown. Tibia of hind legs with a narrow dark grayish brown band at basal one fourth and a somewhat broader band at basal three fourth; metatarsus pale brownish apically. Fore wings with a length a little greater than twice the greatest breadth, posterior angles rounded, with a clear colourless patch basally up to the basal three fourths of the submarginal vein, beyond which it is diffusely pale brownish.

*Holotype*.—One example partly dissected on slide No.  $\frac{903}{H3}$ . Coll. T. V Ramakrishna Ayyar, Coimbatore. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Paratypes*.—Several examples on slide (In the collections of the Agricultural Research Institute, Coimbatore).

*Host*.—Pulse scale insect *Ceroplastodes cajani* Mask.



# STUDIES ON INDIAN ITONIDIDAE (CECIDOMYIDAE : DIPTERA).<sup>1</sup>

## II.—DESCRIPTIONS OF NEW MIDGES AND GALLS.

By M. S. MANI.

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

### A.—DESCRIPTIONS OF NEW MIDGES.

#### Subfamily HETEROPEZINAE.<sup>2</sup>

##### Genus **Meinertomyia** Felt.

1870. *Pero*, (*pre-occ. Pero*, Schaffer), *Meinert*, *Naturhist. Tidsskr. Copenhagen* (3) VI, p. 463.  
1898. *Pero*, Kieffer, *Synop. Cecid. Europe et Algerie*, p. 54.  
1911. *Meinertomyia*, Felt, *Journ. N. Y. Entomol. Soc.*, XIX, p. 37.  
1911. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 147, p. 85.  
1913. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 165, p. 214.  
1913. *Meinertomyia*, Kieffer, *Gen. Ins.*, fas. 152, p. 139.  
1925. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 139.

This monotypic genus is being recorded for the first time from India. The genotype, *M. fasciata* (Mein.), described from Denmark, is reported to occur on the European hornbeam. I describe below two new species from the material received from the Forest Entomologist, Forest Research Institute, Dehra Dun.

The genus is recognised by the following characters: Palpi triarticulate. Antennae moniliform, segments 14 in female and 23 in male, flagellate segments with two whorls of hairs in female and a single whorl in male. Wings acuminate, hyaline, finely haired, with three longitudinal veins, third vein reaching margin near the apex of the wing, fifth vein simple and sometimes not fully reaching the wing margin. Tarsi quinque-articulate, metatarsus shorter than the second tarsal segment. Claws simple, short, empodium<sup>3</sup> very short. Terminal clasp segment large. Ovary simple, short, never longer than half the length of the body.

#### *Key to Indian species.*

- I. The three palpal segments of equal length or nearly so ;  
terminal flagellate segments trinodose, moniliform ;  
empodium about three fourths the length of the claws *M. aequipalpis*, sp.  
nov.
- II. The three palpal segments of unequal lengths ; terminal  
flagellate segments rather short and pyriform ; empodium  
about half the length of the claws *M. inaequipalpis*, sp.  
nov.

<sup>1</sup> Part I of this paper was published in *Rec. Ind. Mus.*, XXXVI, pp. 371-451, (1934).

<sup>2</sup> Midges belonging to this subfamily have not previously been recorded from India.

<sup>3</sup> Pulvillus of Felt's key. Empodium is the name applied to the cushion-like pad between the claws, while pulvillus is a similar pad on the sides of the claws.

**Meinertomyia aequipalpis**, sp. nov.

*Female*.—1 mm. long. Body pale reddish brown in the dry condition, moderately setose. Palpi triarticulate, short, segments slender, subequal. Antennae brownish, about one third the length of the body, setose; segments 14, third and fourth segments short, rather subglobose; fifth onwards elongated, subcylindrical, subequal and somewhat attenuated apically; terminal segment trinodose, moniliform; setae about twice as long as the segments. Mesonotum reddish brown, submedian lines moderately setose. Wings hyaline, densely and finely covered with dark brown hairs; costa interrupted behind its union with third vein; fifth vein rather faint terminally. Legs dark brown, thickly scaled. Claws simple, slender, strongly curved. Empodium about three fourths the length of the claws. Scutellum prominent, brick-coloured, setose; post scutellum pale reddish brown. Abdomen reddish brown. Ovipositor about one fourth the length of the abdomen, yellowish brown; terminal lamellae small, linear-oblong and with a few long setae.

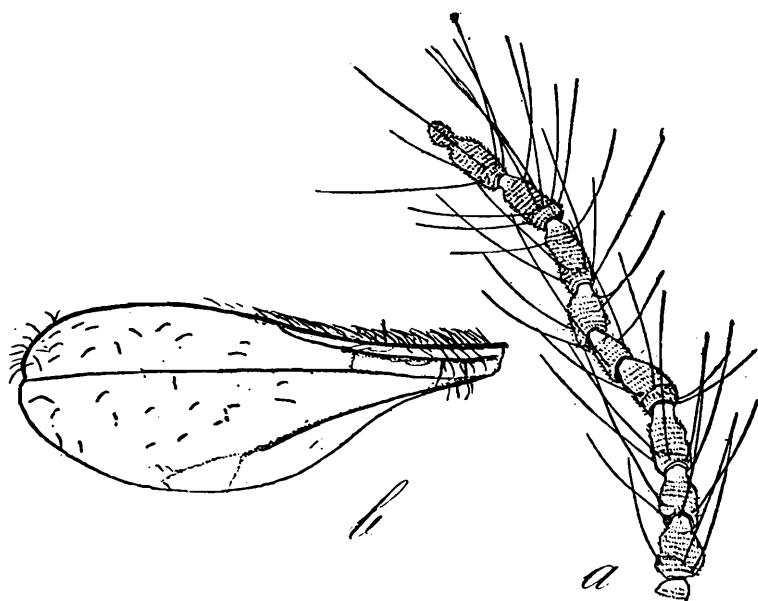
*Cotypes*.—One female partly dissected on slide No.  $\frac{1063}{H\ 6}$ . One female dry on card No.  $\frac{1064}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Nos. 60-64. In the collections of the Forest Research Institute, Dehra Dun.

*Type-locality*.—Jhajra, Dehra Dun. (U. P.), Coll. N. C. Chatterji, 4-6.xii.1924.

*Habitat*.—*Ficus rumphii*.

**Meinertomyia inaequipalpis**, sp. nov.

*Female*.—0.75 mm. long. Body pale reddish brown in the dry and deep red in the fresh specimens, densely setose. Palpi moderately long, sparsely covered with short setae; first segment longest, with a length about twice its diameter; second segment a little shorter than the first and nearly as stout; third segment a little longer and stouter than the



TEXT-FIG. 1.—*Meinertomyia inaequipalpis*, sp. nov. a. antenna; b. wing.

second, broadly ovoid. Antennae about half the length of the body, setose, dark brown; segments 14; first two segments large, globose; third, fourth and fifth segments subequal and subcylindrical; sixth

segment a little longer and subconical; tenth and eleventh subequal and subcylindrical; thirteenth shorter and napiform; terminal segment rather small and pyriform. Mesonotum black in front and dark reddish brown behind, submedian lines setose. Wings hyaline, more densely clothed with long, black hairs than in *M. aequipalpis*; anal margin fringed with very long, slender, black hairs; costa interrupted behind its union with the third vein; fifth vein faint terminally. Legs dark brown, rather darker and somewhat longer than in *M. aequipalpis* and rather very thickly clothed with scales. Claws simple, somewhat relatively more slender, moderately sharply bent. Empodium half the length of the claws. Scutellum prominent, light brick red in colour and finely pubescent, post scutellum darker. Abdomen deep reddish. Ovipositor somewhat long, terminal lamellae linear-elliptic and sparsely setose.

*Cotypes*.—Two females partly dissected on slides Nos.  $\frac{1065}{H 6}$  and  $\frac{1066}{H 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Also several examples dry on card No.  $\frac{1067}{H 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Type-locality*.—Srimangal, Sylhet, Assam. Coll. D. J. Atkinson, 27-x-1927, ex. *Odina wodier* Roxb.; Kotdwara, Lansdowne, (U. P.), Coll. B. M. Bhatia, 19-x-1934, ex. green shoots of Bamboo.

*Other localities*.—Moiyanala, Jubbulpore, (C. P.), Coll. S. N. Chatterji, 20-29.x.1934, ex. *Odina wodier* Roxb., and *Buchnanian latifolia*; Samsingh, Kalimpong, Bengal, N. C. Chatterji, 24-x-1934, ex. *Polyantha simiarum*; New Forest, Dehra Dun, R. N. Mathur, 7-25.xi.1932, ex. *Morus alba* hin.

#### Subfamily ITONIDIDINAE.

#### Tribe PORRICONDYLIARIE.

#### Genus *Bainidiplosis*, nov.

This new genus, with which I associate the name of Dr. Baini Prashad, Director, Zoological Survey of India, is erected to accommodate a series of midges received from the Forest Entomologist, Forest Research Institute, Dehra Dun. This genus falls in Felt's key to the genera in the series having the cross vein forming a well marked angle with costa. It resembles *Winnertzia* Rond. and its allies in having four longitudinal veins and a free sixth vein, but differs in having the fifth vein forked. Its relationship to the known genera of the *Winnertzia* series of Porricondylariae is shown in the key below which is modified from Felt.<sup>1</sup>

- |                                                                                                                    |                                  |
|--------------------------------------------------------------------------------------------------------------------|----------------------------------|
| I. Four long veins, fifth vein obsolete or if present simple, sixth vein free.                                     |                                  |
| A. Fifth vein arising from the third vein near the cross vein; a supernumerary vein at the basal third of subcosta | <i>Diallactes</i> Kieff.         |
| B. Fifth vein arising from the base of wing; no supernumerary vein.                                                |                                  |
| 1. Fifth vein well developed, circumfili horse-shoe-shaped                                                         | <i>Winnertzia</i> Rond.          |
| 2. Fifth vein obsolete basally and apically                                                                        | <i>Gonioclema</i> Skuse.         |
| 3. Fifth vein absent                                                                                               | <i>Parwinnertzia</i> Felt.       |
| II. Four long veins, fifth vein well developed, forked, sixth vein free                                            | <i>Bainidiplosis</i> , gen. nov. |

<sup>1</sup> Felt, E. P., *Bull. N. Y. St. Mus.*, No. 257, p. 139, (1925).

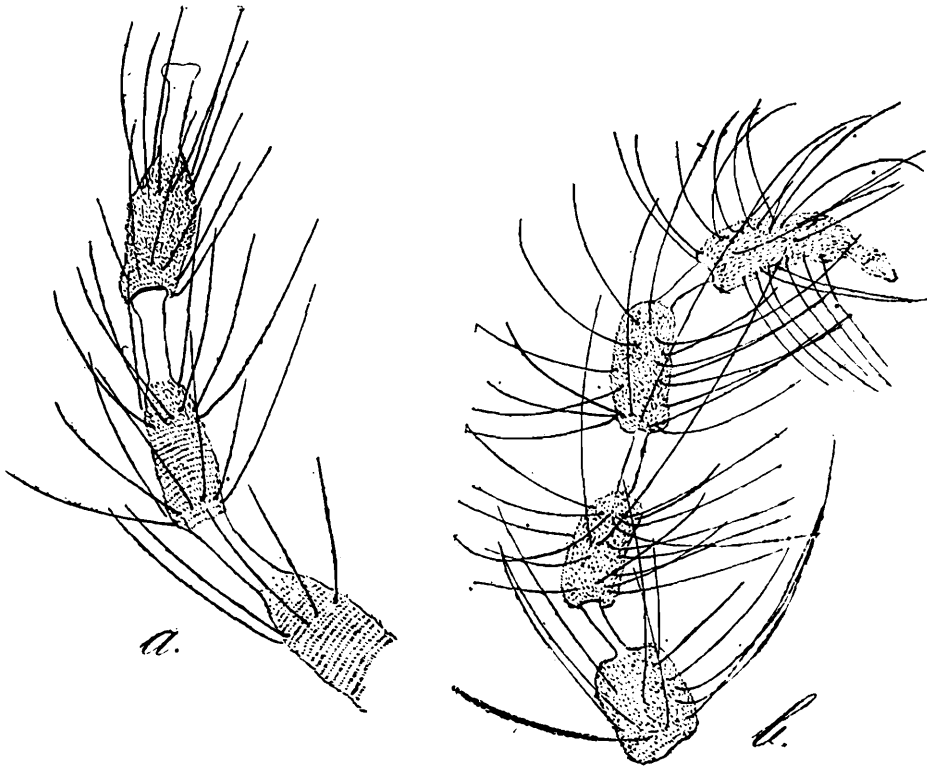
The following are the characters of this genus :

Palpi quadriarticulate. Antennal segments 14 in female, cylindrical, with moderately long stems and circumfilum normal, *i.e.*, not horse-shoe-shaped as in the genus *Winnertzia* Rond. Wings hyaline, with four longitudinal veins ; costa well developed ; cross vein forming a large acute angle with costa ; third vein reaching margin beyond the apex of wing ; fourth and fifth veins well developed, the latter broadly forked, branches of the fork unequal and faint apically ; sixth vein moderately developed and free, reaching to about three fourths the length of the fifth vein. Claws unidentate. Ovipositor short. Male genitalia moderately large ; dorsal plate small, divided into two subtriangular lobes with rounded sides ; ventral plate a little longer ; harpes shorter than style, but longer than both dorsal and ventral plates, truncate apically ; style moderately stout, about one fourth longer than the basal clasp segment ; latter not very large of almost uniform thickness ; terminal clasp segment as long as the basal clasp segment and bidentate apically.

*Genotype*.—*Bainidiplosis championi*, sp. nov.

***Bainidiplosis championi*, sp. nov.**

*Female*.—1.5 mm. long. Body brownish yellow, moderately setose and somewhat hunch-backed with the head partially hidden under the thorax. Frons pale yellowish. Palpi brownish, moderately densely setose, quadriarticulate ; first segment cylindrical, with a length about four times its diameter ; second segment subfusiform, almost as long

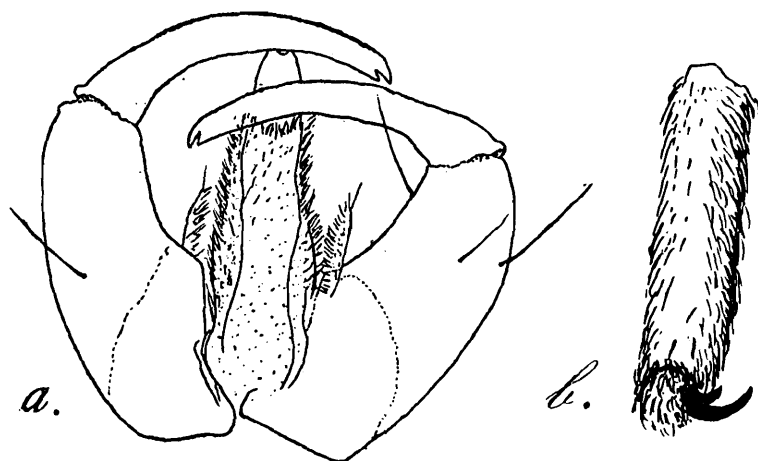


TEXT-FIG. 2.—*Bainidiplosis championi*, sp. nov. a. basal antennal segments of female ; b. apical antennal segments of female.

as and somewhat stouter than the first, length also about one and a half times its own diameter ; third segment a little longer and more slender than the second ; fourth segment a little longer and more slender than the third and rounded at the tip. Antennae about as long as the body,

yellowish brown, moderately hairy, with 14 cylindrical segments; scape large, pale yellowish, flagellate segments brownish; third segment long, fused with the fourth, with a stout stem about three fourths the length of the enlargement; fourth segment a little shorter than the third, stout basally and somewhat slender apically, stem slender, about one fourth the length of the enlargement; fifth segment a little shorter than the fourth, enlargement slightly more slender, of uniform thickness, stem about two thirds the length of the enlargement; sixth segment nearly equal to the fifth; seventh somewhat shorter, enlargement stouter apically than basally, stem about one fifth shorter than the enlargement; eighth segment similar to the seventh; tenth segment with a stem about half the length of the enlargement; thirteenth segment similar to the tenth; terminal segment slender, about twice the length of the thirteenth, enlargement uniformly thick, broadly rounded apically, with the prolongation roughly one half more slender and shorter than the enlargement. Mesonotum yellowish brown, submedian lines sparsely haired. Scutellum pale yellowish. Wings hyaline, moderately long and narrow, moderately hairy; costa thickly haired; proximal branch of the fork of the fifth vein reaching the posterior margin of wing before the basal half, distal branch reaches the margin with the fourth vein beyond the basal three fourth. Legs mostly pale straw-coloured and moderately setose. Claws unidentate on all legs, slender, moderately long, sharply bent; tooth long and moderately stout and curved. Pulvilli and empodium well developed, as long as claws. Abdomen somewhat longer than the rest of the body, slender, depressed, yellowish ventrally and grayish dorsally, moderately hairy. Ovipositor short.

*Male*.—1.5 mm. long, yellowish brown. Palpi presumably quadriarticulate long, pale yellow; first segment very stout, long, conical; second segment more slender and about one half longer than the first segment. Antennae lost. Mesonotum yellowish. Halteres short and slender. Genitalia moderately large. Dorsal plate small, deeply divided into two subtriangular lobes with rounded outer margins. Ventral plate a little



TEXT-FIG. 3.—*Bainidiplosis championi*, sp. nov. a. male genitalia; b. terminal segment of tarsus of fore leg with claw.

longer than the dorsal plate, bilobed, hairy and apparently emarginate. Harpes about three fourths the length of the style, rather broadly emarginate near the apex and somewhat deeply truncate. Style projecting a little beyond the basal clasp segment, with a length roughly five times

its diameter, somewhat constricted just above the base and swollen at about the basal three fourth and broadly rounded at apex. Basal clasp segment with a length roughly twice its breadth, very slightly narrowed near the apex, sparsely setose. Terminal clasp segment nearly as long as the basal clasp segment, somewhat stout basally, slightly curved and bidentate at the moderately chitinised apex.

*Cotypes*.—One female partly dissected on slide No.  $\frac{1068}{H\ 6}$ . One female on pin, No.  $\frac{1069}{H\ 6}$ . One male partly dissected on slide No.  $\frac{1070}{H\ 6}$ . In the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta, and one male partly dissected on slide No.  $\frac{1071}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Type-locality*.—Mundali, 8,600 ft., Chakrata, Coll. H. G. Champion, 1-13.xii.1927.

*Habitat*.—Ex. *Quercus dilatata*.

### Genus *Colpodia* Winn.

1934. *Colpodia*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 385.

The one Indian known species of *Colpodia*, *C. fletcheri* Felt, recorded in my previous paper was provisionally referred to this genus by Felt. In this species the cross vein is not at right angles to the costa as in the other species of the genus but runs almost parallel to it.

I describe here one new species, under the name *C. dhakae* from the material received from the Forest Entomologist, Dehra Dun. This new species resembles *C. fletcheri* Felt in its 15 antennal segments but differs in having the cross vein forming a right angle with costa. These two Indian species fall between *C. pratensis* Felt and *C. maculata* Felt in Felt's key to the American species<sup>1</sup>; and they may be separated from each other by the key given below.

#### Key to Indian species.

- |                                                                             |                             |
|-----------------------------------------------------------------------------|-----------------------------|
| I. Cross vein almost parallel with costa                                    | <i>C. fletcheri</i> Felt.   |
| II. Cross vein not parallel with costa but forming a right angle with costa | <i>C. dhakae</i> , sp. nov. |

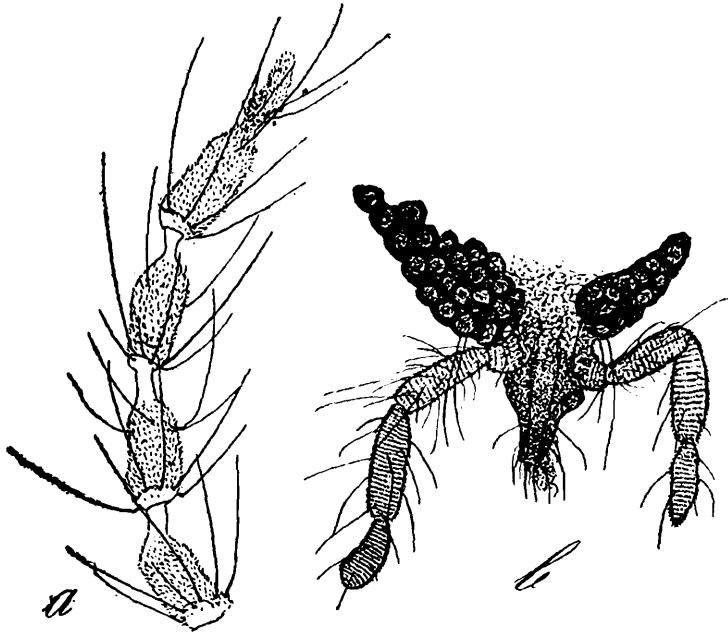
### *Colpodia dhakae*,<sup>2</sup> sp. nov.

*Female*.—About 1.5 mm. long. Body yellowish brown and moderately setose. Palpi quadriarticulate, somewhat long and brownish; first segment short; second segment about twice the length of the first, apparently slender basally and clothed with denser and longer setae than the other segments; third segment about as long as the second and moderately setose; fourth segment about half the length of the third but somewhat more setose. Mouth parts somewhat prolonged and about as long as the first two palpal segments. Antennae about

<sup>1</sup> Felt, E. P., *Bull. N. Y. St. Mus.*, No. 124, p. 416, (1908).

<sup>2</sup> *Dhakae* from *dhak* the vernacular name of the plant *Butea frondosa*, on which the species was taken.

half the length of the body ; segments 15 ; third segment short, slender, somewhat attenuated beyond its basal half ; fourth segment one fourth longer than the third, stout, reduced up to the basal one sixth, sub-cylindrical beyond, with a stem about one fourth the length of the segment ; fifth a little shorter than half the length of the fourth, some-



TEXT-FIG. 4.—*Colpodia dhakae*, sp. nov. a. antennal segments ; b. mouth parts.

what more slender, with a stem about as long as the enlargement ; sixth about one and a half times the fifth, somewhat more slender, with a stem about one fifth the length of the segment, *i.e.*, a little longer than one third the enlargement ; segments nine and ten with stout enlargements and slender stems ; eleventh nearly equal in length to the tenth, somewhat more slender, with a stem a little shorter than that of the tenth ; twelfth one half longer and somewhat more slender than eleventh, stem about one fourth the length of the enlargement ; thirteenth nearly equal to twelve, somewhat stouter, stem nearly equal to but more slender than that of the twelfth ; fourteenth fused with the fifteenth, a little shorter than thirteenth, stem almost suppressed ; the terminal segment apparently three fourths the length of the fourteenth, swollen basally, with a prolongation about twice the length of the enlargement. Mesonotum brown, submedian lines haired. Wings long, narrow, moderately thickly setose ; cross vein at right angles to costa. Legs dark brown, densely hairy. Claws simple, slender, strongly curved. Pulvilli absent. Empodium rudimentary. Scutellum yellowish brown, post scutellum lighter. Halteres brown and moderately setose. Abdomen more than twice the length of the thorax, yellowish brown, sparsely setose. Ovipositor apparently aciculate, moderately long, yellowish ; terminal lobes very short.

*Holotype*.—One female partly dissected on slide, No.  $\frac{1072}{H 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Paratypes*.—Two examples dissected on slides, Nos.  $\frac{1073}{H 6}$ ,  $\frac{1074}{H 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Type-locality*.—Lachiwala, Dehra Dun (U. P.), Coll. Forest Entomologist, 9-xii-1928.

*Habitat*.—On *Butea frondosa* (*dhak*).

### Tribe OLIGOTROPHIARIAE.

#### Genus *Misopatha* Kieff.

1913. *Misopatha*, Kieffer, *Bull. Soc. Hist. Nat. Metz*, XXVIII, p. 48.

1913. *Misopatha*, Kieffer, *Gen. Ins.*, fas. 152, p. 44.

1925. *Misopatha*, Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 150.

1934. *Misopatha*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 405.

This genus, not previously recorded from India, comprises about sixty species, distributed all over Asia, Europe, Africa and the Americas. Most of the species of this genus appear to breed in shoot galls of various plants chiefly sturdy herbs, shrubs and small trees.

The genus is closely related to *Rhopalomyia* Kieff. and *Panteliola* Kieff., recorded in my previous paper but is distinguished by its uniarticulate palpus. Numerous species referred to the genus *Rhopalomyia* by Felt<sup>1</sup> have been transferred to *Misopatha* by Kieffer in his monograph in the *Genera Insectorum*.

The genus is recognised by the following characters :

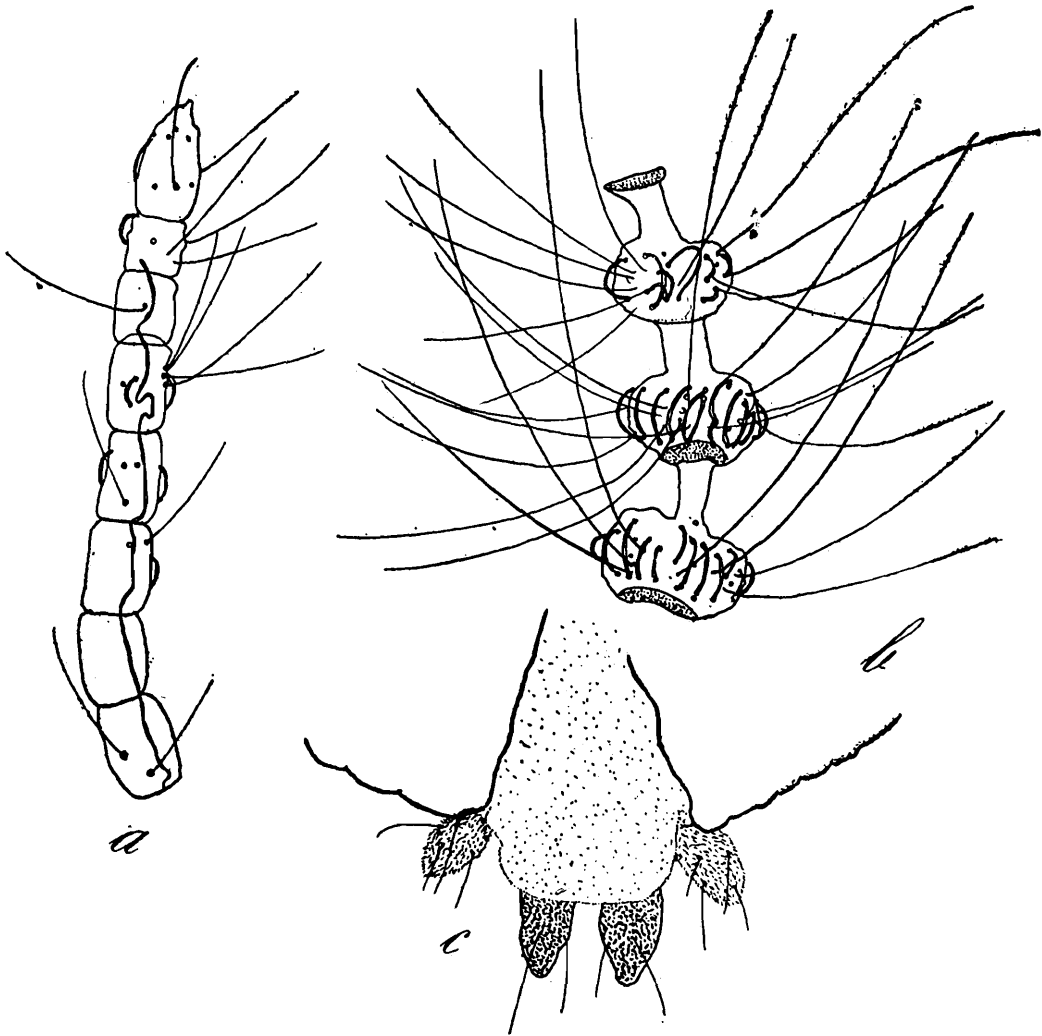
Palpi uniarticulate. Antennae with variable number of (generally numerous) segments ; flagellate segments short, stout and long-stemmed in male ; subsessile or sessile in female ; circumfila not reticulated ; third flagellate antennal segment not heavier and with no more circumfili than the rest of the segments. Wings broad, costa moderately finely haired, third vein united with costa a little beyond the apex of wing. Claws simple, stout, as long as the empodium or nearly so, pulvilli distinctly shorter than empodium. Ovipositor more or less constricted, not aciculate, not strongly chitinated, protractile, terminal segment pouch-like, with a ventral lobe at base. Terminal clasp segment of male genitalia large and swollen ; dorsal plate bilobed.

#### *Misopatha tamaricis*, sp. nov.

*Female*.—2.75 mm. long. Body brownish black and sparsely setose in the dry specimen. Palpus uniarticulate, elongate, subcylindrical, with a length about four times its diameter, one fourth longer than the trophus, reduced to a rounded tip beyond the basal three fourth, densely scattered with groups of stout stiff hairs. Antennae very short, not very much longer than the height of the head, brown, sparsely setose with 14 segments, segments seven to eleven subequal, with lengths roughly two fifths greater than their diameters ; twelfth segment a little shorter than eleventh ; thirteenth segment about half the length of eleventh ; fourteenth segment about twice the length of the thirteenth, rather stout in the middle and somewhat abruptly reduced to a blunt apex beyond. Mesonotum brownish black, submedian lines naked. Wings hyaline,

<sup>1</sup> Felt, E. P., *Bull. N. Y. St. Mus.*, No. 180, pp. 127-288, (1915).

finely and densely hairy, anal margin fringed. Legs mostly brownish straw-coloured, densely setose. Claws simple, slender, slightly curved.

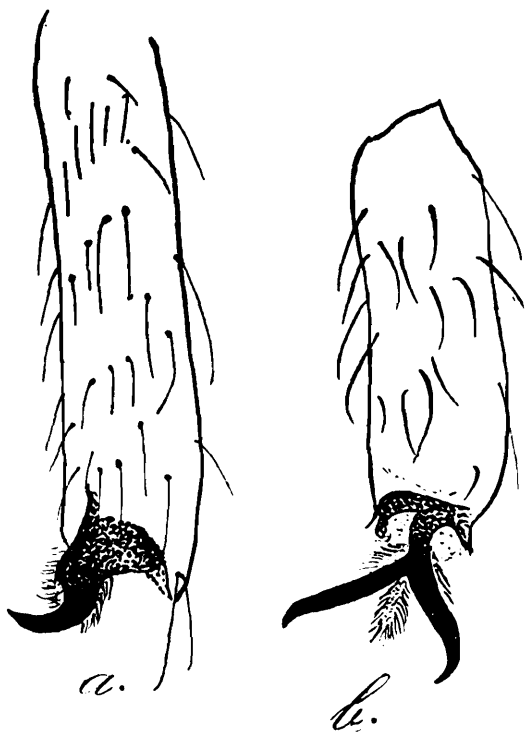


TEXT-FIG. 5.—*Misospatha tamaricis*, sp. nov. a. terminal antennal segments of female; b. basal antennal segments of male; c. mouth parts of male.

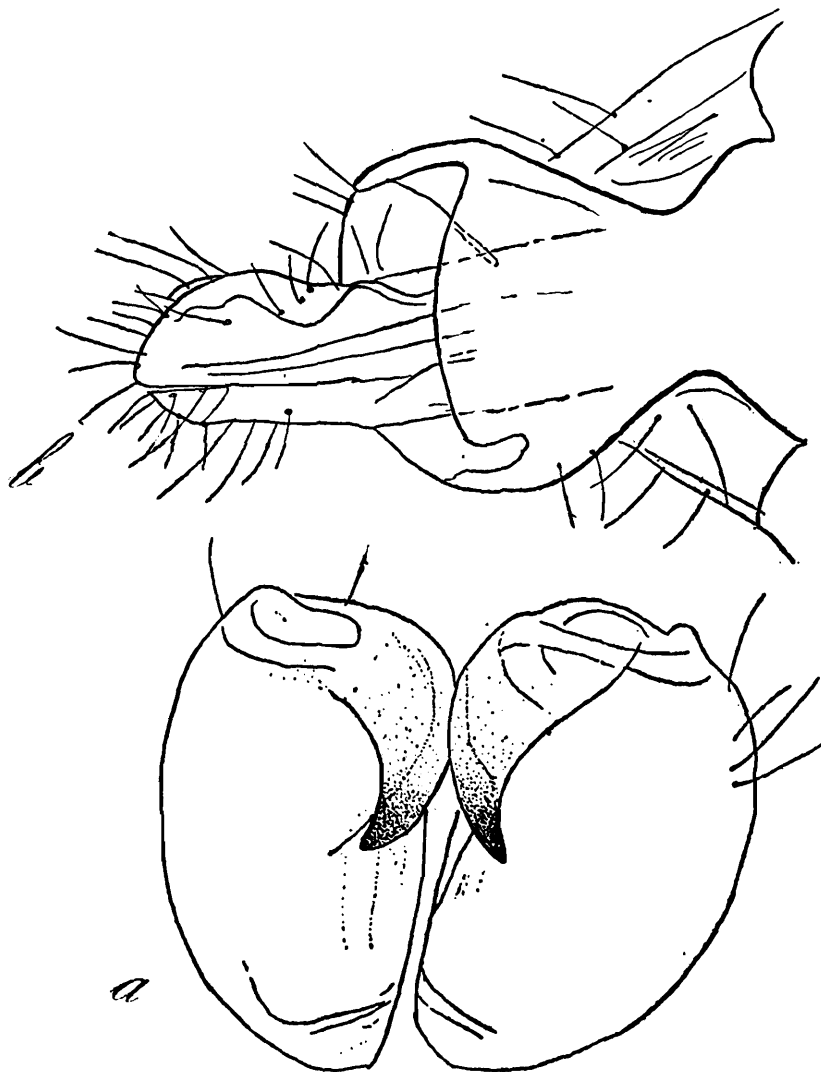
Pulvilli somewhat shorter than empodium, the latter being short and rounded at tip. Scutellum dark brown, with long setae. Post scutellum brownish. Halteres setose. Abdomen about two thirds the length of the body, stout, conically and abruptly reduced posteriorly, dark brownish and moderately setose. Ovipositor strongly constricted, moderately long, finely and shortly setose.

*Male*.—About 3.25 mm. long. Has the same general body colour as female in the pinned specimen and also appears to be somewhat less hairy. Palpus uniarticulate, somewhat shorter and stouter than that of female, subovate, truncate apically, with a length roughly twice its greatest diameter in the middle and about one fourth shorter than trophi and with a few long setae in addition to short stiff ones. Antennae less than half the length of body, segments presumably 18; segments three to seven rather stout, shortly cylindrical, with slender stems nearly equal to the enlargements; rest of the segments relatively more slender, elongate-cylindrical, with rather stout, somewhat conically tapering stems nearly equal to the enlargements; segments fifteen and sixteen

subequal ; segment seventeen a little shorter, with a very long stem ; terminal segment a little shorter than the one immediately preceding it,



TEXT-FIG. 6.—*Misopatha tamaricis*, sp. nov. *a.* terminal segment of tarsus of male with the claw ; *b.* terminal segment of tarsus of female with the claw.



TEXT-FIG. 7.—*Misopatha tamaricis*, sp. nov. *a.* male genitalia ; *b.* ovipositor.

broadly conic-ovate, rounded at tip ; circumfili not very low. Mesonotum, scutellum, post scutellum and abdomen apparently similar to those of female. Halteres densely setose. Legs sparsely setose, terminal tarsal segments somewhat stouter than the others. Claws simple and moderately stout. Pulvilli less than half the length of the empodium, which latter is ovate and as long as or somewhat longer than claws. Genitalia dark brown, densely clothed with long setae and rather *strongly* chitinated ; basal clasp segment roughly forming a square, emarginate basally and strongly chitinated apically ; terminal clasp segment dark reddish brown, slender and reduced towards the tip, which latter is black and moderately setose.

*Cotypes*.—One female partly dissected on slide, No.  $\frac{1075}{H\ 6}$ . One female dry on pin, No.  $\frac{1076}{H\ 6}$ . Two males partly dissected on slides, Nos.  $\frac{1077}{H\ 6}$ ,  $\frac{1078}{9\ H}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta, and four females on pins in the collections of the Forest Research Institute, Dehra Dun.

*Type-locality*.—Ghazighat, Multan, Punjab, Coll. R. N. Mathur, 15-ii-1929.

*Habitat*.—In galls of *Tamarix dioica*.

*Galls*.—About 5 to 10 mm. Globose or irregular, hard, woody, corticose (?) multicellular, acystiferous growths on branches. Cell proliferation apparently takes place in the cortex of the branches. Dry galls are brownish black in colour.

### Tribe *ITONIDIDINARIAE*.

#### Subtribe BIFILA.

#### Genus *Odinadiplosis*, nov.

This new genus is erected for a midge which I bred from very remarkable solid galls on leaves of *Odina wodier* Roxb. described below. The genus is readily distinguished from all others of the Bifila group of the Itonididinae by the biarticulate palpi. This is the first record of midges with biarticulate palpi in the aforesaid group ; and possibly many more forms with a similar character await discovery. The genus would run in Felt's key (*loc. cit.*) between the series of genera with triarticulate palpi and the series with uniarticulate palpi.

The following is a full description of the genus :

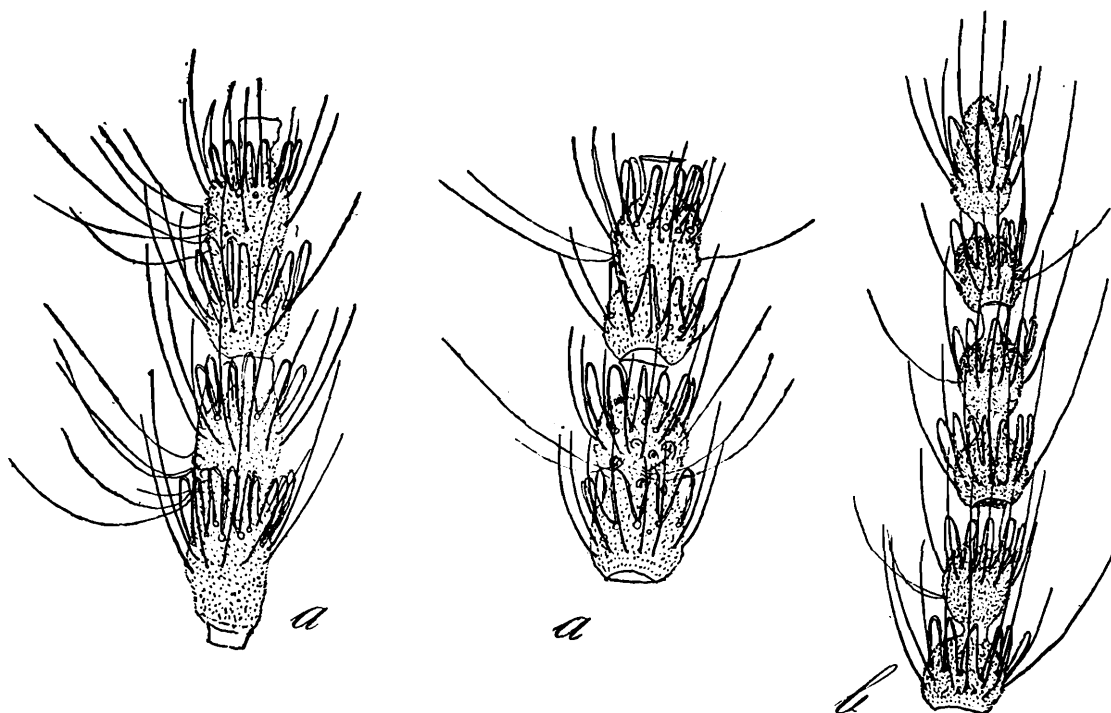
Palpi biarticulate. Antennal segments 14 in both sexes, basal four segments of the flagellum of the male subcylindrical and more or less constricted in the middle, rest of the segments binodose, circumfili in two equal moderately long whorls. Wings hyaline, with three long veins, third vein uniting with margin a little behind the apex, forks of the fifth vein rather faint. Claws simple on all legs. Ovipositor subaciculate, moderately long and exserted. Male genitalia rather densely hairy. Dorsal plate small, broadly and roundly bilobed. Ventral plate moderately large, entire, emarginate apically and a little longer than the dorsal

plate. Basal clasp segment large, slightly emarginate internally. Terminal clasp segment short, with a heavily chitinated, pectinately dentate apex and subapical striations.

*Genotype*.—*Odinadiplosis odinae*, sp. nov.

***Odinadiplosis odinae*, sp. nov.**

*Female*.—Length 3.5-4.0 mm. Body moderately hairy, mostly golden yellow in colour before, and brownish yellow after oviposition. Antennae about one third the length of body, segments 14; flagellate segments brownish yellow, densely hairy and with long stems. Palpi biarticulate, short, stout, sparsely setose; first segment slender, elongate, cylindrical; second segment relatively stouter, conic-ovate, almost as long as first segment. Mesonotum black. Scutellum dark brown.

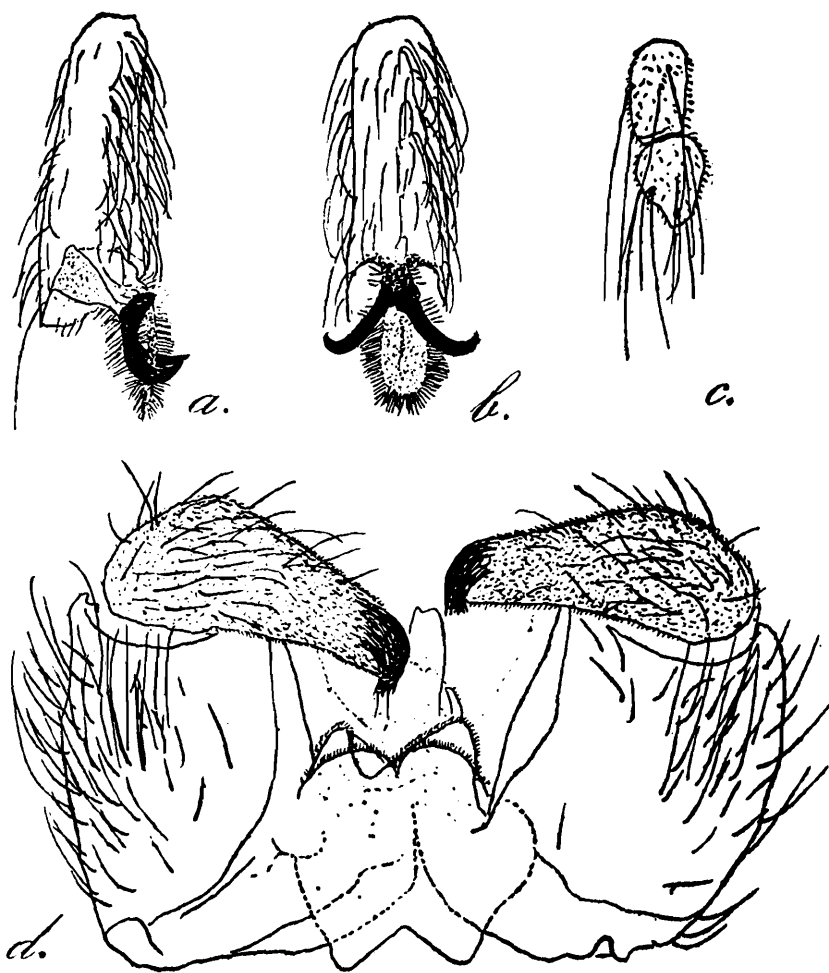


TEXT-FIG. 8.—*Odinadiplosis odinae*, sp. nov. a. basal antennal segments of male; b. terminal antennal segments of male.

Post scutellum darker. Wings hyaline, with three long veins, third vein uniting with margin just behind the apex of wing, fifth vein obsolete apically. Legs mostly brown. Claws simple on all legs, moderately curved in hind legs and somewhat strongly curved in the fore legs. Empodium large and nearly as long as claws. Halteres long. Abdomen about five eighths the length of body, stout, deep golden yellow, segments 1-3 a little black dorsally. Ovipositor exerted, about one eighth the length of body, slender, somewhat smoothly curved downwards, basal lamellae rather very long, terminal lamellae about one tenth the length of basal lamellae.

*Male*.—Length 3.0 mm. Body black and sparsely haired; dark brown in old specimens. Palpi short, moderately densely clothed with long setae; first segment subcylindrical, with a length about twice the thickness; second segment cordate-pyriform, broadly rounded basally and bluntly pointed apically, with a length about one fifth greater

than the thickness. Antennae about half the length of body, brownish, thickly haired, segments 14; third segment with a length about four times its diameter, stem about one eighth the length of segment; fourth, fifth and sixth segments subequal and nearly three fourths the length of third, with stems about one fifth to one sixth the segments, constricted in their middle; seventh a little longer than sixth, distinctly binodose, with a stem about one fourth to one fifth the segment; segments eight to thirteen subequal (and of the same length as the seventh), binodose, basal and apical enlargements of equal diameters, stems one tenth and one fifth the segments; terminal segment distinctly longer than the preceding segments, with a basal pyriform swelling, apical subconical swelling about twice the length of the basal enlargement, and a stem about one fifth the length of basal enlargement; circumfila equal, as long as the stems of enlargements. Mesonotum pale brown, with the submedian lines haired. Scutellum dirty white and rather thickly haired. All legs dirty white and somewhat densely setose. Claws simple on all legs, moderately curved. Empodium somewhat longer than claws. Wings hyaline, with three long veins, third vein uniting with margin just behind the apex of wing, fifth vein obsolete apically. Abdomen somewhat shorter than the rest of the body. Genitalia rather densely clothed



TEXT-FIG. 9.—*Odindiplosis odinae*, sp. nov. a. claw of the fore leg of male; b. claw of the mid leg of male; c. palpus; d. male genitalia.

with long setae. Dorsal plate short, with two broadly rounded lobes. Ventral plate a little longer than dorsal plate, emarginate. Harpes

about as long as the basal clasp segment. Basal clasp segment with a length about twice its breadth, emarginate basally and on the inner side, densely hairy behind and on the outer side. Terminal clasp segment a little over half the length of basal clasp segment, apex heavily chitinated, black and longitudinally striate, ending in numerous pectinate teeth.

*Cotypes*.—One female partly dissected on slide and several females in spirit. Nos.  $\frac{1079}{H\ 6}$ ,  $\frac{1014}{H\ 6}$ ,  $\frac{1080}{H\ 6}$ . Two males partly dissected on slides Nos.  $\frac{1081-86}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Type-localities*.—Borstal School Farm, Tanjore, Madras Presidency, Coll. M. S. Mani, 19-xii-1928 ; Tollygunj, Calcutta, Coll. M. S. Mani, 21-vii-1935.

*Distribution*.—Tanjore, Vellore, Calcutta.

*Galls*.—The galls are local or extensive tumescence of the rachides, petioles, midribs and veins of the leaves. They have not been described so far ; this is also the first record of any galls on *Odina wodier*.

10-15 mm. in diameter. Regular, simple, globose ; or much larger, ranging from 10-20 mm., irregular, compound, ovoid, moniliform ; yellowish brown, glabrous when young and covered with minute patches of scattered brownish scales when mature ; solid, carnos, succulent, cystiferous, indehiscent ; cysts L-shaped, the opening of the cyst to the surface closed by the thin epidermis before the escape of the adult midges, rather thick and moderately hard. Minute circular holes are found on the surface of the galls from which the adults of the midges have escaped. Generally a single midge develops inside one simple gall, though two to three midges issue from the compound ones.

The epidermis surrounds a large parenchyma of concentric layers of oblong cells, which become rounded ones towards the centre of the gall. There is no cortex or medulla comparable to that of the normal stem. The cells in the immediate neighbourhood of the larva in young galls are small and meristematic, while in the older galls they tend to become collenchymatous. The cyst consists of closely packed, thick walled, sclerenchyma cells ; the innermost layer often has the cavity of the cells completely blocked up. Irregular groups of vascular bundles, occasionally with portions of normal cortex of the part attacked, are generally found near the surface immediately below the epidermis of gall, sometimes however rather deep in the interior. The seat of cell proliferation is the cortex of the parts attacked.

The number of galls on one leaf averages from about one to ten. Galls form abundantly from June to March, when the tree is in leaves.

*Biology*.—The adult female midge rests near the veins on the under side of the leaflets, curves down the posterior end of the abdomen, feels the surface of the leaf with the tip of ovipositor, drops an egg, jumps a little forward and repeats the egg-laying. Now and then it flies from one spot to another and rapidly covers several leaflets, rachides, etc., with about one hundred eggs within about ten minutes. After oviposition the abdomen shrinks considerably in size, becomes darker in colour, while the midge itself becomes exhausted and finally drops on some leaf dead.

The eggs are golden yellow in colour, oblong-ovoid, smooth and shiny, about 0.25 mm. long, and are placed on their ends, cemented by some secretion from the mother. The larvae hatch from these eggs in about two days. Soon after hatching the larvae are colourless, transparent, cylindrical and pale yellow. They readily bore into the soft cortex of the veins or rachides thus giving rise to cell proliferation in those parts and consequent formation of galls. A well grown larva is orange yellow in colour, about 3.5 mm. long, somewhat flattened dorso-ventrally, with a well developed sternal armature at the anterior end. The larval period appears to extend from four to five weeks. Just before pupating the larva bores its way to the surface of the gall, but does not quite make a hole to the exterior, leaving the epidermis of the gall intact, so as to facilitate the easy escape of the adult when it emerges from the pupa and at the same guarding against exposure. It then retreats to the bottom of the L-shaped cyst, where it subsequently turns into a pupa and is further protected by a thin circular membrane. The pupa is found with the anterior end (cephalic end) pointing towards the external opening of the cyst. The immature pupa is about 3 mm. long and white in colour. When mature it is 3 mm. long and dirty brown in colour, with the dorsal surface arched and the ventral side rather flat. Prominent cephalic horns are present. When the adult is about to emerge from the pupa the latter wriggles to the opening of the cyst, pierces the thin epidermis with the help of the cephalic horn and sticks out on the surface of the gall. The adult comes out by bursting the anterior end of the puparium. Pupal period appears to extend to about ten days. There appear to several generation in the year. The adult seems to hibernate during the hot months when the tree is devoid of leaves. The larva is extensively parasitised by a minute Chalcidid. The galls are bored by a Lepidopterous larva, which completely eats away all the soft parts, leaving the gall a hollow bag, inside which it pupates later on.

#### Subtribe TRIFILA.

#### Genus **Horidiplosis** Felt.

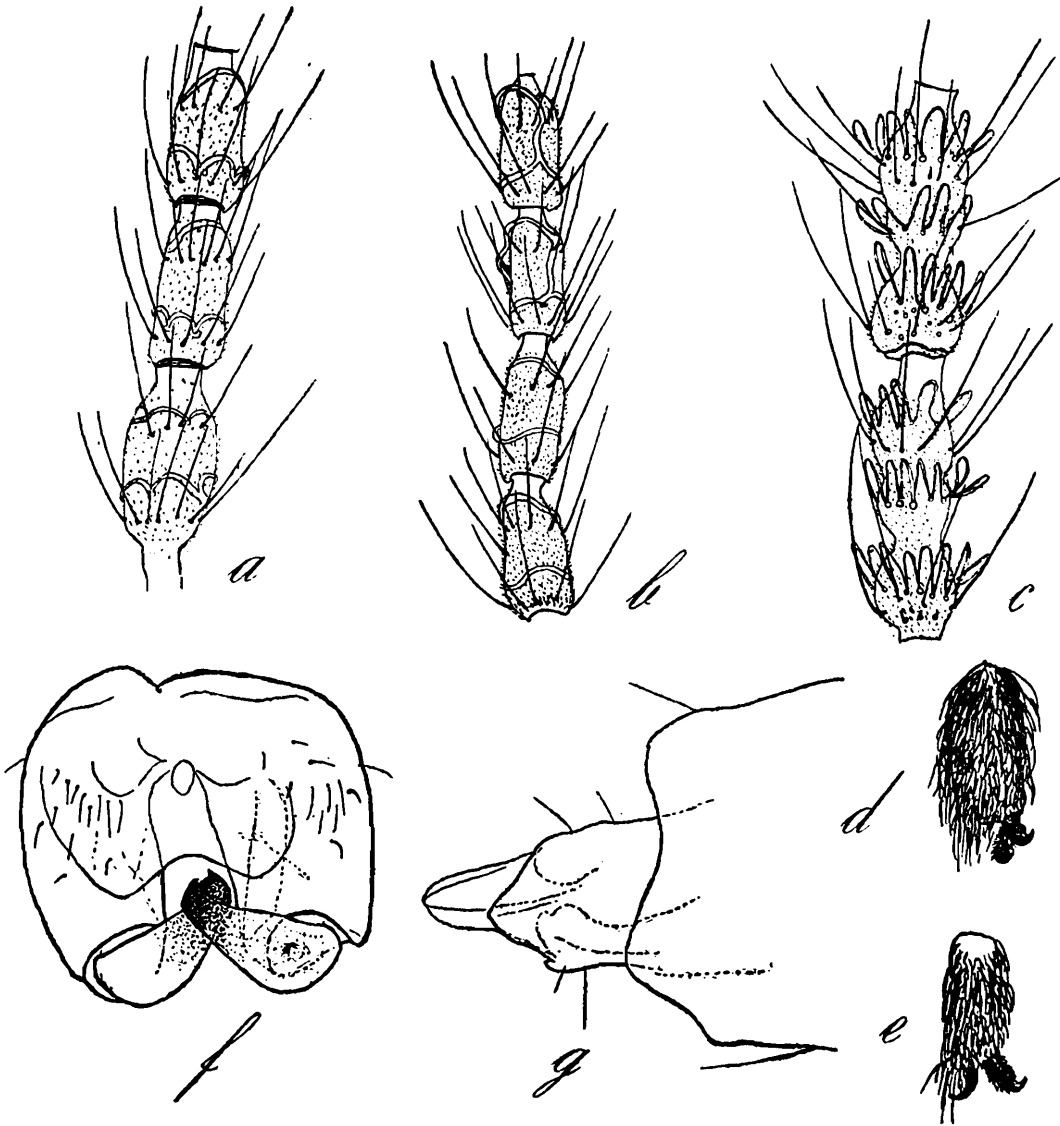
1934. *Horidiplosis*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 442.

I describe below one new species under the name *H. mathuri*, from a series of midges received from the Forest Entomologist, Forest Research Institute, Dehra Dun. This new species can be easily distinguished from *H. fici* Felt., recorded in my previous paper by reference to the key given below.

- I. Body fuscus yellow in female and dark brown in male ;  
antennae about three fourths the length of body in female  
and as long as body in male ; stem of fifth antennal  
segment one fifth the length of enlargement, which latter  
has a length three and a half times its diameter in female ;  
palpus simple, long and tapering in both sexes ;  
empodium about two thirds the length of claws . *H. fici* Felt.
- II. Body reddish brown in both male and female ; antennae  
about half the length of body in both male and female ;  
stem of fifth antennal segment about one seventh the  
length of enlargement, which latter has a length about  
twice its diameter ; palpus swollen very much basally,  
empodium about three fourths the length of claws . *H. mathuri*, sp. nov.

***Horidiplosis mathuri*, sp. nov.**

*Female*.—2 mm. long. Body reddish brown, setose. Palpi swollen basally, slender truncate, apically; with a length about three times the length of the swollen portion; covered with very short, stiff hairs. Antennae about half the length of body, reddish brown, thickly haired; segments 14; third segment fused with fourth, with a length a little over twice its diameter, stem one fifth the length of the cylindrical enlargement; fourth a little shorter and stouter than third (the length also about twice its own diameter), stem about one seventh the length of enlargement, circumfila with a low basal transverse band connected by three longitudinal bands with an apical low transverse band; fifth segment a little shorter than fourth, the enlargement with a length somewhat less than twice its diameter, stem a little shorter than that of fourth and about one eighth the length of enlargement, circumfila as in fourth;



TEXT-FIG. 10.—*Horidiplosis mathuri*, sp. nov. *a. b.* antennal segments of female; *c.* antennal segments of male; *d.* claw of male; *e.* claw of female; *f.* male genitalia; *g.* ovipositor.

sixth a little shorter, enlargement with a length about twice its diameter, stem one seventh the length of enlargement; seventh similar to sixth, circumfila with the apical transverse band apparently a little higher than in the rest of the segments; segments eight and nine similar to sixth; tenth a little shorter and rather stouter than ninth, stem about

one sixth the length of enlargement; eleventh a little longer, more slender, stem a little shorter; twelfth equal in length to tenth, stem one twelfth the enlargement; thirteenth one sixth shorter than twelfth, stem almost obsolete, enlargement long and slender; terminal segment one sixth longer than thirteenth, somewhat swollen at basal and apical one fourths of the enlargement, with a subcylindrical, subtruncate, semi-transparent apical prolongation about one-fifth the length of the enlargement, apical band of circumfila a little higher than the basal band. Mesonotum reddish brown, with submedian lines sparsely haired. Scutellum and post scutellum concolourous with mesonotum. Wings hyaline, densely hairy, anal marginal fringes moderately long. Halteres long, reddish brown, thickly setose. Legs dark brown, thickly haired. Claws simple, heavily chitinated, slightly curved subapically. Pulvilli about half the length of claws. Empodium about three fourths the length of claws. Abdomen reddish brown. Ovipositor short, stout, conical, yellowish brown; basal lobe reddish brown, moderately chitinated, sparsely setose; terminal lobe roundly subtriangular with a few short, stout, stiff setae at the tip.

*Male*.—About 2 mm. long. Body reddish brown, densely haired. Palpi short, moderately stout and tapering towards apex. Antennae presumably about half the length of body, dark brown, thickly haired, segments 14. Mesonotum dark reddish brown, submedian lines sparsely setose. Scutellum reddish brown. Claws simple, heavily chitinated, slender, somewhat curved at tip. Empodium over three fourths the length of claws. Pulvilli rudimentary. Abdomen reddish brown and densely hairy. Genitalia brownish, densely hairy. Dorsal and ventral plates almost as in *H. fici* Felt. Basal clasp segment moderately long, stout, very densely covered with long setae. Terminal clasp segment less than half the length of basal clasp segment, short, stout, napiform, setose, heavily chitinated and bidentate apically. Harpes dark brown, small and subtriangular.

*Holotype*.—One female partly dissected on slide, No.  $\frac{1087}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Paratypes*.—Two males partly dissected on slides, Nos.  $\frac{1088-89}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta, and several examples on pin, Nos.  $\frac{1090}{H\ 6}$ . In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

*Type-locality*.—New Forest, Dehra Dun (U. P.). Coll. R. N. Mathur, 23-iii-1932, 10-xi-1934.

*Habitat*.—Minute pustule-like galls on the leaves of *Ficus glomerata* Roxb.

#### B.—DESCRIPTIONS OF NEW MIDGE GALLS.

##### Natural Order CAPPARIDAE.

##### *Cadaba indica* Lamk.

*Bud and leaf galls*.—An unknown midge lays eggs on the buds and the tender leaves and the larvae hatching from them give rise to spongy

gall similar to those produced by *Cecidomyiella crataevae* Mani<sup>1</sup> on *Crataeva religiosa* Forst. differing, however, in its smaller size and relatively more spongy texture. Axillary buds generally turn into regular, globose, greenish, glabrous, unicellular, acystiferous, indehiscent galls, about 3 mm. in diameter. Generally a single maggot inhabits the gall. The gall formation on leaves is more complex, several galls forming close together, fusing into large irregular, tubercular, multicellular masses, binding the blade of leaf along its mid rib and thus causing folding up of leaf, with swollen portions. On old galls are found large, circular holes, through which the adult midge escaped.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. Miss M. Meenakshi, Girls' Christian High School Garden, Tanjore, Madras Presidency, 12-ix-1932.

### **Capparis sepiaria (?)**

*Spongy leaf gall*.—An unknown midge lays numerous eggs in the fold of the tender leaves of an evolving bud, causing very extensive cell proliferation of the leaf parenchymae. The folds are thus bound together and an oval, flattened, spongy, multicellular, acystiferous, indehiscent mass, about 20 mm. long, 10 mm. broad and 5 mm. thick is formed in the place of normal leaves. This gall looks like a common leguminous fruit, especially on account of the prominent side veins and the mid rib, which closely simulate the veins and the dorsal rib of a legume. Externally the gall is pale yellowish green and glabrous but the substance of the gall is soft, fleshy and beautiful pinkish in colour. Numerous maggots are found in the small oval cavities in the flesh of gall. There is complete degeneration of the palisade parenchyma of the leaf and the real spongy parenchyma lying just beneath the epidermis of gall turns into a sort of palisade tissue and functions as such. The midge larva is very heavily parasitized by two different Chalcids.

Two examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, Sivaganga Garden, Tanjore, Madras Presidency, 21-ix-1928.

### Natural Order TILIACEAE.

### **Grewia orientalis** Linn.

*Tricho-cecidia on leaves*.—This hairy gall resembles the 'capsule gall' on the leaf of Turkey Oak, *Quercus cerris*, produced by *Cecidomyia cerris* and the hairy galls on leaf of *Ficus nervosa* produced by *Dynopsylla grandis* Craw. recorded by Ramakrishna Ayyar<sup>2</sup> from North Malabar.

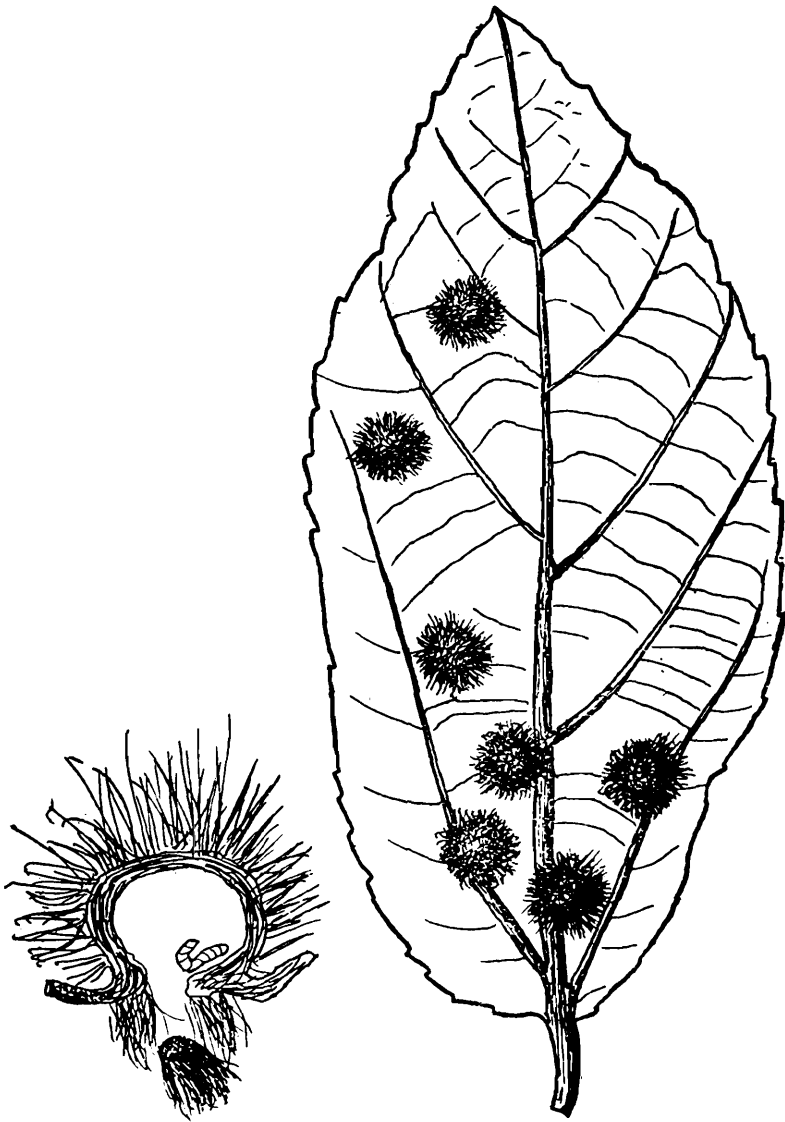
An unknown species of *Cecidomyia* lays eggs on the upper side of the tender leaves near the mid rib or some of the larger veins. The larvae hatching from these eggs produce an invagination and tumescence of the leaf, thus giving rise to a ball-like bulging on the under side of the leaf. The remarkable feature of this gall is that its cavity opens to the outside on the upper surface of the leaf by means of a stoma,

<sup>1</sup> Mani, M. S., *Rec. Ind. Mus.*, XXXVI, p. 428 (1934).

<sup>2</sup> Ramakrishna Ayyar, T. V., *Rep. Proc. Third Entomol. Meeting*, Pusa, pp. 1030-1031, pl. 173, fig. 1.

which is closed by a small, circular operculum. The adult midge pushes away this operculum when escaping from the gall. The whole gall is covered by a dense growth of long, villous hairs. The galls are more conspicuous on the under than on the upper surface of the leaf.

3-5 mm. in diameter. Regular, globose, pyriform, rarely ovoid, simple, free, sessile, acystiferous, indehiscent, unilocular; with a narrow neck-like stoma opening on upper side of the leaf; the stoma closed by a small, circular operculum before the escape of the adult midge and with a dense fringe of peristomal hairs rising from the edges of the stoma; when young covered with short, stout, whitish, long hairs; when old



TEXT-FIG. 11.—Tricho-ccidia on leaves of *Grewia orientalis* Linn.

densely clothed with stellate fascicles of long, villous, simple, ferrugineous hairs rising from minute carnosse tubercles on the outer surface; walls coriaceous, greenish, smooth on the inner side. The cavity generally contains a single stout, pale yellowish maggot in a doubled up posture and sometimes two or more larvae and pupae of Chalcid parasites of the midge. When a very large number of galls form on a single leaf reduction and deformation of the latter results.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 24-ix-1931.

## Natural Order RUTACEAE.

**Murraya exotica** Koen.

*Vermiform gall on leaflets*.—An unknown midge lays eggs on leaflets towards the end of August or beginning of September and the maggots hatching from them produce peculiar worm-like, fleshy galls on them.

Regular, cylindrical, vermiform, stout, free swellings in large numbers on the surface of the leaflets, 10 mm. long and 1-2 mm. thick; finely tubercular, transversely sulcate, with a long, deep, longitudinal slit, opening into the long tunnel of the gall; whitish, shiny, solid, soft entirely carnose when young; dry, brown, cicatrised and brittle when old; and containing a single, minute whitish maggot in the interior.

The gall comprises entirely parenchymatous cells. Veins of the leaflets entering the gall retain their integrity. The seat of cell proliferation is the parenchyma of the leaflet. The gall forms as a local tumescence of the invaginated leaflets.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 10-ix-1928.

**Aegle marmelos** Corr.

*Univalve gall*.—An unknown midge lays eggs in the opening bud about July and thus occasions numerous pouch-like growths. Instead of opening into normal trifoliate leaves, the bud turns into a cluster of three egg-shaped, ventricose, follicular, reddish brown, thick-walled galls. The galls are really the leaflets, which become folded, with their margins applied valvately together, thus leaving a slit which opens to the outside. Inside the gall often one to two maggots are found. Pupation seems to take place in the soil.

Several examples in formalin in the Collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, 24-i-1929.

## Natural Order SAPINDACEAE.

**Cardiospermum halicacabum** Linn.

*Solid floral gall*.—An unknown midge lays eggs in the flower buds towards September and produces solid fleshy galls.

Irregular, globose, ovoid, or discoid, lobed, free and highly tubercular swellings at the tip of the pedicels of the flowers; about 5-8 mm. in diameter; green or greenish yellow on the surface and greenish white within; irregularly thrown into numerous furrows and ridges, each ridge being finely tubercular and hairy, the basal part often partly enclosed in the enlarged, membranous, smooth sepals, which are closely adherent at the base to the inner swollen parts; punctae when old; solid, spongy, soft and with numerous clefts, passages and cavities, each cavity containing a single larva.

Really the galls are the irregular flowers of the umbellate panicles. The seats of cell proliferation are calyx, corolla, stamens and pistils, each lobe of the gall representing one member of the floral leaves. Enlarged sterile anthers may sometimes be found on the gall. The floral

envelopes and the essential organs of reproduction of the flower are thus completely degenerated.

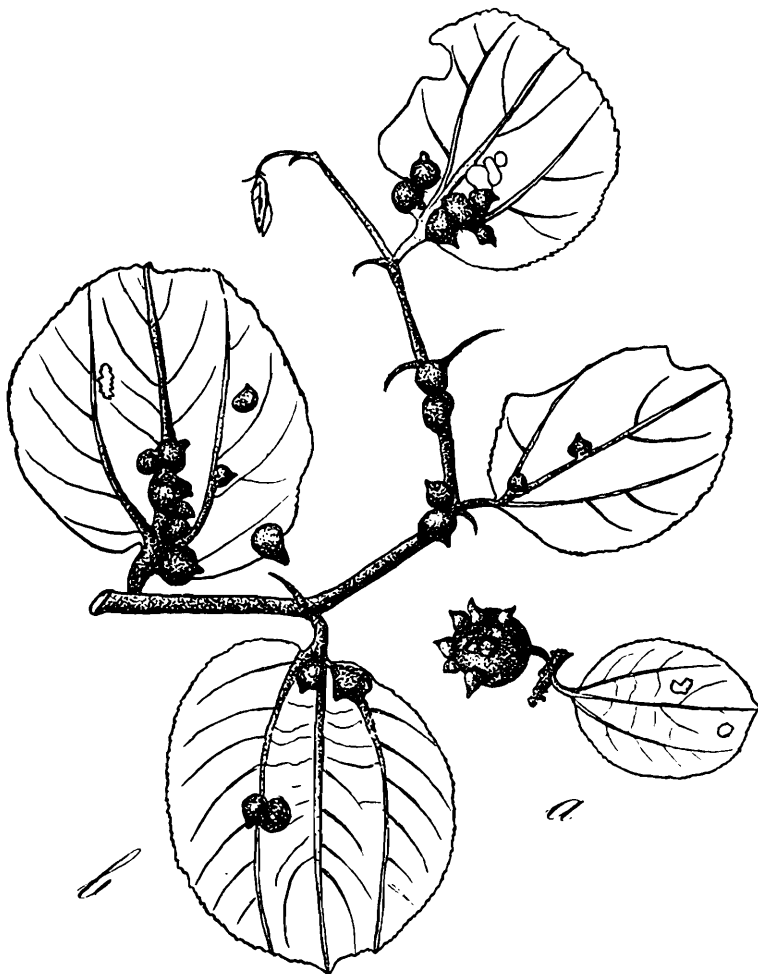
Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, 20-x-1930.

Natural Order RHAMNACEAE.

***Zizyphus jujuba* Lamk.,**

*Capsule gall*.—Towards October an unknown midge lays eggs on the tender leaves, shoots, etc., and the larvae hatching from them penetrate the outer cortex, giving rise to hollow galls. By January the larvae bore their way out of the gall, drop to the ground and pupate in the soil, probably emerging as adults in about three or four days.

3-4 mm. in diameter. Regular, simple, globose, pyriform or conic-pyriform, free, sometimes resembling a rather blunt and swollen thorn; clustered or compound; hollow, capsular, unilocular, acystiferous,



TEXT-FIG. 12.—Galls on *Zizyphus* spp. *a*. epidermal galls on fruits of *Z. xylopyra* Willd.; *b*. epidermal galls on leaves and branches of *Z. jujuba* Lamk.

indehiscent; yellowish green, glabrous or with a sparse yellowish brown tomentum; visible on both sides of the leaf. The galls on the branches are merely epidermal processes.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle, Pilliarpatti, 5 miles south of Tanjore, Madras Presidency, 30-x-1928.

**Zizyphus xylopyra Willd.**

*Epidermal gall*.—An unknown midge (probably identical with that producing the capsule gall of *Z. jujuba* Lamk.) lays eggs on the developing fruits. The maggots penetrate the subepidermal tissues and thus occasion the formation of hollow galls, very much resembling prickles with swollen bases. The seat of cell proliferation is the cortical tissue immediately beneath the epidermis.

4-5 mm. in diameter. Regular, simple, pyriform, conical, sessile, capsular, unilocular, indehiscent, acystiferous, yellowish green when young, brown and sparsely pubescent when old; free, clustered or compound. One to ten galls may form on a single fruit.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle about 3 miles east of Tanjore, Madras Presidency, 5-vii-1932.

**Zizyphus sp.**

*Leaf gall*.—An unknown midge gives rise to minute, globose, unilocular, pustule-like galls on leaves. The galls are visible on both sides of the leaves and are about 1-2 mm. in diameter.

A single leaf in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 27-ix-1932.

## Natural Order ANACARDIACEAE.

**Mangifera indica Linn.**

*Echinate gall*.—There is no previous record of the very remarkable echinate galls on leaves of the Mango, on which at least six galls are known from India.<sup>1</sup> An unknown midge produces globose, spiny galls, very much resembling a miniature sea urchin.

5-7 mm. in diameter. Regular, simple, globose, free, sessile, clustered, or compound; dark green when young, brownish black when old; solid, uni- or bi-locular, cystiferous, indehiscent; densely covered with numerous soft, fleshy, spinous processes. About a dozen galls develop on the upper side of a single leaf. Large holes, through which the adult midges escaped, are found on older galls.

Several examples dry and in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani & C. P. Sharma, Narkelgunj, near Shalimar, Howrah, 29-xii-1934.

## Natural Order LEGUMINOSEAE.

**Desmodium biarticulatum Benth.**

*Flower gall*.—An unknown species of *Asphondylia* lays eggs on the tender flower buds and thus occasions the formation of simple, globose, sometimes pyriform, solid, fleshy, acystiferous, indehiscent galls about 3-5 mm. in diameter and enclosed in the inflated calyx. Corolla, stamens, pistil, etc., are completely degenerated. A single maggot or pupa may be found inside the gall. The adult midge bores its way to the outside (?)

<sup>1</sup> Sundar Raman, A. H., *Journ. Ind. Bot. Soc.*, IV, pp. 38-39 (1924).

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 28-x-1930.

***Indigofera aspalathoides* Vahl.**

*Utricular gall*.—An unknown midge attacks the flower ; and the ovary turns into a cucumber-shaped, utricular gall.

A few examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency.

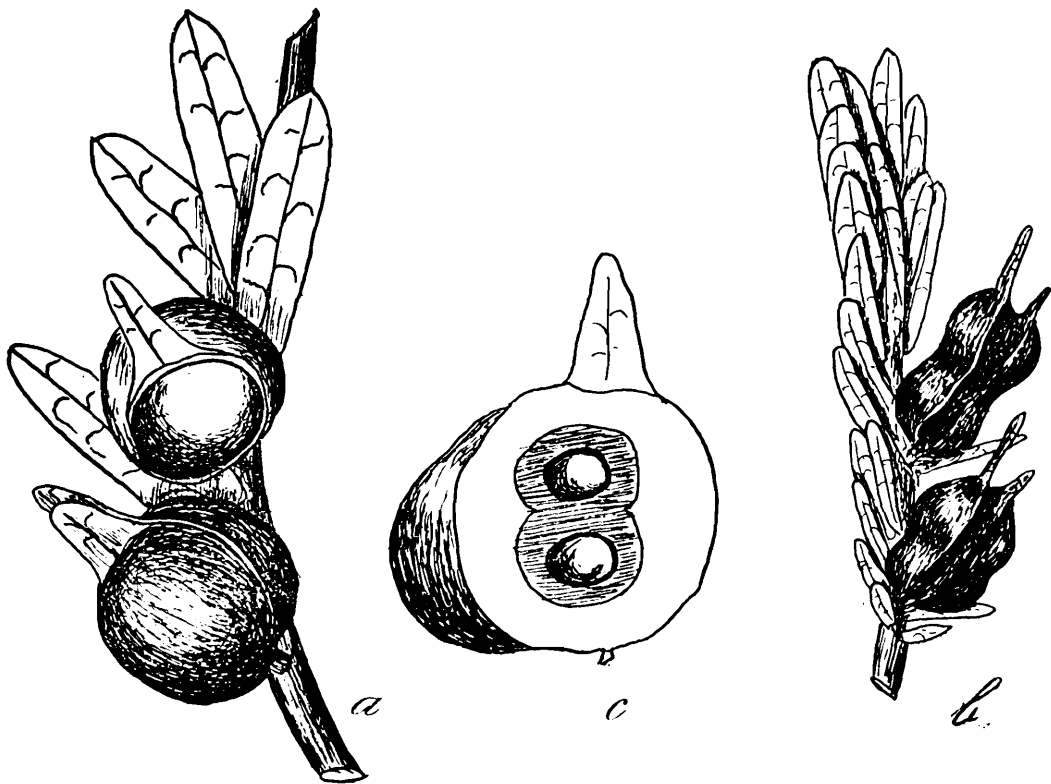
***Hopea wightiana* Wall.**

*Echinate gall*.—Numerous eggs are laid by an unknown midge in the flowers and this occasions the formation of large, globose, hard, woody, cystiferous, simple, spiny galls, about 10-15 mm. in diameter. The spines are slender basally and stout subapically. Similar galls on *H. parviflora* have been recorded by Van Leeuwen from the Netherlands East Indies. A few specimens are preserved in the Madras Herbarium, Agricultural Research Institute, Coimbatore, (Sheet Nos. 3384-3389, 3391 and 3395 ; S. Canara).

Two dry examples in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Coimbatore, 11-viii-1927

***Acacia* sp.**

*Bivalve gall*.—An unknown midge lays eggs on the tender leaf buds. As a result of the irritation produced by the developing larvae hatching from these eggs cell proliferation takes place in the leaflets. Two leaflets



TEXT-FIG. 13.—Galls on *Acacia* spp. a. bivalve gall ; b. legumiform gall c. legumiform gall cut open.

from opposite sides of the pinna swell out basally into cup-shaped, thick hollow valves, which together form a globose, winged hollow gall. The two valves are not equal in size but one is large and the other is small; the two do not fuse with each other so that a slit is left between them, *i.e.*, they are applied valvately by their margins.

2-2.5 mm. in diameter. Regular, globose, glabrous, green, hard, brittle, bialate, bibrachypedicellate, unilocular, acystiferous, indehiscent, free, simple; about a dozen or so on each pinna; the major valves about three times the size of the minor valve. The outer surface of the gall corresponds to the spongy side of the normal leaflet, while the inner surface is really the palisade surface of the normal leaflet. The outer surface of the minor valve has a strong longitudinal ridge. One (sometimes two) larva is found in the cavity of the gall.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Walayar Forest, Palghat Gap, Western Ghats, south of the Nilgris, Madras Presidency, 18-xii-1926.

### ***Acacia leucophloea* Willd.**

*Legumiform gall*.—An unknown midge lays eggs on the tender leaf buds. As a result of the irritation occasioned by the larvae hatching from these eggs two adjacent leaflets from the same side of the pinna are bound together due to cell proliferation and galls resembling a biarticulate legume are produced.

2-2.5 mm. long and 1 mm. in diameter. Regular, simple, biconvex, ovoid, hour glass-shaped or lomentum-like; rarely globose; stout, or subcompressed, sessile or with very short stalks; green, hispid, hard, brittle, thick-walled, bilocular; apically bialate. About a dozen galls are placed obliquely on the pinna. A sulcus bordered by a ridge indicate the place of fusion of the two adjacent leaflets in the course of the formation of the gall. The surface of the gall is formed by the palisade side of one leaflet and the spongy side of another leaflet, but in the gall both sides have palisade tissue. The real palisade tissue of one leaflet is completely degenerated. Below the epidermis there is a cortex of parenchymatous cells surrounding an inner cyst comprising meristematic cells. A single maggot is found in each cavity of the gall.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 16-xii-1928 and 3-viii-1932.

*Pubescent gall on leaf*.—An unknown species of midge lays eggs between two adjacent leaflets in the leaf bud. This gives rise to cell proliferation in the expanding leaflets; the two leaflets grow thicker, meet and fuse with each other, forming a globose, fleshy gall. Cell proliferation is as a rule confined only to the basal portion of the leaflets, the apical portions remaining normal.

4 mm. in diameter. Regular, simple, globose, sessile; irregularly and sinuately lobed on the upper side; the sulci between the lobes rather deep and sometimes with brown lanate hairs; smooth on the under side, pale green or yellowish green, pubescent, bibrachypedicellate;

a broadly sagitate, green, glabrous wing on the upper side, about one fourth the length of gall. Galls arranged alternately or scattered to the extent of about 15 per leaf. There are two cysts inside. In general, structure of this gall is very similar to the tomentose gall on *A. leucophloea* Willd. produced by *Schizomyia acaciae* Mani described in a previous paper.<sup>1</sup> This gall is easily distinguished from it by the absence of the dense tomentum.

A single leaf with numerous galls in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 7-iv-1932.

*Solid gall on shoot*.—An unknown midge lays eggs on the developing young shoot towards the beginning of spring. The maggots hatching from these eggs penetrate the tissues of the plant and give rise to large, globose, solid, woody galls. The maggots and pupae are found in the cortical layer of the gall. The galls are really the suppressed branches.

10-15 or 25-30 mm. in diameter. Regular, simple, globose, oblate, or pyriform; or irregular, compound, with large globose tubercles; grayish or brownish yellow; with a flattened, cup-shaped, ethmoid surface, the numerous holes on this surface being covered with tubercular operculum and opening into the cysts in which the maggots are found; hard, woody, solid, indehiscent; with an outer softer cortex and an inner hard woody core in which are found numerous ligneous, sclerenchymatous and vascular elements. Occasionally vestiges of leaves may be found on the surface of the younger galls. The galls form in such huge numbers that whole trees are heavily laden with them and actually branches bend with the weight of the galls. The midge is very heavily parasitised by several Chalcids.

Several examples preserved dry in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, 9-xii-1928.

### ***Prosopis spicigera* Linn.**

*Solid leaf gall*.—An unknown midge gives rise to solid galls on the leaflets and rachides in large numbers.

Galls on leaflets: globose, simple or aggregate, about 1-2 mm. in diameter, yellow or yellowish brown, sessile, solid, hard, on the upper or under sides of leaflets from 1-2 or 10-15, with one minute cavity and entirely parenchymatous.

Galls on the rachides: Globose, fusiform, local or extensive, about 7 mm. in diameter, brownish and covered with irregular patches of squamae, solid, hard, woody; with circular holes when old.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Ammathottam on the bank of the River Vadavar near Tanjore, Madras Presidency, 2-ix-1931.

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<sup>1</sup> *loc. cit.*, p. 406, pl. vii, fig. 1.

## Natural Order CUCURBITACEAE.

**Mukia scabrella** Arn.

*Shoot gall*.—An unknown species of *Lasioptera* lays eggs on the tender shoots and the larvae hatching from these eggs penetrate the vegetable tissues and cause a swelling of the vine. This gall is similar to the shoot gall of *Momordica charantia* Linn. produced by *Lasioptera falcata* Felt recorded in my previous monograph (*loc. cit.*, p. 394).

Regular, simple, globose, ovoid, ellipsoid, fusiform, cucumiform or moniliform, local or subextensive, terminal or basal, general tuberous swellings, about 30-45 mm. long and 10-15 mm. in diameter; pentagonal in cross-section; rough, irregular, scabrid, longitudinally ridged, often grooved, green, solid, carnose and spongy; multicystiferous, indehiscent. When galls are terminal the further growth of the affected shoot is completely arrested; on the radical galls, however, leaves and tendrils may be found. The anatomy differs very little from that of the normal stem except in the superabundance of the cortex and the medulla. The epidermis is densely covered with multicellular hairy outgrowths and encloses a large parenchyma, in which the vascular bundles are scattered irregularly. This parenchyma comprises large polygonal cells which are relatively smaller in the deeper layers. Cysts are longitudinal and are found both in cortex and the medulla. The seats of cell proliferation are the cortex and the medulla of the stem.

A single example in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. Miss M. Meenakshi, Tanjore, 4-i-1932.

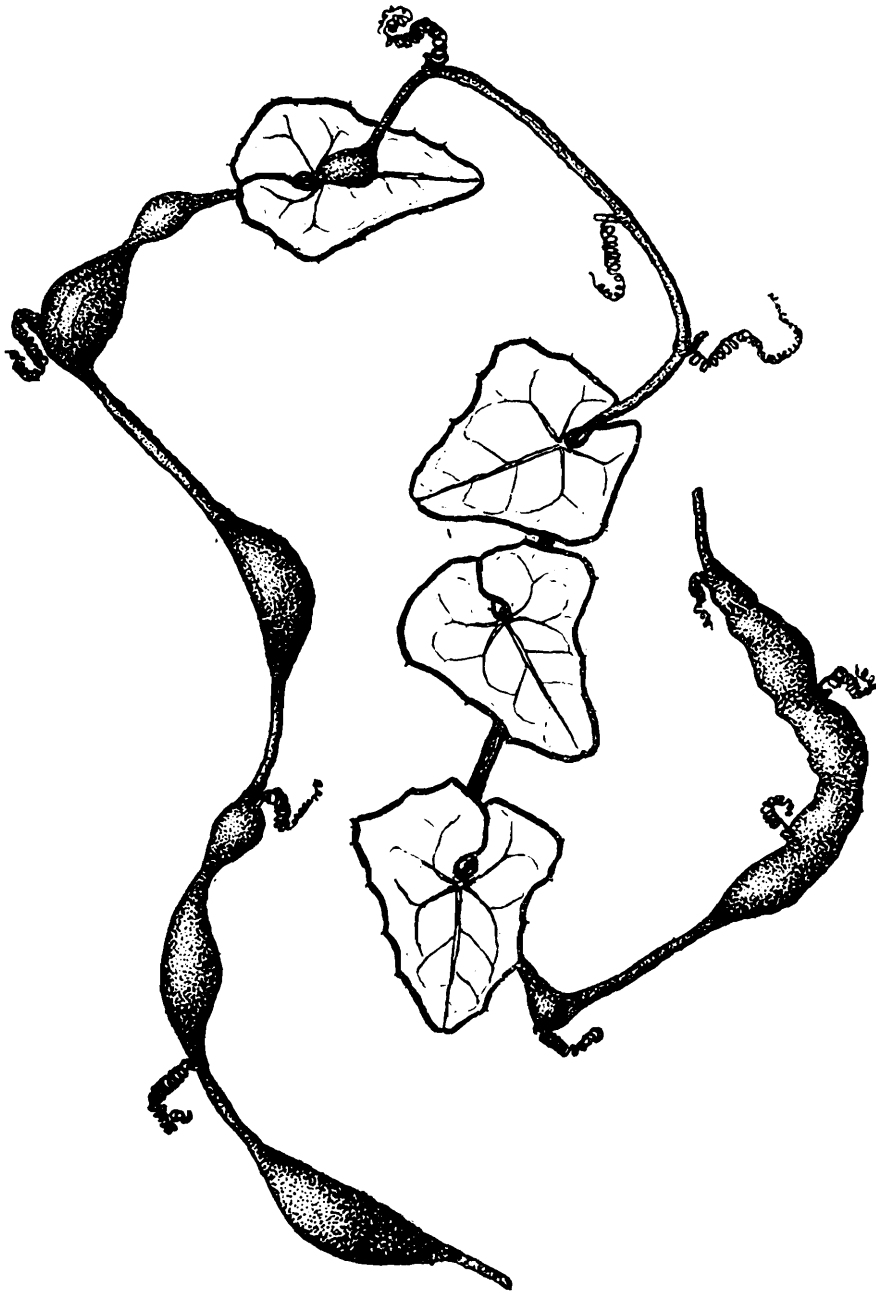
**Melothria amplexicaulis** Cogn.

*Shoot gall*.—An unknown species of *Lasioptera* lays numerous eggs on the tender vines and the larvae hatching from them penetrate the tissues of the plant and thus give rise to the formation of extensive swellings.

Regular, simple, fusiform, cucumiform, local or extensive, subcylindrical, sometimes compressed tumescence, generally about 25 mm. long, 10-15 mm. thick; longitudinally striate and somewhat sulcate, otherwise smooth and glabrous, rarely with diffuse small tubercles; yellowish green or yellowish brown; solid, hard, fibrous, with superficial or deep-seated, longitudinal cysts, which in the old specimens open to the outside by minute holes. Sometimes the galls are articulated and branched. The surface of the gall occasionally bears leaves, tendrils, etc., which may be rather small. Really the galls are swellings of the vine produced by the cell proliferation of the cortex. Anatomically the gall differs very little from a normal stem except in the greater abundance of the parenchymatous tissues and in the presence of the meristematic tissue.

Galls form both on the staminate and the pistillate plants of this species. The galls are allied to those described on *Cephalandra indica* Naud. produced by *Neolasioptera cephalandrae* Mani recorded in my previous monograph (*loc. cit.* p. 397) and *Mukia scabrella* Arn. described above.

A few examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle,



TEXT-FIG. 14.—Shoot gall of *Melothria amplexicaulis* Cogn.

Orattanad-Vetticaudu, 25 miles South-east of Tanjore, Madras Presidency, 20-x-1930 and 15-x-1931.

### ***Melothria heterophylla* Cogn.**

*Shoot gall*.—An unknown midge, probably the same species producing gall on *M. amplexicaulis*, gives rise to shoot galls very similar to those described above.

A few examples in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency 21-xi-1932.

## Natural Order BIGNONIACEAE.

**Stereospermum chelonoides** (D. C.).

*Fruit gall.*—Probably an unknown midge lays eggs on the tender developing fruits and thus produces the rather remarkable galls, which resemble a young bird at rest. The galls are 25 mm. long and 15 mm. thick, subcompressed, bicarpellary, capsular, unilocular, punctate and brownish in colour in the dry material. The normal fruits are generally about a foot or so long.

A few examples on sheets Nos. 36879, 5874, in the collections of the Madras Herbarium, Agricultural Research Institute, Coimbatore, Madras Presidency. Coll. Herbarium collector, Anamalai Hills, Western Ghats, South of the Palghat Gap, 13-v-1903.

## Natural Order LOGANIACEAE.

**Strychnos potatorum** Linn.

*Leaf gall.*—An unknown midge lays eggs on the young leaves. The larvae hatching from them penetrate the leaf tissues and thus give rise to solid galls on the leaves.

3 mm. in diameter. Regular, simple, globose, pyriform or turbini-form, button-like, free or compound, hard, solid, pale green or yellowish white, glabrous above and rugose below; forming to a greater extent on the upper surface of the leaf than on the under surface.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 26-xii-1930 and 31-viii, 14-ix-1932.

## Natural Order CONVULVULACEAE.

**Ipomea sepiaria** Koen.

*Solid flower gall.*—These galls are similar to the ones on *Rivea hypocrateriformis* Choisy, recorded as caused by *Asphondylia rivoecae* Mani in my previous monograph (*loc. cit.*, p. 411).

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, from a plant growing over hedges in a kitchen garden in Tanjore, Madras Presidency, 5-x-1929.

## Natural Order ACANTHACEAE.

**Asystasia coromandeliana** Nees.

*Cortical gall.*—An unknown midge lays eggs on the shoot and the larvae hatching from them penetrate the cortex and thus occasion the formation of globose, or fusiform, local or extensive, solid galls, with a spongy inner substance and a hard outer rind.

Two examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 12-xii-1932.

## Natural Order NYCTAGINEAE.

**Boerhaavia** spp.

*Capsule floral gall*.—An unknown midge lays one or two eggs in the flower buds. The larvae hatching from them attack the developing flower, which fails to open but turns into a remarkable gall.

For a proper understanding of the structure of this gall, it is necessary to describe briefly the normal flower of *Boerhaavia*. The small pinkish red flowers are collected together in small heads, which are arranged in loose panicles. The perianth is gamophyllous and inferior. The monocarpellary, unilocular, uniovular ovary is superior. Immediately above the level of the ovary the perianth tube is constricted, the constriction dividing it into a thick, basal part completely enclosing the ovary (to which it is not adherent) and a thin, membranous, coloured, expanding upper part. After flowering, the upper part of the perianth tube withers and separates at the constriction, while the basal part persists, enlarges, becomes more or less hardened and forms an outer envelop for the fruit. This enlarged basal portion develops externally a large number of short, stout, stigmatic, viscid hairs, which are of great importance in the dispersal of the ripe fruit.

In the course of gall formation this basal part of the perianth tube (i.e., the part below the characteristic constriction) becomes swollen, inflated and turns into the gall. On hatching from eggs the larvae find their way into the basal part of the perianth tube through the passage in the constriction. This gives rise to cell proliferation in the basal part of perianth.

5 mm. in diameter. Regular, simple, globose, discoid, or flask-shaped, inflated, free, subsessile; pinkish red, longitudinally five ridged, sticky and covered with numerous, short, stout, stigmatic, viscid, simple hairs; hard, coriaceous, cavate and surmounted on the top by the dry unopened or sometimes opened vestiges of the upper part of the perianth tube. The aborted ovary is found at the bottom of the spacious, hairy cavity of the gall. Inside the dried upper part of the perianth tube may be found the vestigial stamens and style. The thick wall comprises parenchymatous cells.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Madras Medical College Grounds, Madras, 11-xi-1929.

## Natural Order URTICACEAE.

**Ficus bengalensis** Linn.

*Echinate gall*.—This remarkable gall, resembling a rather miniature sea urchin, is produced by an unknown midge which lays eggs on the under side of the leaves. The gall is easily mistaken for a scale-insect.

4 mm. in diameter. Regular, simple, globose or subglobose, bright or dark red, rough, echinate, sessile, free, solid, cystiferous; fleshy, soft, entirely solid when young; partly fleshy, succulent and partly woody, hard when old; one to four celled when old; scattered in very large numbers on the under side of the leaves. The galls are easily

broken away from the leaf. The seat of cell proliferation is the parenchyma of the leaf. In the young galls a cortex and a distinct medulla are distinguishable in the cross section. There is no proper epidermis. The medulla consists of large, parenchymatous, round or hexagonal cells. The cortex consists of smaller rectangular cells. The spiny tubercles, which give the characteristic appearance to the gall, comprise bundles of rectangular cells arranged end to end in several radial rows, projecting from the cortex, evidently a part of the cortex itself. There are no vascular bundles in the gall. When old, the outer parenchymatous cortex encloses a hard, woody, thick-walled, one-to four-celled cyst. The spiny tubercles are pyramidal in shape but have an irregular section.

Several examples dry in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 18-xii-1930.

### ***Ficus religiosa* Linn.**

*Leaf gall*.—An unknown midge attacks the leaf veins and gives rise to solid swellings.

10-50 mm. long and 5 mm. thick. Regular, ovoid to fusiform, extensive, tuberous, often unilateral and cortical, general, simple or branched swellings of the midrib or side veins of the leaves; greenish yellow and glabrous when young; brown, cicatrised, sulcate, often fissured and longitudinally striate when old; solid, ligneous, with one or more longitudinal cysts. The galls are more conspicuous on the under than on the upper side of the leaf. Minute holes, through which the adult midge escaped, are found on the surface of the old galls.

Several examples both dry and in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Palace Garden in front of the Saraswathi Mahal Library, Tanjore, Madras Presidency, 20-iv-1931; also Calcutta Maidan, near Chowringhee Road, on different dates.

ON TREMATODE PARASITES FROM *PTYAS KORROS* (SCHLEGEL 1837) AND *P. MUCOSUS* (LINNAEUS 1758) FROM RANGOON.

By B. S. GOGATE (*From the Biological Department, University of Rangoon*).

From April 1931 to May 1933, 19 snakes were dissected. These, as may be seen from the results, were very slightly infected with trematodes. Out of 4 specimens of *Ptyas korros* (Schlegel 1837) only one was infected: 2 trematodes being obtained from the gall bladder, and 8 from the bile ducts. The remaining 15 snakes were *P. mucosus* (Linnaeus 1758). Of these only 2 harboured trematodes, one with 2 specimens and one with 3. The paucity of the trematode infection is to be noted in comparison with the associated relatively constant and heavy infection by cestodes and nematodes.

I am indebted to Prof. F. J. Meggitt for the use of his host records, and to Prof. H. R. Mehra of the University of Allahabad and Dr. G. S. Thapar of the University of Lucknow for the loan of slides of *Ommatobrephus lobatum*.

***Ommatobrephus lobatum* Mehra 1928.**

*Synonymy*.—*O. folium* Thapar and Ali 1929.

*Host*.—*Ptyas mucosus* (Linnaeus 1758).

The present material consists of only 2 specimens, from the same host from which the species was originally described (Mehra 1928). It differs from the original in (1) its diminutive size; (2) the smaller sizes of the oral and ventral suckers; (3) the absence of a prepharynx; (4) the comparatively larger ovary; (5) the pear-shaped receptaculum seminis; and (6) the smaller ova.

These differences are within the limits of individual variation. The only one that appears at the first sight to be of any importance is the presence of a pear-shaped receptaculum seminis. That this too may be considered an individual variation is shown by the two different descriptions of this structure by Mehra and Thapar and Ali. It is possible that this discrepancy may be the result of the varying degrees of pressure to which specimens were subjected during fixation. A study of the slides from Prof. Mehra and Dr. Thapar showed that the topography of the transverse vitelline ducts in this species is not constant: they may either run along the anterior or the posterior border of the ovary.

***Ostiolum mehrai*, sp. nov.**

*Hosts*.—*Ptyas korros* (Schlegel 1837); *P. mucosus* (Linnaeus 1758).

*Location*.—Gall bladder and bile ducts.

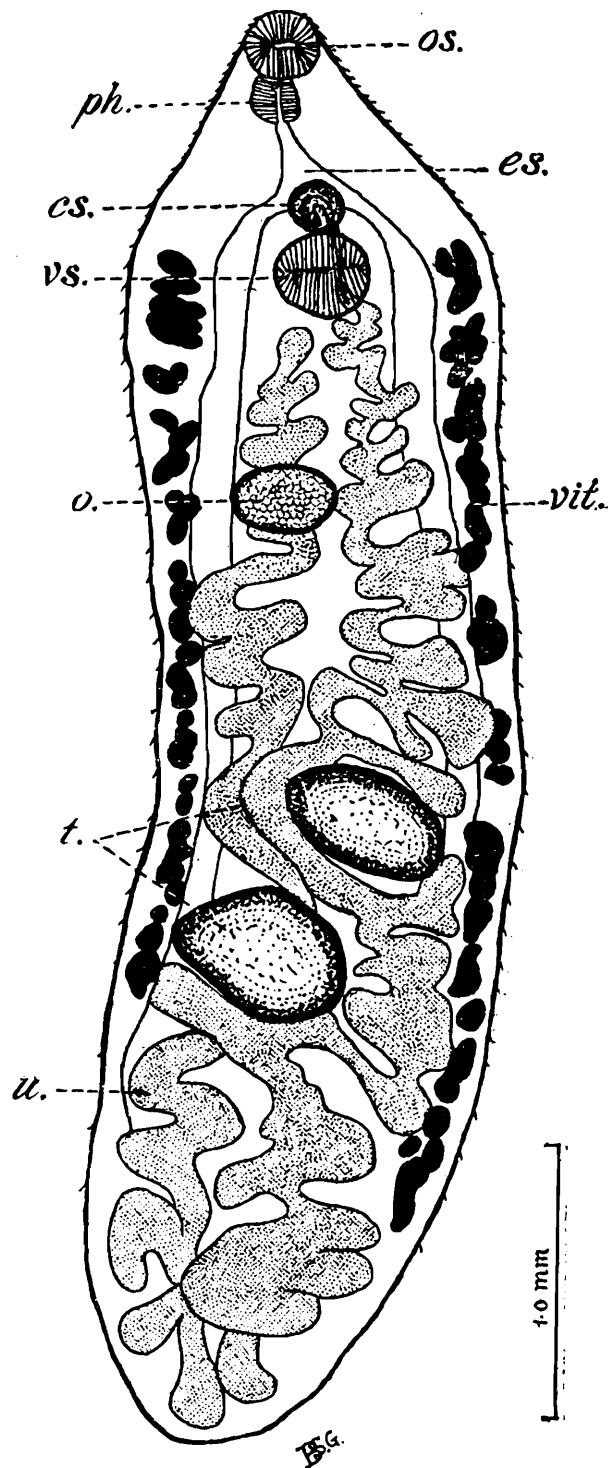
*Locality*.—Rangoon.

*Description*.—Body elongated, 4.5-5<sup>1</sup> long, spiny, more spiny anteriorly. Anterior end narrowed, posterior end rounded. Maximum

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<sup>1</sup> All measurements in millimeters.

breadth 1-1.6. Oral sucker terminal,  $0.235-0.294 \times 0.224-0.352$ , with moderately developed muscles, immediately followed by a globular pharynx,  $0.141-0.20$  diameter, in contracted specimens partly obscured by oral sucker. Oesophagus coiled, massive, broad at its junction with caeca, and narrow at its commencement. Caeca broad, broadening posteriorly, running in a more or less straight line almost to the posterior end of body. Ventral sucker feebly developed,  $0.195-0.352 \times 0.3-0.367$ , separated from caecal bifurcation by  $0.08-0.14$ .



*Ostiolum mehrai*, sp. nov.

cs. cirrus pouch; o. ovary; oes. oesophagus; os. oral sucker; ph. pharynx; t. testes; u. uterus; vit. vitellaria; vs. ventral sucker.

Genital pore anterior to caecal bifurcation at approximately the middle of the oesophagus. Testes postovarian, oblique, entire, round,

oval, or irregular,  $0.352-0.529 \times 0.559-0.648$  : anterior testis on left side, in middle of body, separated from the posterior by the uterine coils. Cirrus pouch moderately developed,  $0.18-0.275 \times 0.14-0.19$  with an internal coiled vesicula seminalis.

Ovary entire, round to oval,  $0.23-0.36 \times 0.30-0.441$ , postacetabular, pretesticular, widely separated from testes, almost in middle line in some specimens, in the others towards the right side. Posterior to ovary a moderately developed receptaculum seminis under uterine coils. Vitellaria in elongated groups of follicles, not arranged in rosettes, extending on one side at least, from intestinal bifurcation to behind posterior testis, groups becoming fewer posterior to the testes. Transverse vitelline ducts immediately behind the ovary formed by the junction of 3-5 feeding ducts on each side. Vitelline reservoir not observed. Uterus with massive descending and ascending transverse coils, filling the whole of the post-testicular region. Ova small,  $0.0315-0.041 \times 0.015-0.019$ , yellow.

Excretory pore subterminal. Excretory bladder elongated, wide, wavy in outline in fixed specimens, extending to ovary and there bifurcating into two oblique short blunt arms.

The following table gives the differences between the present form and others of the same genus previously described.

|                                              | <i>medioplexus</i><br>(Stafford 1902).      | <i>complexus</i><br>(Seely 1906).                     | <i>coloradensis</i><br>(Cort 1917).         | <i>mehrai</i> , sp.<br>nov.         |
|----------------------------------------------|---------------------------------------------|-------------------------------------------------------|---------------------------------------------|-------------------------------------|
| <i>Body</i>                                  | Spiny                                       | Smooth                                                | Spiny                                       | Spiny.                              |
| <i>Oral sucker—</i>                          |                                             |                                                       |                                             |                                     |
| <i>Ventral sucker</i>                        | 4 : 1                                       | 4 : 3                                                 | 5 : 4                                       | Ventral sucker slightly larger.     |
| <i>Caecal bifurcation to Ventral sucker.</i> | 1.1 mm.                                     | 0.8—1.4 mm.                                           | 0.8 mm.                                     | 0.08-0.145 mm.                      |
| <i>Testes</i>                                | Separated                                   | Contiguous                                            | Separated                                   | Separated.                          |
| <i>Ovary</i>                                 | Post acetabular                             | Partly acetabular                                     | Post-acetabular                             | Post-acetabular.                    |
|                                              | Lateral                                     | Contiguous behind posterior testis otherwise lateral. | Lateral                                     | Lateral.                            |
| <i>Vitellaria</i>                            | Commencing 0.5 mm. from caecal bifurcation. | Commencing from caecal bifurcation.                   | Commencing 0.5 mm. from caecal bifurcation. | Commencing from caecal bifurcation. |
|                                              | In rosettes of 18-23 follicles.             | In rosettes of 6-20 follicles.                        | In rosettes of 8—14 follicles.              | Follicles not arranged in rosettes. |
| <i>Ova</i>                                   | $0.022-0.039 \times 0.013-0.018$ .          | $0.029-0.035 \times 0.014-0.020$ .                    | $0.032-0.039 \times 0.018-0.021$ .          | $0.0315-0.041 \times 0.015-0.019$ . |
| <i>Hosts</i>                                 | <i>Bufo lentiginosus</i>                    | ..                                                    | ..                                          | ..                                  |
|                                              | <i>Rana virescens</i>                       | <i>Rana pipiens</i> Schreber.                         | <i>Rana pipiens</i> Schreber.               | <i>Ptyas korros</i> (Schlegel).     |
|                                              | <i>Rana pipiens</i> Schreber.               | ..                                                    | ..                                          | <i>Ptyas mycosus</i> (Linnaeus).    |
| <i>Location</i>                              | Lungs                                       | Lungs                                                 | Lungs                                       | Gall bladder and Bile ducts.        |
| <i>Locality</i>                              | North America                               | North America                                         | North America                               | Burma.                              |

## REFERENCES.

- Mehra, H. R. (1928) : On the Bionomics and structure of a new trematode *Ommatobrephus lobatum* n. sp. from *Zamenis mucosus*. *Proc.*, xv *Ind. Sci., Congr.*, p. 199.
- Mehra, H. R. (1931) : Two distomate trematodes from Indian reptiles. *All. Univ. Studies*, VII, *Sci., Sect.* pp. 31-52.
- Thapar, G. S. and Farzand Ali (1929) : On the trematodes of the digestive tract of *Tropidonotus piscator* from Lucknow. *Jour. Helminthol.*, VII, pp. 247-252.
- Travassos, L. and Darriba, A. R. (1930) : Pesquisas helminthologicas realizadas em Hamburgo iii. Trematodeos dos generos *Pneumonoeces* e *Ostiolum*. *Mem. Inst. Oswald. Cruz.*, XXIII, pp. 251,252.

## A NOTE ON THE SYSTEMATIC POSITION OF *PSILORHYNCHUS* *AYMONIERI* TIRANT FROM CAMBODIA.

By SUNDER LAL HORA, D.Sc., F.R.S.E., F.A.S.B., Assistant Superintendent, Zoological Survey of India.

In 1883, Tirant<sup>1</sup> described a new species in the genus *Psilorhynchus* McClelland<sup>2</sup> from Cambodia and remarked : “ Espèce nouvelle appartenant au groupe intéressant des Homaloptérinés, qui habitent les ruisseaux des montagnes boisées de l’Indo-Malaisie. On a décrit deux espèces seulement du genre *Psilorhynchus* : les *P. sucatio*, et *P. balitora*, des torrents montagneux N.-E. du Bengale et de l’Assam.” The description is accompanied by 4 outline drawings which are not only inaccurate but in several respects misleading. Two years later, Tirant<sup>3</sup> included the description of this species in his “ Notes sur les Poissons de la Basse-Cochinchine et du Cambodge ” and in referring to the genus *Psilorhynchus* remarked : “ Les *Psilorhynchus* ont une apparence de Cyprin à forme peu ordinaire, en raison de leurs pectorales horizontale et de leur bouche de forme bizarre placée en dessous de la tête. Ils habitent les ruisseaux de montagnes.” He included this genus in the family Homalopteridae which he characterised by the absence of an air-bladder. He distinguished *Homaloptera* from *Psilorhynchus* principally by the character of the barbels which are absent in the latter and present (6 in number) in the former. It seems probable, however, that in describing his new species of *Psilorhynchus* he did not study the character of the air-bladder for the unique specimen of *P. aymonieri* Tirant in the Lyon Museum is intact and there is no reference to the structure of the air-bladder in the description of the species. After Tirant no author seems to have referred to this species till Chevey<sup>4</sup> in 1934 published a “ Révision synonymique de l’Oeuvre ichthyologique de G. Tirant ” and regarded the species as having been correctly assigned to the genus *Psilorhynchus*.

The systematic position of the genus *Psilorhynchus* remained obscure for a long time and it is not surprising that earlier authors referred some of the flattened fishes of the mountain torrents of China and Siam without or with minute barbels to this genus. In another place I<sup>5</sup> defined the generic limits of *Psilorhynchus* after examining fresh material of Hamilton’s<sup>6</sup> two species from India, and showed that they are sufficiently distinctive from other members of the Cyprinoidea to constitute a separate family of that order ; this view has been strengthened by the researches of Mukerji<sup>7</sup> on a much larger collection of these peculiar fishes. The

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<sup>1</sup> Tirant, *Bull. Soc. Etudes Indochinoises Saigon* (1883) ; Chevey, *Notes de l’Institut Oceanographique de l’Indochine*, No. 6, pp. 35-37, pl. i (1929).

<sup>2</sup> McClelland, *As. Res.*, XIX, pp. 300, 428 (1839).

<sup>3</sup> Tirant, *Excursions et Reconnaissances*, IX (1885) ; Chevey, *loc. cit.*, p. 136 (1929).

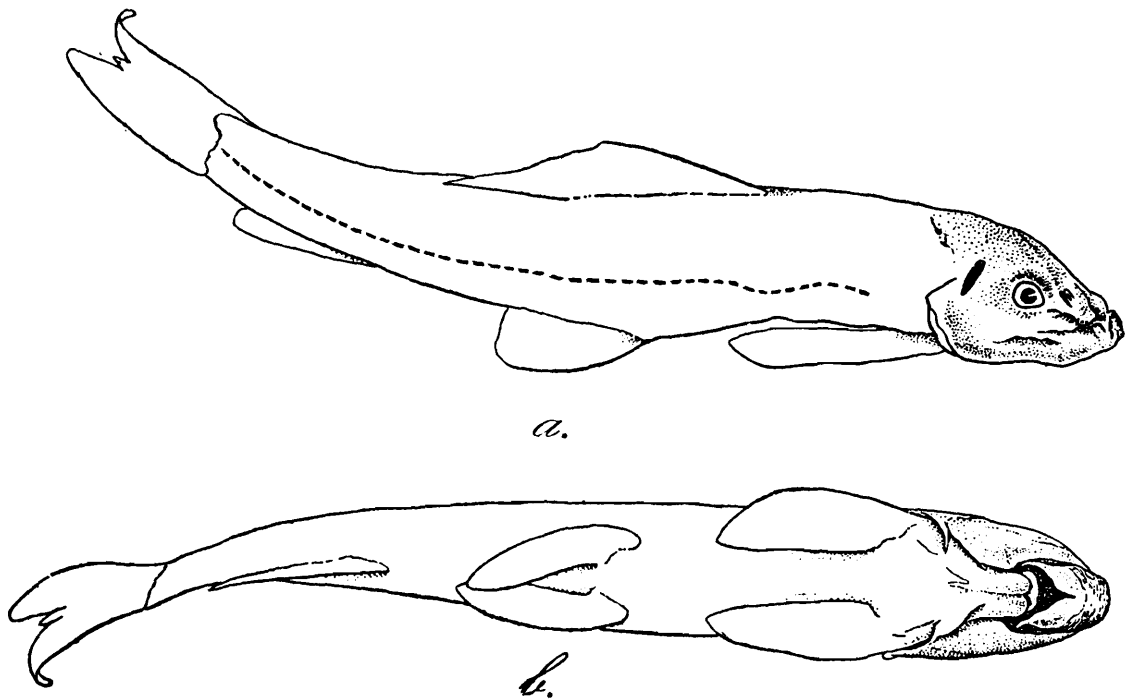
<sup>4</sup> Chevey, *loc. cit.*, No. 7, p. 43 (1934).

<sup>5</sup> Hora, *Rec. Ind. Mus.*, XXVII, p. 457 (1925).

<sup>6</sup> Hamilton, *Fish. Ganges*, pp. 347, 348 and 393 (Edinburgh : 1822).

<sup>7</sup> Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVI, pp. 823-828 (1933).

two Chinese species of *Psilorhynchus*, *P. sinensis* Sauvage & Dabry de Thiersant<sup>1</sup> and *P. fasciatus* Sauvage<sup>2</sup> were, on examination, found to belong to the Homalopterid genera *Hemimyzon* and *Pseudogastromyzon*<sup>3</sup> respectively. In view of the poor figures and inadequate description it was not possible, however, to evaluate the exact nature of Tirant's *Psilorhynchus* from Cambodia. In a description of the new species of *Psilorhynchus* from the Naga Hills, Assam, Mukerji and I<sup>4</sup> referred to *P. aymonieri* Tirant and remarked that "The descriptions and figures of the species recently reprinted by Chevey do not show its *Psilorhynchus* affinities, but it is difficult to assign any systematic position to it without examining the specimens" To clear up the distribution of this Indian genus, the Director of the Museum of Natural Sciences, Lyon, was requested for the loan of the type-specimen of Tirant's species. As the unique specimen could not be sent by post, Dr. Claude Gaillard, Director of the Museum, very kindly sent me photographs of the lateral and ventral views of the type-specimen. These photographs show very clearly that *P. aymonieri* must be referred to the genus *Gyrinocheilus* Vaillant<sup>5</sup>. I take this opportunity to publish fresh drawings of *P. aymonieri* which are prepared from the photographs supplied by Dr. Gaillard.



*Gyrinocheilus aymonieri* (Tirant)  $\times \frac{3}{5}$ .

a : Lateral view of type-specimen ; b : Ventral view of same.

Only two species have so far been described in the genus *Gyrinocheilus*, one from Borneo—*G. pustulosus* Vaillant<sup>6</sup> and the other from Siam and Cambodia—*G. kaznakoi* Berg.<sup>7</sup> In describing the Siamese species,

<sup>1</sup> Sauvage & Dabry de Thiersant, *Ann. Sci. Natur. Paris*, (6) I, Art. 5, p. 14 (1874).

<sup>2</sup> Sauvage, *Bull. Soc. Philom. Paris*, (7) II, p. 88 (1878).

<sup>3</sup> Hora, *Mem. Ind. Mus.*, XII, pp. 299, 314 (1932).

<sup>4</sup> Hora & Mukerji, *Rec. Ind. Mus.*, XXXVII, p. 397 (1935).

<sup>5</sup> Vaillant, *Notes Leyden Mus.*, XXIV, p. 107 (1902).

<sup>6</sup> Weber & Beaufort, *Fish Indo-Austral. Archipel.*, III, pp. 224-225, figs. 89, 90 (1916).

<sup>7</sup> Berg, *C. R. Trav. Soc. Nat. St. Petersb.*, XXXVII, pp. 305, 307 and 364-366 (1906).

Berg referred at length to the distinctive characters of the two species and later I<sup>1</sup> discussed the taxonomic importance of these characters and the systematic position of the genus *Gyrinocheilus*. Vaillant referred his genus to the Homalopterinae, but Boulenger<sup>2</sup> constituted a new sub-family Gyrinocheilini to accommodate it. Agreeing with Boulenger's view, I proposed the family Gyrinocheilidae for the genus.

*G. aymonieri* was found in a small stream called Prek-Tenot in the Samrong-Tong Mountains about 75 kilometres from Phnom-Penh, Cambodia. *G. kaznakoi* was described from the same river system; two specimens were obtained at Pai-lin between Battambang and Schantabun. I recorded the latter species from Nontaburi, while Smith<sup>3</sup> collected specimens "in the Menam Chao Phya at Nontaburi and Paknam; in Bung Borapet and Klongs draining that swamp, Central Siam; in mountain streams in the Pak Jong district, Central Siam; in the Menam Pong at Udon, Northeastern Siam; in mountain streams in Peninsular Siam east of Bandon; in the Menam Wang at Lampang, Northern Siam; and in the Meklong at Potaram and in the west branch of the Meklong north of Kanburi in Western Siam" From the wide distribution of *G. kaznakoi* and the occurrence of *G. aymonieri* in an adjacent locality, it seems to me certain that the two species are identical.

The structure of the snout in *G. aymonieri* is described by Tirant as follows:—"Un tubercule recouvert de pores à l'extrémité du museau; un autre tubercule médian sur le front, avec deux groupes de pores latéraux en triangle de chaque côté, deux autres tubercules latéraux très saillants un peu en arrière du front chacun d'eux accompagné d'une ligne latérale de 9 pores." According to Berg, *G. kaznakoi* is distinguished from the Bornean species, among other characters, by the possession of a large central and two small lateral proboscides on the snout. I have compared the specimens of *G. kaznakoi* from Siam with the photographs and descriptions of *G. aymonieri* and am of opinion that the two species are identical.

In view of what is stated above *Gyrinocheilus kaznakoi* Berg 1906 has to be regarded as a synonym of *G. aymonieri* (Tirant) 1883.

In conclusion I have to offer my sincere thanks to Dr. Claude Gailard, Directeur du Museum des Sciences Naturelles de Lyon, for his kindness in sending me photographs of the unique specimen of *Psilorhynchus aymonieri* Tirant.

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<sup>1</sup> Hora, *Journ. Nat. Hist. Soc. Siam*, VI, p. 159 (1923).

<sup>2</sup> Boulenger, *Cambridge Nat. Hist.*, VII, p. 582 (1909).

<sup>3</sup> Smith, *Journ. Siam Soc. Nat. Hist.*, Suppl., VIII, p. 187 (1931).



## FURTHER NOTES ON CRUSTACEA DECAPODA IN THE INDIAN MUSEUM.

### VIII. ON THE DECAPOD CRUSTACEA COLLECTED BY THE BENGAL PILOT SERVICE OFF THE MOUTH OF THE RIVER HOOGHLY. BRACHYGNATHA (OXYRHYNCHA AND BRACHYRHYNCHA).

By B. CHOPRA, D.Sc., Zoological Survey of India, Calcutta.

(Plate IX.)

The Dromiacea and the Oxystomata of the Sandheads, off the mouth of the Hooghly River, have already been dealt with in the present series of notes<sup>1</sup>; an account of the remaining crabs, comprising the tribe Brachygnatha, is given in this paper. Both the sub-tribes of the Brachygnatha, namely the Oxyrhyncha and the Brachyrhyncha—the latter including all the crabs formerly grouped under the old, well-known and convenient names of Cyclometopa and Catometopa—are well represented at the Sandheads. In the Oxyrhyncha, the Maiidae have six representatives in the Sandheads fauna, all belonging to more or less common and widely distributed species, while the Parthenopidae are represented by two species only, one of which is recorded from this locality for the first time. In the Brachyrhyncha the apparent scarcity of the Catometopes in this area is very remarkable; only one species of this large group of crabs, the somewhat rare *Scalopidia spinosipes* Stimpson (family Gonoplacidae) is present in the Sandheads collection. The Cyclometopa, on the other hand, seem to flourish in this locality, and are represented by three families, Portunidae, Corystidae and Xanthidae. Of these the Portunidae are the commonest, both in species and in individuals. Some of the species of this family in the present collection are somewhat rare, and a number of these are recorded from the Sandheads for the first time. The Xanthidae are represented by four species, all of which are more or less rare. Finally the aberrant family Corystidae is represented in the fauna by only one specimen of the uncommon genus *Gomezia* Gray, which has had to be given a new varietal name.

I give below a list of species dealt with in the present paper; an asterisk placed before the name of a species indicates that it is recorded from the Sandheads for the first time.

Oxyrhyncha.

Maiidae.

Pisinae.

*Hyastenus dicanthus* (de Haan).

*Doclea ovis* (Herbst).

*Doclea canalifera* Stimpson.

*Doclea gracilipes* Stimpson.

*Doclea tetraptera* Walker.

*Phalangipus longipes* (Linn.).

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<sup>1</sup> Chopra, *Rec. Ind. Mus.* XXXV, pp. 25-52 (1933) and XXXVI, pp. 477-481, pl. viii (1934).

## Parthenopidae.

*Lambrus (Platylambrus) prensor* Herbst.\* *Cryptopodia angulata* M.-Edw. & Lucas.

## Brachyrhyncha.

## Portunidae.

## Lupinae.

*Neptunus (Neptunus) sanguinolentus* (Herbst).*Neptunus (Neptunus) pelagicus* (Linn.).*Neptunus (Hellenus) hastoides* (Fabr.).\* *Neptunus (Hellenus) pulchricristatus* Gordon.*Neptunus (Lupocycloporus) gracilimanus* (Stimpson).*Charybdis (Goniosoma) cruciatus* (Herbst).\* *Charybdis (Goniosoma) merguiensis* (de Man).\* *Charybdis (Goniosoma) miles* (de Haan).\* *Charybdis (Goniosoma) variegata* (de Haan).\* *Charybdis (Goniosoma) callianassa* (Herbst).*Charybdis (Goniosoma) rostrata* (A. M.-Edwards).\* *Charybdis (Goniohellenus) vadorum* Alcock.

## Caphyrinae.

*Lissocaricinus arkati* Kemp.

## Corystidae.

\* *Gomezia distincta* (de Haan), var. *indica*, nov.

## Xanthidae.

## Xanthininae.

\* *Halimede tyche* (Herbst).*Liagore rubromaculata* de Haan.\* *Galene bispinosa* (Herbst).\* *Galene granulata* Miers.

## Gonoplacidae.

## Rhizopinae.

\* *Scalopidia spinosipes* Stimpson.

Some of the species that have proved of interest either from a taxonomic point of view or on account of their comparative rarity or distribution may be briefly referred to here. In the Maiidae some of the species of *Doclea* are very similar to one another, and the separation of the common *Doclea ovis* from Ortmann's *Doclea japonica* has presented special difficulties. An examination of a large number of specimens of these two forms preserved in the Indian Museum collection has, however, shown that the two are identical, and that Ortmann's *japonica* must, therefore, be considered a synonym of the variable *D. ovis*. *D. canalifera* of Stimpson is quite distinct from *D. ovis* or *D. japonica*, and the last mentioned species cannot, therefore, be included in the synonymy of Stimpson's form, as was suggested by Miss Rathbun<sup>1</sup> and Balss<sup>2</sup>. For reasons given by Miss Rathbun<sup>3</sup>, I have adopted the name of *Phalangipus longipes* for the form that has so long been known as *Egeria arachnoides* (Rumph.). It is a pity to have to give up

<sup>1</sup> Rathbun, *Proc. U. S. Nat. Mus. Washington* XXVI, p. 29 (1902).<sup>2</sup> Balss, *Arch. Naturgesch.* XC, Heft 5, p. 30 (1924).<sup>3</sup> Rathbun, *Proc. Biol. Soc. Washington* XI, pp. 159, 160 (1897).

such an old and well-known name, but under the existing rules of zoological nomenclature there is no help for it. In the Portunidae Miss Gordon<sup>1</sup> has shown that *Neptunus spinipes* of Alcock<sup>2</sup> is not the form that Miers<sup>3</sup> had described under that name; an examination of the Indian material of Alcock's *spinipes* has fully borne out Miss Gordon's contention, and her name of *pulchricristatus* has, therefore, been adopted for it. In the same way it is clear that *Neptunus gracilimanus* as recognised by Alcock<sup>4</sup> is distinct from Stimpson's<sup>5</sup> species of that name, but A. Milne-Edward's (and Alcock's)<sup>6</sup> *whitei* is identical with it. For Alcock's *gracilimanus* Miss Rathbun's<sup>7</sup> name *innominatus* must, therefore, be employed. Alcock had described a new variety of *Charybdis hoplites* (Wood-Mason) under the name *vadorum*<sup>8</sup>; I have found it necessary to raise this variety to a specific rank and to include the species recently described by Miss Gordon<sup>9</sup> under the name of *sinensis* in its synonymy. Kemp's *Lissocarcinus arkati*<sup>10</sup> was so far known from female specimens only; from some adult males in the present collection I am able to supply a description of this sex also. In the family Corystidae a new variety of the Japanese *Gomezia distincta* (de Haan) has been described; the genus is somewhat rare in Indian waters. In the Xanthidae *Halimede tyche* (Herbst) is recorded from the Sandheads and the question of its synonymy is discussed. *Galene bispinosa* (Herbst), a somewhat rare species, is quite common at the Sandheads, while Miers' *Galene granulata*<sup>11</sup>, which was hitherto known only from Australia and Singapore also occurs here. The latter species was so far somewhat inadequately described and I have, therefore, given a fresh illustration and have also added some descriptive notes on it. As mentioned above the only representative of the Catometopes at the Sandheads is *Scalopidia spinosipes* Stimpson of the family Gonoplacidae: the species is rather rare. All the questions referred to above are fully discussed in the following pages in their appropriate places.

In the present paper, as previously, I have closely followed Alcock in the classification and arrangement of species, as given in his masterly account of the Indian crabs in the series of papers entitled "Materials for a Carcinological Fauna of India." I have not considered it necessary to give anything like complete synonymies; in many cases Alcock's work alone is referred to and at most one or two later important references only are added.

Miss Gordon<sup>12</sup> has recently directed attention to the importance of studying the abdominal appendages of the male in view of their providing characters of considerable systematic value. I have paid special

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<sup>1</sup> Gordon, *Journ. Linn. Soc. London (Zool.)* XXXVII, p. 534 (1931).

<sup>2</sup> Alcock, *Journ. As. Soc. Bengal* LXVII, pp. 39, 40 (1899).

<sup>3</sup> Miers, *Challenger Brachyura* (Zool. XVII), p. 178, pl. xv, fig. 1 (1886).

<sup>4</sup> Alcock, *loc. cit.*, p. 45.

<sup>5</sup> Stimpson, *Smithsonian Misc. Coll.* XLIX, p. 77, pl. x, fig. 3 (1907).

<sup>6</sup> Alcock, *loc. cit.*, p. 44 (1899); a reference to Milne-Edward's paper is given in Alcock's synonymy.

<sup>7</sup> Rathbun, *Proc. Biol. Soc. Washington* XXII, p. 114 (1909).

<sup>8</sup> Alcock, *loc. cit.*, p. 67 (1899).

<sup>9</sup> Gordon, *loc. cit.*, pp. 534-536 (1931).

<sup>10</sup> Kemp, *Rec. Ind. Mus.* XXV, pp. 405-408, pl. x, fig. 1 (1923).

<sup>11</sup> Miers, "Alert" *Crust.*, p. 208, pl. xx, fig. A (1884).

<sup>12</sup> Gordon, *loc. cit.*, pp. 525, 526 (1931).

attention to these appendages in the course of my present work, and have found them to afford in many cases useful characters in separating males of closely allied species. This has been specially so in the case of some species of *Doclea* and in some of the Portunids. For purposes of future reference and comparison I have given figures of the anterior male appendages of most of the species dealt with in this paper.

The physical conditions prevailing at the Sandheads, so far as known at present, have been briefly described in an earlier paper<sup>1</sup>, but for convenience of reference it may be mentioned that this area lies roughly in 21°N. and 88°E. The salinity of the surface water is somewhat lower than that of the outlying parts of the Bay of Bengal, and varies a great deal at different times of the year. The water is richly laden with fine silt brought down by the Hooghly and the neighbouring branches of the Ganges from the rich alluvial plains of upper India. The depth in most places is about 20 fathoms, and the bottom consists of soft ooze-like mud, with patches of sand and mud here and there.

The photographs and text-figures illustrating this paper have been made under my supervision by Babu Subodh Mondul, one of the talented artists of the Zoological Survey of India, with his usual skill and accuracy, and I owe him my best thanks for the care with which he has done the work. To my chief Dr. Bains Prasad I am greatly indebted for constant help and valuable suggestions throughout the course of my work and for going through the manuscript with me. I am also thankful to Dr. Heinrich Balss of München for helping me in clearing up some doubts about the rare Xanthid *Galene granulata* Miers, and to Dr. F. H. Gravely of Madras for lending to me for study, from the Museum under his charge, the only specimen of *Medaeus rouxi* Balss in his collection.

### Tribe BRACHYGNATHA.

#### Subtribe OXYRHYNCHA.

#### Family MAIIDAE.

#### Subfamily PISINAE.

#### **Hyastenus dicanthus** (de Haan).

1895. *Hyastenus dicanthus*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 210, 211.

1924. *Halimus dicanthus*, Balss, *Arch. Naturgesch.* XC, Heft 5, p. 32.

A single male example of this somewhat common species is present in the Sandheads collections; it was collected by "Lady Fraser" in May, 1926. The carapace length, including the long rostral horns, is 36 mm., while the greatest breadth, inclusive of the epibranchial spines, is 24.5 mm. The specimen is probably immature.

The Sandheads example agrees closely with Alcock's description of the species, and with named examples in the Museum collection. The carapace, when denuded, is smooth and polished, but the tubercle on the gastric region is somewhat inconspicuous. Alcock has described this tubercle as acuminate, and most of the specimens in the Museum

<sup>1</sup> Chopra, *Rec. Ind. Mus.* XXXV, pp. 25, 26 (1933).

collection, including several young ones, have the tubercle more or less sharp and quite prominent. There is no spine on the intestinal region, but an inconspicuous thickening in the form of a low tubercle is present. In two large examples from Australia in the Museum collection there is a more or less distinct tubercle near the middle of the posterior border of the carapace. The chelipeds in the Sandheads example, as is the case in young males, are slender, and shorter than the carapace including rostrum. The abdomen consists of seven distinct segments, and is concave along the sides. On the second and third segments, especially the third, there are distinct convexities.

Besides specimens from Australia and the Chinese Sea, *H. dicanthus* is represented in the Indian Museum collection by examples from the Mergui Archipelago, Tavoy, the Andaman Islands, Orissa Coast and Ceylon. There is also a doubtful specimen from Bombay. The species has a very wide range of distribution over the Indo-Pacific area, occurring from New Zealand to the east coast of Africa<sup>1</sup>. In the north the species does not appear to extend beyond Japan.

*H. dicanthus* closely resembles *H. spinosus* A. Milne-Edwards<sup>2</sup>, but the latter has always two spines on the gastric region, in addition to a spine on the intestinal region also. The specimen from Durban referred by Stebbing<sup>3</sup> to *H. dicanthus* resembles Milne-Edwards' species in these characters.

On the authority of Miss Rathbun<sup>4</sup> the generic name *Halimus* has been extensively employed in preference to *Hyastenus* White, but Calman<sup>5</sup> has shown that there is no justification for giving up White's name.

### ***Doclea ovis* (Herbst).**

1895. *Doclea ovis* and var. *japonica*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 227, 228.

1924. *Doclea canalifera*, Balss, *Arch. Naturgesch.* XC, Heft 5, p. 30 (*partim*).

In the Sandheads collection there are eleven specimens, four of which agree closely with the descriptions of *Doclea ovis*, four appear referable to de Haan's *Doclea japonica*, while the remaining three appear in certain characters to be intermediate between the two; these last I find difficult to refer with any degree of certainty either to the one or to the other. Alcock in considering *D. japonica* as a variety of *D. ovis* mentioned that the only difference between the two is in the presence, in de Haan's species, of an additional spine on the branchial region, and of a coarse spine or a blunt tooth just above the middle of the posterior border of the carapace. He pointed out, however, that in *D. ovis* also traces of tubercles are generally present in place of these spines. I have examined a large number of specimens of both these forms in our collection, and have found that in respect of the development of these tubercles or spines they can be arranged in a more or less regular series. Typically in *D. ovis* there are two spines on the antero-lateral margin (in addition

<sup>1</sup> Stebbing, *Ann. S. Afric. Mus.* VI, pp. 5, 6 (1908).

<sup>2</sup> A. Milne-Edwards, *Nouv. Arch. Mus. Paris* VIII, p. 250 (1872).

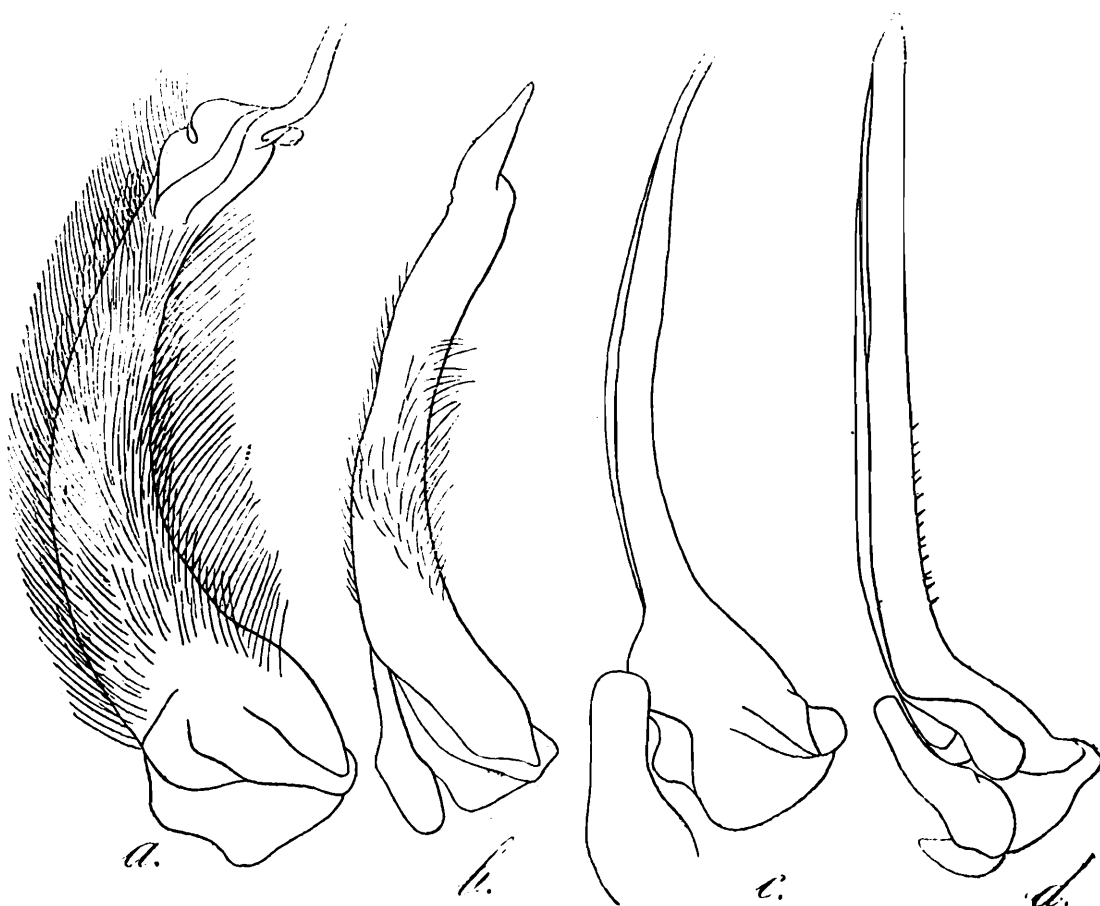
<sup>3</sup> Stebbing, *loc. cit.*, pp. 5, 6 (1908).

<sup>4</sup> Rathbun, *Proc. Biol. Soc. Washington* XI, p. 157 (1897).

<sup>5</sup> Calman, *Ann. Mag. Nat. Hist.* (8) XI, pp. 313, 314 (1913).

to the sub-hepatic), and posterior to these and on a higher level there is always a more or less blunt tubercle, which is only clearly seen on denuding the specimen. In some specimens this tubercle is quite large, and is sometimes even sharply pointed, more or less like a coarse spine. At the other end of the series are the specimens that are referable to *japonica*; in these the tubercle is replaced by a distinct spine, as large or even larger than the two anterior spines. Similarly a tubercle on the posterior margin of the carapace is present in all our specimens of *D. ovis*; in some it is low, while in others it is quite prominent and somewhat sharp. In specimens of *japonica* it is always more or less sharp.

In the three intermediate specimens from the Sandheads the tubercle on the posterior margin is fairly prominent, and in at least one of them is somewhat sharp. The last lateral spine is sharp in all the three examples; in one it is like a large, sharply-pointed tubercle, while in the other two it is a well-formed spine differing from that of typical *japonica* only in its being shorter than the two anterior spines.



TEXT-FIG. 1.—Left anterior pleopod of male in a. *Doclea ovis* (Herbst):  $\times 5\frac{1}{2}$ , b. *Doclea canalifera* Stimpson:  $\times 5\frac{1}{2}$ , c. *Doclea gracilipes* Stimpson:  $\times 8$ , d. *Doclea tetraptera* Walker:  $\times 9\frac{1}{2}$ .

A careful examination of our material has not revealed any other important difference between these two forms, and I am, therefore, of the opinion that de Haan's *D. japonica* is only a synonym of *D. ovis* (Herbst). The species is no doubt variable in the form of the third spine on the lateral border, and also to a certain extent, in that of the tubercle on the posterior border of the carapace.

I have carefully examined the anterior male appendages in a number of specimens of both the forms, and have failed to find any material difference between the two. In both the appendage is rather stout (text-fig. 1a) and is straight. There is a long, somewhat curved and forwardly-directed, finger-like process near the tip, and another somewhat rounded process, pointing outwards and somewhat forwards, on the outer margin just behind the tip. The outer margin is densely hairy and the terminal portion of the inner margin is hardened and chitinated. There are certain slight variations in the shape of the two processes, but these do not appear to be associated with the characters that are employed for distinguishing *ovis* from *japonica*.

Balss, probably on the authority of Miss Rathbun<sup>1</sup>, has considered *Doclea japonica* as a synonym of *D. canalifera* Stimpson, but in the latter species the third lateral spine is very long and there is a long spine at the posterior margin.

*Doclea ovis* is represented in the Indian Museum collection by a number of specimens from Mergui, the Sandheads and the Orissa and Madras coasts. All the examples that have been called var. *japonica* are from the Sandheads.

The species has a wide range over the Indo-Pacific region.

#### *Doclea canalifera* Stimpson.

1895. *Doclea canalifera*, Alcock, *Journ. As. Soc. Bengal* LXIV, p. 228.

1902. *Doclea canalifera*, Rathbun, *Proc. U. S. Nat. Mus. Washington* XXVI, p. 29 (*partim*).

1907. *Doclea canalifera*, Stimpson (Rathbun), *Smithsonian Misc. Coll.* XLIX, pp. 7, 8, pl. i, fig. 4.

1924. *Doclea canalifera*, Balss, *Arch. Naturgesch.* XC, Heft 5, p. 30 (*partim*).

In the Sandheads collection there are four specimens that I refer to Stimpson's *D. canalifera*. There are two males and two females, and except for one mutilated male, are all young.

As is clear from the descriptions of Alcock and Stimpson, the present species is characterised by the possession of a remarkably deep and well-defined pterygostomian canal, in addition to having long epibranchial and posterior spines. Some of the spines on the dorsal surface of the carapace are also long. *Doclea ovis* (with which is included *D. japonica*) is undoubtedly its nearest ally, but in this form the spines are greatly reduced and are generally replaced by tubercles.

Besides the three spines on the branchial border of the carapace, there is a largish spine on the pterygostomian region, another at the external angle of the buccal cavern, and the outer angle of the basal antennal joint is also spiniform. Between the antennal angle and the spine at the outer corner of the buccal cavern a very small spine is generally present, and a small blunt tubercle can be seen at the base of the pterygostomian spine also, between it and the tooth at the outer angle of the buccal cavern.

As remarked by Nobili<sup>2</sup>, the rostral spines are much longer in the young than in older specimens, and their tips are also generally some-

<sup>1</sup> Rathbun, *Proc. U. S. Nat. Mus. Washington* XXVI, p. 29 (1902).

<sup>2</sup> Nobili, *Boll. Mus. Zool. Torino* XVIII, No. 455, p. 28 (1903).

what divergent. The dorsal spines are also generally longer in smaller examples.

The anterior abdominal appendages of the male (text-fig. 1b) are different from those of the preceding species. These are rather stout and more or less straight. The terminal part is in the form of a somewhat curved finger-like projection arising from one end of the truncate anterior margin.

I am unable to agree with Balss in considering Ortmann's *Doclea japonica* as a synonym of the present species. In *D. canalifera*, in addition to some other characters also, the epibranchial spines and the spine at the posterior border of the carapace are long and the spines on the gastric and the cardiac regions are well developed; in *japonica* all these spines are greatly reduced. The anterior abdominal appendages of the male also are quite different in the two forms (see text-figs. 1a and 1b).

*D. canalifera* is fairly common at the Sandheads and has been recorded from this locality on a number of previous occasions also. Besides this locality, the species is represented in the Indian Museum collection by numerous small specimens from the Arakan and the Orissa coasts. Stimpson described the species from Hongkong, while Nobili<sup>1</sup> obtained it from Singapore and Miss Rathbun<sup>2</sup> from the Gulf of Siam. There are also some other records of the species from the eastern parts of the Indo-Pacific region, but that of Miss Rathbun (1902) from Japan is somewhat doubtful, as it is not clear whether her specimens were referable to *D. japonica* or to the present species.

### ***Doclea gracilipes* Stimpson.**

1895. *Doclea gracilipes*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 229, 230.

1907. *Doclea gracilipes*, Stimpson (Rathbun), *Smithsonian Misc. Coll.* XLIX, pp. 6, 7, pl. i, fig. 1.

One young male specimen of this very variable species is in the present collection. It has a carapace length of about 32 mm. from the tip of the rostrum to the base of the long posterior spine. The specimen appears to be typical in every respect.

The anterior male appendages (text-fig. 1c) are more or less straight, there being only a slight bending about the middle. The distal half of the appendage is abruptly narrowed and the tip is sharply pointed.

Besides the present specimen, the species has already been recorded from the Sandheads. In the Indian Museum collection there are specimens from Hongkong, the Mergui Archipelago, the Andaman Islands, the Sandheads and the Orissa coast. Laurie<sup>3</sup> has recorded it from the Gulf of Manaar and the coast of Ceylon. The species was originally described from Hongkong.

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<sup>1</sup> Nobili, *Boll. Mus. Zool. Torino* XVIII, No. 455, p. 28 (1903).

<sup>2</sup> Rathbun, *Skrift. K. Dansk. Vidensk. Selsk. Copenhagen* (7) V, p. 318 (1910).

<sup>3</sup> Laurie, *Ceylon Pearl Oyster Fish. Rept.* V, p. 381 (1906).

***Doclea tetraptera* Walker.**

1895. *Doclea tetraptera*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 231-233.

As pointed out by Alcock, the present species resembles very closely *Doclea calcitrata* White<sup>1</sup>, the most important difference between the two being that in White's species the legs are very much longer and somewhat more slender. The disposition of hairs on the legs is also different in the two species, and the palm of the male chela in White's species does not appear to be elegantly carinated on the lower border, as in the case of *D. tetraptera*. In most other characters, however, the two species appear to be very closely similar.

*D. tetraptera* is represented in the present Sandheads collection by four specimens, three females, of which two are ovigerous, and one young male. They agree in every respect with the published descriptions of the species, as also with the Indian Museum specimens named by Alcock. The disposition of the hairs on the walking legs and the chelipeds is very characteristic in this species. The chelipeds in the young male are very slender like those of the female, and the palm is not particularly inflated.

The anterior abdominal appendages of the male (text-fig. 1d) are straight and stout throughout, except right at the tip, where a sharp angle is formed. There are a few spinules on the basal part of the outer border.

The species does not grow to a large size, the largest male specimen in the Museum collection has its carapace, including the rostrum, but excluding the long posterior spine, about 46 mm. long, while the breadth, exclusive of the lateral spines, is 35 mm. A large egg-bearing female in the present collection is 40 mm. long and about 31 mm. broad.

The species appears to be fairly common at the Sandheads; all the specimens in the Museum collection, excepting one very young example<sup>2</sup> from the Gulf of Martaban, are from this locality. The species was originally described from Singapore, and has also been recorded from the Gulf of Siam by Miss Rathbun<sup>3</sup>.

***Phalangipus longipes* (Linn.).**

1895. *Egeria arachnoides*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 223, 224.

As pointed out by Miss Rathbun<sup>4</sup>, Leach's generic name *Egeria* (or *Aegeria*, as it has been spelt by some of the earlier writers) cannot be employed in the Oxyrhyncha, as it has already been used in the Mollusca, as early as 1804-1805. The other names used for the forms included under *Egeria* Leach, viz., *Leptopus* Lamarck and *Stenopus* Leach, are also preoccupied. Miss Rathbun has, therefore, revived, in a restricted sense, the composite name *Phalangipus*, which Latreille used in 1828<sup>5</sup> for *Libinia*, *Doclea* and *Egeria*—all genera of Leach 1815.

<sup>1</sup> Adam and White, 'Samarang' Crust., p. 7, pl. i, fig. 2 (1848).

<sup>2</sup> This specimen differs in some minor characters from the larger examples, but is most probably referable to the present species.

<sup>3</sup> Rathbun, *Skript. K. Dansk. Vidensk. Selsk. Copenhagen* (7) V, p. 318 (1910).

<sup>4</sup> Rathbun, *Proc. Biol. Soc. Washington* XI, pp. 159, 160 (1897).

<sup>5</sup> According to Sherborn and Woodward [*Ann. Mag. Nat. Hist.* (7) XVII, p. 578 (1906)] the date of publication of this part of Latreille's work is 1828, and not 1825, as mentioned by Miss Rathbun and several other authors.

The two first-named of these genera are still valid, but *Egeria* being preoccupied, the use of *Phalangipus* in its place appears to be permissible under the operation of Art. 30 of the International Code (see also Opinion 9).

The pre-Linnean name *arachnoides* Rumphius 1711 must, according to the rules of zoological nomenclature, give place to the Linnean name *longipes*. *Egeria indica* Leach and *Egeria herbstii* Milne-Edwards appear to be only synonyms of *longipes*.

*Phalangipus longipes* appears to be a very common species at the Sandheads; in the present collection it is represented by 24 examples, 16 males and eight females, collected on eight different occasions between 1922 and 1932. All the females, except one young specimen, are ovigerous; most of the males also appear to be adult.

The Sandheads specimens agree closely with Alcock's excellent description, as also with our named material. As usual the abdomen in the male consists of seven distinct somites. The first segment has a prominent keel-like median projection posteriorly; the second and the third segments also have traces of similar projection, while the remaining segments, except the terminal, have a small thickening each in the middle line near the distal border. Besides these the third somite has two fairly large tubercles, one on each side near the lateral border. In the female the three basal segments have keel-like median projections, while the third has in addition two lateral projections. The composite segment 4-6 has two pairs of small projections on the sides near the base, one pair appearing to belong to the fourth and the other to the fifth somite.

An examination of a large number of specimens of both sexes in the Indian Museum collection has shown that the present species is very variable in the size and disposition of the spines on the dorsal surface of the carapace and, to some extent, in the length and proportion of the chelipeds and the last pair of walking legs.

The banding of the ambulatory legs in red, as mentioned by Alcock and de Man<sup>1</sup>, is faintly visible in some of the Sandheads specimens.

*P. longipes* occurs quite commonly in the Indian waters. Besides specimens from Formosa and Hongkong, the species is represented in the Indian Museum collection by numerous examples from Mergui, Tenasserim coast, Nicobar Islands, Delta of the Irrawady, Chittagong coast, Sandheads, and from several localities off the Orissa and Madras coasts. There are no specimens from the western coast of the Indian Peninsula, or from any locality in the Arabian Sea.

The species has also been recorded from several other localities in the eastern parts of the Indo-Pacific region and from the Laccadives and Maldives by Borradaile<sup>2</sup>.

A number of specimens have a few Cirripedes attached on the dorsal surface of the carapace, especially near the joints of the legs, and several in the older collection are infested with Rhizocephala.

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<sup>1</sup> De Man, *Vidensk. Medd. naturhist. Foren. Kobenhaven* LXXXVII, pp. 106-108 (1929).

<sup>2</sup> Borradaile, *Fauna Geog. Maldives and Laccadive Arch.* II, p. 688 (1903).

## Family PARTHENOPIDAE.

**Lambrus (Platylambrus) prensor** Herbst.

1895. *Lambrus (Platylambrus) prensor*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 262, 263.

1931. *Lambrus (Platylambrus) prensor*, Flipse, *Rijks Mus. Nat. Hist. Leiden* XIV, pp. 91-93.

This rather common Indian species is represented by seventeen examples in the present collection ; out of these ten are males and seven females. Of the latter three are ovigerous, the largest of these being about 27 mm. broad across the carapace, excluding the lateral spines. The species appears to be very common at the Sandheads, and has already been collected there on a number of occasions.

The present specimens agree closely with the published descriptions of the species, as also with named examples in the Museum collection.

*L. (Platylambrus) prensor* is a fairly common species in the Indian waters. In the Indian Museum there are specimens from Penang, the Andaman Islands, the Arakan coast, the Sandheads and from a number of localities along the Orissa and Ganjam coasts.

Flipse gives the distribution of the species as Orissa coast, Yanaon (Madras coast), Singapore, Benkalis Island and Soerabai (Indian Archipelago). I have not been able to verify his record of the species from Ceylon<sup>1</sup>. The species lives in shallow waters only.

**Cryptopodia angulata** Milne-Edwards & Lucas.

1895. *Cryptopodia angulata*, Alcock, *Journ. As. Soc. Bengal* LXIV, pp. 282, 283.

*C. angulata* appears to be fairly common at the Sandheads ; there are in the present collection fourteen examples, seven males and seven females, collected between 1923 and 1932.

The present specimens agree fairly closely with the original description of the species by Milne-Edwards and Lucas<sup>2</sup>, as also with Alcock's account of it. In some examples the triangular depression on the carapace is more or less shallow, while in others it is quite deep—almost as deep as described by Alcock for his variety *cippifer*.<sup>3</sup> The depression appears to be deeper in smaller specimens than in larger ones. Another character that Alcock mentioned for his variety is the presence of some sharp spines on the ridges that bound the triangular depression on the carapace. There are two spines close together side by side in the middle line in front, one at either branchial angle, and one in the middle line posteriorly, on the summit of the cardiac region. All these spines are very clearly seen in the six specimens on which Alcock based his variety. In most of the Sandheads examples the position of these spines is indicated by large or small tubercles, which, though mostly blunt, are somewhat sharp in a few cases. In one small individual the tubercles at the branchial angles are replaced by small spines, while at the anterior angle of the triangle there are small sharp tubercles.

<sup>1</sup> Flipse, *Siboga Exped. Rep.* XXXIX C<sup>2</sup>, p. 79 (1930).

<sup>2</sup> Milne-Edwards and Lucas, *Arch. Mus. Hist. Nat. Paris* II, pp. 481, 482, pl. xxviii, figs. 16-19 (1841).

<sup>3</sup> Alcock, *Journ. As. Soc. Bengal* LXIV, p. 283 (1895) ; *Ill. Zool. Investigator, Crust.*, pl. xxiii, fig. 4 (1897).

In no Sandheads specimen, however, is there a full complement of spines, or even sharp tubercles, that characterise the variety; the spine on the posterior border of the depression, on the summit of the cardiac region, is invariably absent. The amount of granulation on the upper surface of the globular carpus of the chelipeds also appears to be variable; in most examples the carpus is smooth, while in some the condition almost approaches that found in the variety *cippifer*.

As usual in the genus the abdomen in the male has only five distinct somites, segments 3-5 being more or less coalesced. Milne-Edwards and Lucas say that "l'abdomen offre sept segments distincts dans les deux sexes", but this is obviously a mistake, so far as the males are concerned. The segments, except the terminal, are more or less keeled transversely in the middle, and there is a sharp upright spine on the sixth segment. There are also a few small, scattered tubercles on the composite segment 3-5 and on the sixth segment. In the female also the segments are keeled and some of them are sharply tuberculate.

*C. angulata* does not appear to be a common species in the Indian waters. Apart from the present specimens, it is represented in the Museum collection by a single specimen, collected by the Marine Survey, off Hanawar along the western coast of India, at a depth of 28 fathoms; the correct identification of this specimen, as mentioned below, is far from certain. Alcock recorded the species from the Orissa coast also, but unfortunately the material on which this record is based cannot at present be traced in the collections.

The type-locality of the species is not known. Apart from this, *C. angulata*, as so far recorded, is restricted to the Indian waters only. According to Alcock it occurs along both the coasts of the Indian Peninsula, while his variety *cippifer* is known from Karachi only. The present record of the species from the Sandheads somewhat extends its range along the eastern coast. I have not been able to verify Flipse's<sup>1</sup> record of the species from Ceylon; he also gives the distribution of the species as the Orissa and Malabar coasts.

The large male specimen from off Hanawar, as mentioned by Alcock, has the dorsal surface of the carapace and the chelipeds profusely granular, and their borders far more sharply toothed than is usually the case in this species. It is possible this specimen represents an undescribed species.

### Subtribe *BRACHYRHYNCHA*.

#### Family PORTUNDIDAE.

#### Subfamily LUPINAE.

#### **Neptunus (Neptunus) sanguinolentus** (Herbst).

1899. *Neptunus sanguinolentus*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 32, 33.

1922. *Neptunus (Neptunus) sanguinolentus*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, pp. 106, 107.

1925. *Neptunus sanguinolentus*, Delsman and de Man, *Treubia* VI, p. 310.

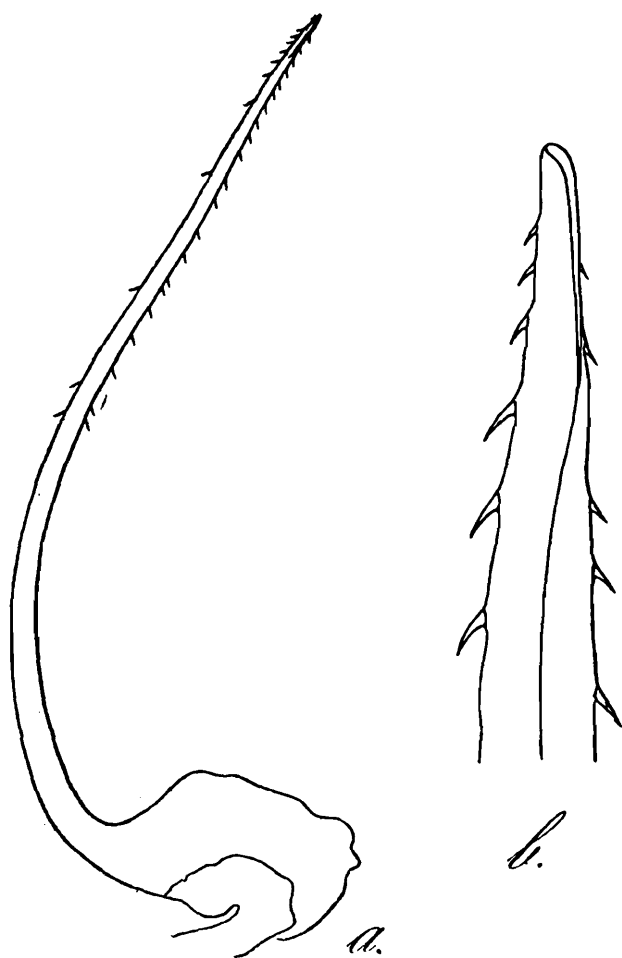
In the Sandheads collection there are twelve specimens that are referable to the present species; of these nine are males and three females.

<sup>1</sup> Flipse, *Siboga Exped. Rep.* XXXIX C<sup>2</sup>, pp. 78 and 82 (1930).

All the females are ovigerous. The largest male specimen is about 120 mm. broad across the carapace, including the large lateral spines, while the largest female has a corresponding breadth of 126 mm.

All the specimens agree closely with Alcock's description, as also with specimens named by him in the Indian Museum collection. In younger specimens, as is usually the case, the spines on the antero-lateral margins of the carapace are sharply pointed and are proportionately long; these tend to wear off with age, and in large examples are somewhat blunt and proportionately short.

The anterior male appendages are as shown in the accompanying text-figure. These are quite straight and have no sharp bend near the tip. The margins in the distal part are beset with somewhat stout spines.



TEXT-FIG. 2.—*Neptunus* (*Neptunus*) *sanguinolentus* (Herbst). a. First left pleopod of male :  $\times ca. 4$ . b. Tip of the same enlarged :  $\times 32$ .

The three large red spots on the posterior part of the carapace are very characteristic of this species, and can generally be made out even in specimens that have long been preserved in spirit.

*N. sanguinolentus* occurs quite commonly in the Indian coastal waters. In the Museum collection there are specimens from Hongkong, the Andaman Islands, the mouth of the Hooghly river, several localities along the eastern coast of the Indian Peninsula, Ceylon, Malabar coast, Karachi and the Persian Gulf,

The species has a very extensive range over the Indo-Pacific region. Delsman and de Man give its distribution as : " Red Sea (Coast of Erythraea), Natal, Cape of Good Hope, Indian Ocean, Indian Archipelago, China Sea, Japan, Hawaiian Islands, East- and South-Australia"

De Man<sup>1</sup> has recorded the species from fresh waters of the Malay Archipelago also.

**Neptunus (Neptunus) pelagicus (Linn.).**

1899. *Neptunus pelagicus*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 34, 35.

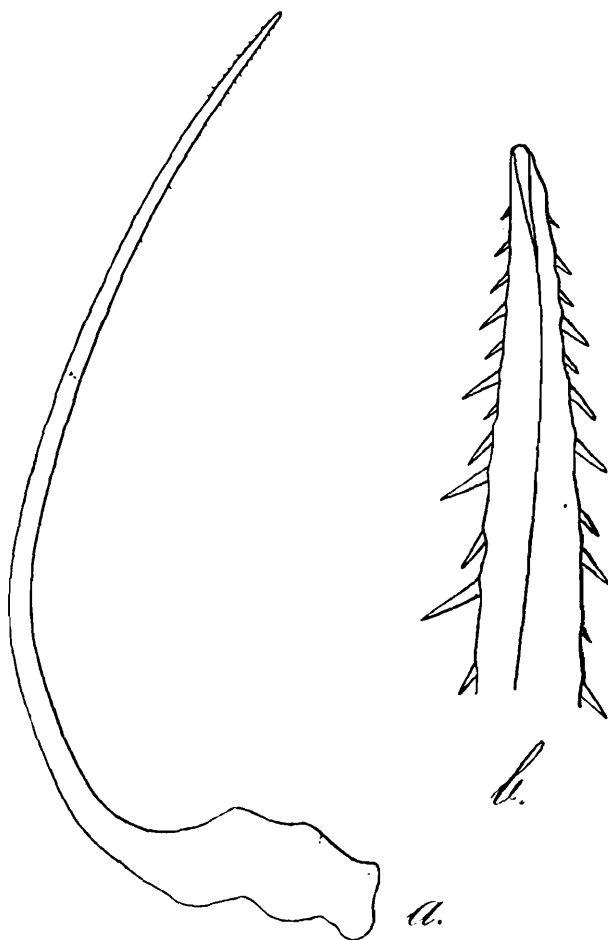
1922. *Neptunus (Neptunus) pelagicus*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft II, p. 107.

1925. *Neptunus pelagicus*, Delsman and de Man, *Treubia* VI, pp. 309, 310.

1930. *Neptunus pelagicus*, Monod, *Zool. Anz.* XCII, p. 140.

1933. *Neptunus pelagicus*, Steinitz, *Publ. Stat. Zool. Napoli* XIII, p. 150.

Four specimens, three males and one female, are in the Sandheads collections. One young male has a carapace breadth (including the long lateral spines) of 89 mm. only, while the other two are 134 and 140 mm. broad respectively. The single female is non-ovigerous, and has an extreme breadth of the carapace of 123 mm.



TEXT-FIG. 3.—*Neptunus (Neptunus) pelagicus* (Linn.). a. First left pleopod of male :  $\times 3$ . b. Tip of the same enlarged :  $\times 32$ .

As is usual in the species the anterior border of the merus of the large cheliped is armed with three large spines, but in the female specimen in the present collection there are four large spines, in addition to a small one, on this border.

<sup>1</sup> De Man, *Abh. Senkenb. Natur. Ges. Frankfurt* XXV, p. 642 (1902).

All the specimens carry a few Lepadids on the dorsal surface of the posterior part of the carapace.

The anterior appendages of the male are more or less like those of the preceding species, though the distal part seems to carry a larger number of spines (text-fig. 3).

The general colouration of the species has been described by Alcock and several other writers. In two large freshly preserved males the general colour was observed to be pinkish-purple, with the tips of the chelae and the distal segments of the legs purple. The carapace was somewhat dirty-brownish, with the gastric region orange. There were extensive whitish spots on the carapace and legs. As remarked by Munro Fox<sup>1</sup>, the females are not brilliantly coloured like the males, but are sand-coloured.

In the Indian Museum there is a large number of specimens of this species from several localities from Penang to the Persian Gulf.

Delsman and de Man give the distribution of the species as follows:—"Red Sea (Suez), Mediterranean (Port Said), Indian Ocean (Natal, Zanzibar, Mozambique, Madagascar, Coasts of India), Persian Gulf, Mergui Archipelago, Singapore, Indian Archipelago, Philippines, coasts of Australia (Port Jackson, Swan River, Shark Bay, Western Australia), New Zealand, New Caledonia, Tahiti, China Sea, Japan."

In 1924 Munro Fox<sup>2</sup> discussed the migration of this species through the Suez Canal into the Mediterranean Sea and opined that Haifa, on the coast of Palestine, was perhaps near the limit of its penetration to the north-east, while on the west the crab had definitely been reported from Mersa Matruth, a little over 500 kilometres from Port Said, where its presence was first noticed in 1898. Six years later Monod was able to show that the species had travelled up along the coasts of Palestine and Syria to the extreme point of the Gulf of Alexandretta, about 800 kilometres from Port Said. The further migration of this crab along the coast of Asia Minor on one side and along that of Egypt on the other is not known. Steinitz has also recorded this species from the Mediterranean.

### ***Neptunus (Hellenus) hastoides* (Fabr.).**

1899. *Neptunus (Hellenus) hastoides*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 38, 39.

1922. *Neptunus (Hellenus) hastoides*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, p. 108.

The present species is represented by four specimens in the Sand-heads collection; out of these three are males, ranging from 35 mm. to 37 mm. in the extreme breadth of the carapace (including the long epibranchial spines), while the single female, which is apparently young, is 34 mm. across the carapace. According to Alcock in egg-bearing females the carapace, including the spines, is 42 mm. broad.

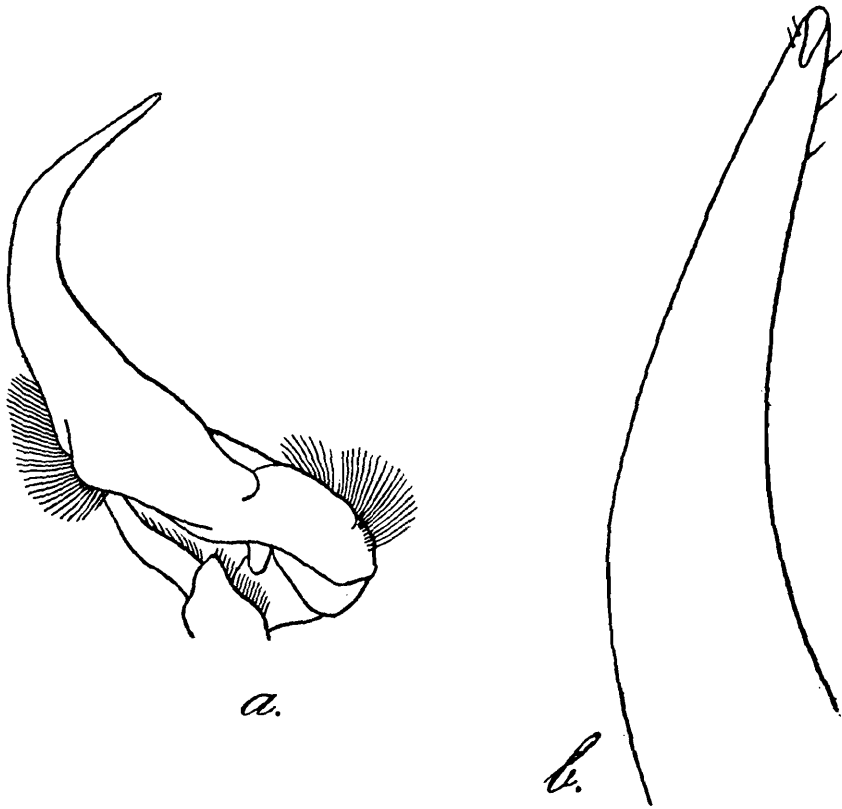
The first abdominal appendage of the male is rather short, and, as illustrated in the accompanying text-figure, is considerably curved a little behind the tip. There are very few hairs on the distal part.

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<sup>1</sup> Munro Fox, *Trans. Zool. Soc. London* XXII, p. 217 (1927).

<sup>2</sup> Munro Fox, *Nature* CXIII, pp. 714, 715 (1924); also *Trans. Zool. Soc. London* XXII, p. 217 (1927).

The blackish-brown mark on the tip of the dactylus of the last pair of legs seems to be a constant feature of this species, and can be made out even in examples that have long been preserved in spirit.



TEXT-FIG. 4.—*Neptunus (Hellenus) hastoides* (Fabr.). a. First left pleopod of male, with part of the second pleopod, seen near the base:  $\times ca. 9$ . b. Tip of the first pleopod enlarged:  $\times ca. 46$ .

*N. hastoides* is frequently met with at the Sandheads, for besides the present specimens the species has already been recorded from this locality on a number of previous occasions. It occurs quite commonly along the eastern coast of India from the Sandheads to the Palk Straits, and has been recorded by Laurie<sup>1</sup> from the coasts of Ceylon also. In addition there are specimens in the Museum collection from Hongkong, the Andaman Islands, Gulf of Martaban and the Persian Gulf. Most of the specimens have been collected in shallow waters, though some from the Bay of Bengal, off the Orissa coast, are from a depth of 31 fathoms.

Balss gives the distribution of the species as: "Japan, Kobi, Tokiobai, Tanagawa, Wakanuura, Nagasaki, Hongkong, Malakka, Singapore, Penang, Neu-Guinea, Ceylon, Andamanen, Laccadiven, Vorderindien, Zanzibar."

It is difficult to say whether Laurie's variety *unidens*, based on a single incomplete specimen, is referable to the present species or not. The character of the frontal teeth, on which the variety is primarily based, shows such fundamental difference from the typical species that the possibility of Laurie's specimen being abnormal cannot be overlooked.

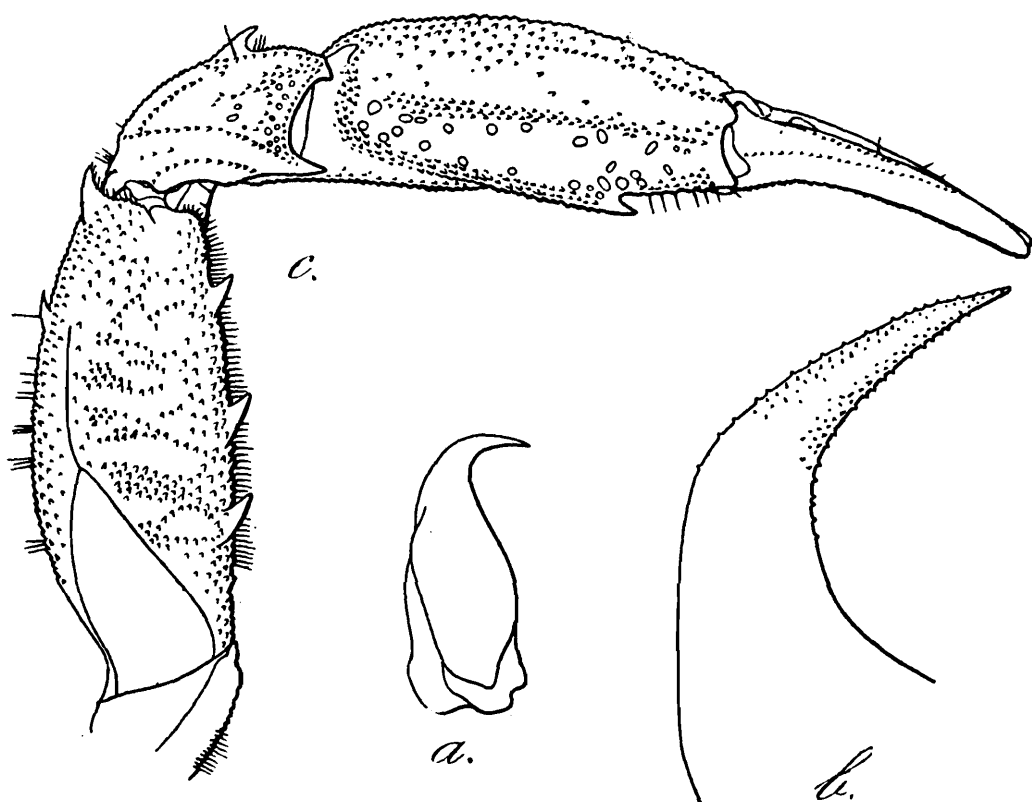
<sup>1</sup> Laurie, *Ceylon Pearl Oyster Fish. Rep.* V, p. 414 (1906).

**Neptunus (Hellenus) pulchricristatus** Gordon.

1899. *Neptunus (Hellenus) spinipes*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 39, 40 [*nec* 1886, *N. spinipes*, Miers, *Challenger Brachyura* (Zool. XVII), p. 178, pl. xv, fig. 1].

1931. *Neptunus (Hellenus) pulchricristatus*, Gordon, *Journ. Linn. Soc. London* (Zool.) XXXVII, p. 534.

On comparing specimens of Alcock's *N. spinipes* with the Challenger type-specimens of the species preserved in the British Museum, Miss Gordon came to the conclusion that the two were not identical and that the former required a new name. An examination of a large number of specimens referred by Alcock to Miers' species has fully justified Miss Gordon's conclusions. The last pair of spines on the antero-lateral borders are very much longer in the Indian examples, so that the carapace breadth, including the spines, is generally not less than 2.3<sup>1</sup> times the carapace length, and in some cases is as much as 2.6 times; in Miers' species, as stated by Miss Gordon, it is always less than two times. The antero-lateral borders are not sharply dentiform in the Indian material, there being eight blunt lobes (some of which are obsolete) in front of the large lateral spines; in the Challenger specimens there are distinct teeth. In many of our specimens, however, the lobes are considerably more distinctly separated from one another than shown



TEXT-FIG. 5.—*Neptunus (Hellenus) pulchricristatus* Gordon. *a.* First left pleopod of male :  $\times 9$ . *b.* Tip of the same enlarged :  $\times 45$ . *c.* Left cheliped of male, upper and somewhat inner view :  $\times ca. 5$ .

in Miss Gordon's figure. In the true *spinipes*, as stated by Miers and Miss Gordon, the postero-lateral angles are never spiniform; in Alcock's specimens the posterior border forms "an acutely dentiform angle of junction" with the postero-lateral border. In many of the Indian

<sup>1</sup> In some Persian Gulf examples (*vide infra*) the carapace breadth is a little less than 2.3 times the carapace length.

specimens there is a distinct, sharp spine at this junction, even better developed than shown in Miss Gordon's figure. The second and third abdominal terga in both sexes have their crests "elegantly denticulated" in all the Indian examples; in Miers' species, though these crests are better developed, the beading or denticulation is said to be more or less absent. The anterior abdominal appendages of the male, as shown by Miss Gordon, are also different in the two species. I give here a figure of one of these appendages as seen in a large male specimen identified by Alcock as *N. spinipes*. These appendages are short and stout, except near the tip, where they are sharply bent. The terminal part is sharply pointed and is beset with very minute spines, more or less arranged in rows.

Another point of difference between the two species, not mentioned by Miss Gordon, refers to the number of teeth on the palm of the chelipeds. Miers<sup>1</sup> has described two spines on "the supro-internal margin (whereof the distal one is small and placed just above the dactyl), and one at the base near the articulation with the wrist," and his figure, (Plate xv, fig. 1b) shows the two anterior spines very distinctly. In the Indian Museum material there is only one spine (text-fig. 5c) at the distal end of the palm corresponding to the second spine of Miers' figure, the first spine ("just above the dactyl") being altogether absent. The supro-internal angle is sometimes a little acute, but there is never anything like the spine shown in Miers' figure.

There are four specimens of the present species in the Sandheads collection, collected on three occasions between January and March, 1923. They are all males, having a carapace length ranging between 17 and 22 mm. They agree in every respect with Alcock's and Miss Gordon's descriptions of the species, as also with named material in the Museum collection. The species does not appear to be very common at the Sandheads, and is being recorded from this locality for the first time.

*N. pulchricristatus* is known from several localities along the eastern coast of India; there are also specimens in the Museum collection from the Andamans, the Delta of the Irrawady, off the Akyab coast, the Gulf of Oman and the Persian Gulf. In the Indian waters the species has not been recorded from depths exceeding 35 fathoms, but the Persian Gulf specimens were dredged from depths ranging from 35 to 49 fathoms.

The species has a very wide range over the Indo-Pacific area, being known from localities as far apart as Hongkong and the Persian Gulf. Laurie<sup>2</sup> recorded *N. spinipes* from Galle on the Ceylon coast and also referred Henderson's<sup>3</sup> specimens of *N. andersoni* from the Gulf of Martaban to this species. Laurie had, however, compared his material with the Challenger types in the British Museum, and it is, therefore, likely that his specimens are referable to Miers' species, rather than to the present one.

Some of the Persian Gulf specimens in our collection differ from others in a few minor characters. The lateral spines are somewhat proportionately shorter, so that the carapace breadth (including the spines)

<sup>1</sup> Miers, *Challenger Brachyura* (Zool. XVII), p. 178, pl. xv, fig. 1 (1886).

<sup>2</sup> Laurie, *Ceylon Pearl Oyster Fish. Rept.* V, p. 415 (1906).

<sup>3</sup> Henderson, *Trans. Linn. Soc. London (Zool.)* V, pp. 368, 369 (1893).

is sometimes only 2.1 times the carapace length, and in no Persian Gulf example has it been found to be more than 2.4 times. The lobes on the antero-lateral borders in some examples are also a little more dentiform than is generally the case, though they are never like the well-formed teeth of *N. spinipes*. The postero-lateral angles are generally spiniform, but in some specimens they are a little less pronounced. The eyes in all the Persian Gulf specimens have a distinct reddish tint; in the material from other localities they are of the colour of dark slate, almost verging to black. In every other particular, however, these specimens agree so closely with the Indian examples of the species named by Alcock, that in my opinion there cannot be any doubt about their specific identity.

***Neptunus (Lupocycloporus) gracilimanus* (Stimpson).**

1858. *Amphitrite gracilimanus*, Stimpson, *Proc. Acad. Nat. Sci. Philadelphia* X, p. 38; also 1907. *Smithsonian Misc. Coll.* XLIX, p. 77, pl. x, fig. 3.  
 1899. *Neptunus (Lupocycloporus) whitei*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 44, 45 (*nec Neptunus gracilimanus*<sup>1</sup> Alcock, *loc. cit.*, p. 45).  
 1922. *Neptunus (Lupocycloporus) gracilimanus*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, p. 108.

Though it was no doubt somewhat difficult to recognise adequately this species from the brief Latin diagnosis published by Stimpson in 1858, the publication, by Miss Rathbun in 1907, of Stimpson's fuller description and illustration makes it abundantly clear that the form described by A. Milne-Edwards<sup>2</sup> in 1861 under the name of *Achelous whitei* is the same which Stimpson had diagnosed three years earlier as *Amphitrite gracilimanus*. Stimpson's later description corresponds almost exactly with that of Milne-Edwards, and applies fairly well to his figure also. The lateral spine in Milne-Edwards' figure is shown as somewhat shorter than in Stimpson's, but, as hinted by Henderson<sup>3</sup>, this character is probably variable to a certain extent. The only other difference between the two is that Stimpson does not mention the presence of a short spine on the posterior border of the merus of the last pair of legs, and it is difficult to say whether this spine is shown in his figure or not; it is, however, always present in this species.

I refer to the present species five examples collected at the Sandheads on three occasions in 1923. Of these there are three males, the largest having a carapace length of 25 mm., and a breadth (including the spines) of 48 mm., and two non-ovigerous females, the larger of the two having its carapace 15 mm. long and 28 mm. broad. The species has also been previously recorded from this locality.

All the Sandheads specimens agree closely with the descriptions given by Stimpson, Milne-Edwards and Alcock. The fine pearly granules on the arms, the costae on the wrists and palms of the chelipeds, and a few scattered ones on the carapace are constant features of the species.

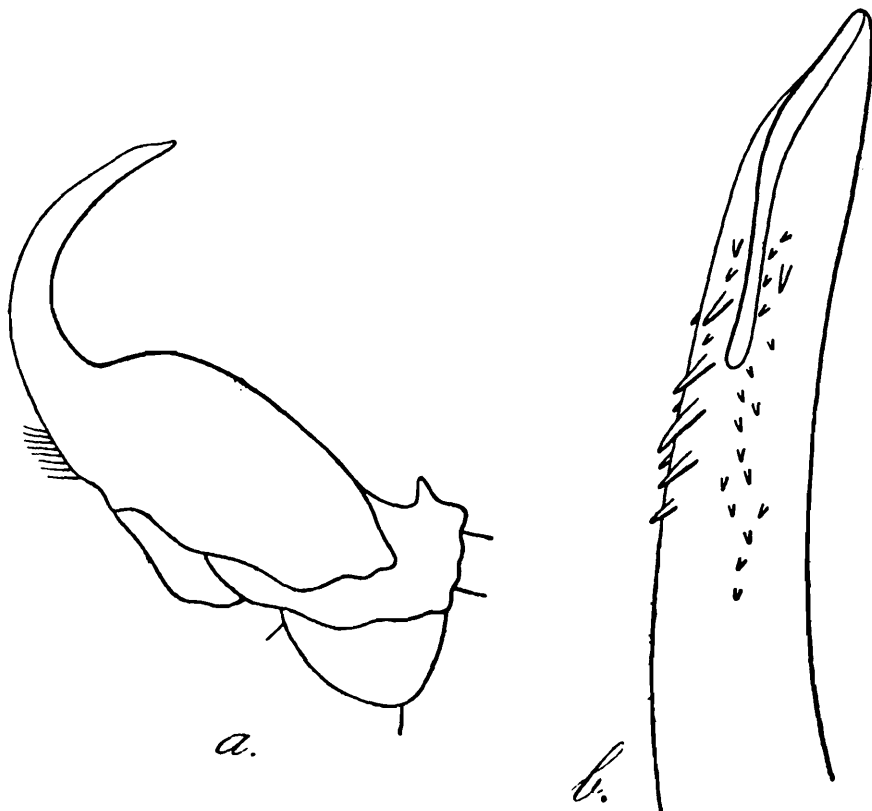
<sup>1</sup> As stated by Alcock, the form described by him as *gracilimanus* is quite distinct from *whitei*, and Miss Rathbun has proposed the name of *innominatus* for it [*Proc. Biol. Soc. Washington* XXII, p. 114 (1909)]. I have also examined the specimens that Alcock called *gracilimanus*, and am of the opinion that they cannot be referred to any of the known species of *Neptunus (Lupocycloporus)*.

<sup>2</sup> Milne-Edwards, *Arch. Mus. Nat. Hist. Paris* X, p. 343, pl. xxxi, fig. 6 (1861).

<sup>3</sup> Henderson, *Trans. Linn. Soc. London (Zool.)* V, p. 371 (1893).

The merus of the external maxillipeds has its antero-external angles pronounced.

The anterior abdominal appendages of the male are figured in the accompanying illustration. They are superficially like those of the two preceding species of *Neptunus* (*Hellenus*), but the terminal portion is longer and is more sharply bent. The minute spines near the tip are also differently arranged.



TEXT-FIG. 6.—*Neptunus* (*Lupocycloporus*) *gracilimanus* (Stimpson). a. Anterior left pleopod of male :  $\times 9$ . b. Tip of the same enlarged :  $\times 47$ .

*N. gracilimanus* is recorded from the Indian waters from Port Blair in the Andaman Islands, the Sandheads, Balasore Bay and Chilka, Bight on the Orissa coast, and the Palk Straits between India and Ceylon ; Henderson recorded the species from the Gulf of Martaban, while Laurie<sup>1</sup> examined specimens from the Gulf of Manaar and off Mutwal Island.

The present species has a very wide range of distribution over the Indo-Pacific area, having been recorded from several localities from the south of New Guinea to the eastern coast of India. It was originally described by Stimpson from Hongkong, while the material on which Milne-Edwards based his *Achelous whitei* was obtained from the coasts of Borneo.

#### ***Charybdis* (*Goniosoma*) *cruciatus* (Herbst).**

1899. *Charybdis* (*Goniosoma*) *crucifera*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 51-53.

1922. *Charybdis crucifera*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, p. 104.

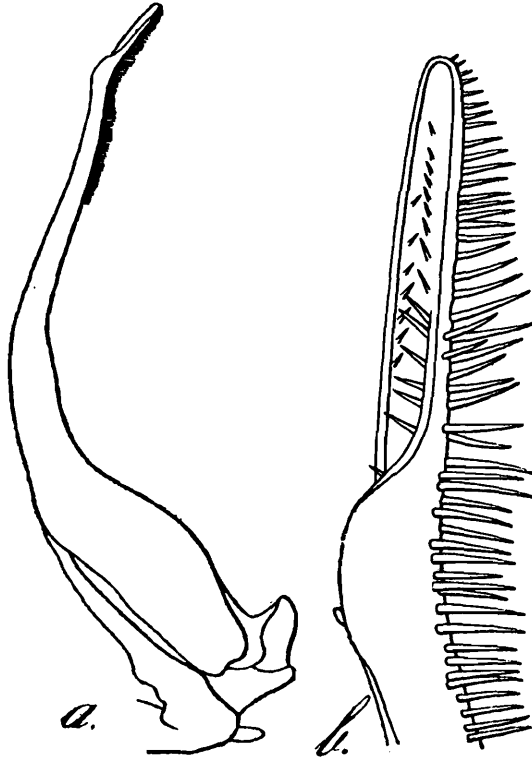
1925. *Charybdis* (*Goniosoma*) *cruciatus*, Delsman and de Man, *Treubia* VI, pp. 311, 312.

This is one of the commonest species of the family Portunidae found at the Sandheads. In the present collection there are 10 male specimens

<sup>1</sup> Laurie, *Ceylon Pearl Oyster Fish. Rep.* V, p. 416 (1906).

(seven of which are of a large size), besides a number of non-ovigerous females and young examples.

For purposes of comparison with other species of the genus I give here a figure of the anterior abdominal appendages of the male. These are more or less straight, with the tip bluntly pointed. There is a thick fringe of longish hairs on the distal part of the outer margin and a few short scattered hairs on the upper surface also.



TEXT-FIG. 7.—*Charybdis (Goniosoma) cruciatus* (Herbst.) a. Left anterior pleopod of male :  $\times 2\frac{1}{2}$ . b. Tip of the same enlarged :  $\times 16\frac{1}{2}$ .

One young female in the Sandheads collection, though apparently referable to the present species, shows some unusual characters. The first lobe on the antero-lateral margin of the carapace is only very faintly notched; the teeth of the outermost pair on the frontal margin are distinctly narrower and less bluntly pointed than those of the other two pairs, as is sometimes the case in very young examples; the arm of the cheliped on one side of the body bears four large spines on its anterior border (on the other side there are only three, as is normally the case in this species); there are four minute spinules on the posterior border of the propodus of the last pair of legs (these are clearly seen on the leg of one side only); and lastly all the four spines on the dorsal surface of the palm are sharply pointed, as is sometimes the case in very young individuals.

One large male specimen has its abdomen shaped somewhat like that of a young female, though the male appendages appear to be normally developed; this is no doubt due to the presence of a Rhizocephalan parasite, that is seen attached on the under side of the abdomen.

*Charybdis cruciatus* is a very common species in the Indian waters, occurring extensively both in the Bay of Bengal and the Arabian Sea. Delsman and de Man give its distribution as: "Indian Ocean, South Africa (Port Alfred), Indian Archipelago, China Sea, Japan, Australia."

**Charybdis (Goniosoma) merguiensis (de Man).**

1899. *Charybdis (Goniosoma) merguiensis*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 55, 56.

1930. *Charybdis (Goniosoma) merguiensis*, Monod, *Zool. Anz.* XCII, p. 140.

1933. *Charybdis merguiensis*, Steinitz, *Publ. Stat. Zool. Napoli* XIII, pp. 151, 152.

I refer to this species one large female ovigerous specimen collected at the Sandheads in January, 1928, along with some examples of the preceding species. The present specimen agrees closely with de Man's<sup>1</sup> excellent and detailed description of the species, as also with the numerous Indian Museum examples named by Alcock. The Sandheads specimen has a carapace length of 37 mm. and a breadth of 64 mm., as measured between the tips of the last antero-lateral spines.

The proportion between the carapace length and its extreme breadth seems to differ considerably in the two sexes. According to de Man the proportion between the carapace breadth measured from tip to tip of the last antero-lateral spines to its length is as 21:13, or in other words, the length is contained 1.61 times in the total breadth; according to Alcock this figure is roughly 1.50. In the Indian Museum collection I find that in large males (carapace length 38-45 mm.) the length of the carapace is contained 1.53 to 1.56 times in the breadth, and even in smaller individuals of this sex the proportion is about the same. There are no ovigerous females in the Museum collection, but in specimens 28-32 mm. long the proportion between length and breadth varies between 1.62 and 1.67. In the Sandheads specimen, an ovigerous female, this figure is about 1.73 and in de Man's figure of the species, which is that of a female, the proportion is about the same. It is thus seen that size for size females are proportionately broader than males; in males the length is about two-thirds the greatest breadth, while in large females it is almost four-sevenths.

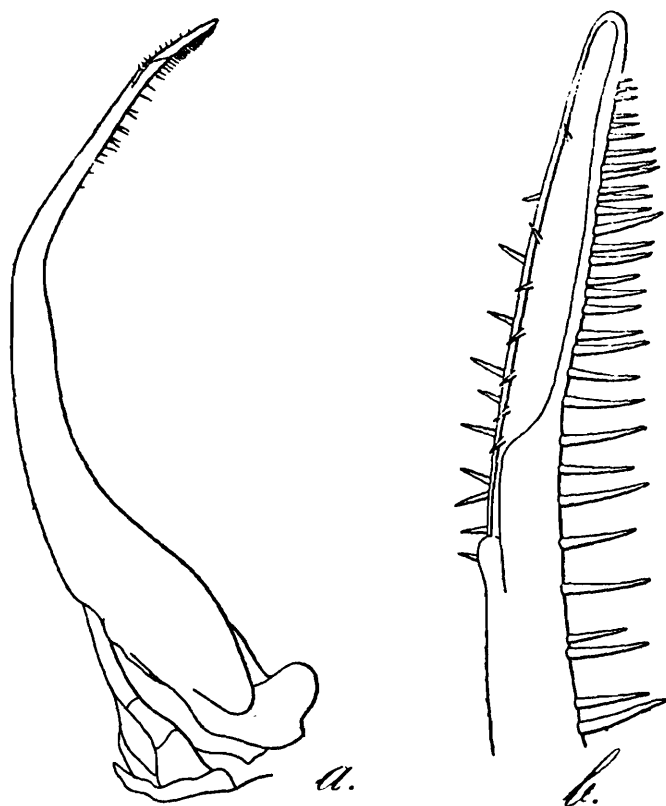
As mentioned by de Man the shape of the frontal teeth varies considerably with age; the smaller examples in the Museum collection bring out this point very clearly. The merus of the external maxilliped has a prominent expansion of its antero-external angle. The spine on the posterior border of the carpus of the last pair of legs is a characteristic feature of the species.

Monod and Steinitz have both referred to the presence of a strongly-arched "Querlinie" behind the front, and Monod has shown its exact position in his figure of the species. In the large number of specimens in the Indian Museum that I have examined I find that in the material from the Persian Gulf this "line" is strongly indicated as a somewhat shallow groove, fringed with a thick short pile on its edges and running almost exactly as shown in Monod's figure. The specimens from the other localities are much less hairy than those from the Persian Gulf and though the groove is faintly indicated in the identical position it is very inconspicuous on account of lack of fur on its edges. The dark red spots on the carapace mentioned by Monod and shown in his figure are not visible in any of the older Indian specimens, but in the example from the Sandheads they can be made out more or less clearly. These

<sup>1</sup> De Man, *Journ. Linn. Soc. London (Zool.)* XXII, pp. 82-88, pl. v, figs. 3, 4 (1887).

spots no doubt become faint and obliterated in specimens that have long been preserved in spirit. The Persian Gulf examples have the sternum of the abdomen and the hands finely hairy, as described by Steinitz for his specimens from the Palestine coast.

The anterior male abdominal appendages are of the same type as in the preceding species, but the outer margin and the upper surface appears to be somewhat less hairy. The inner margin in its distal part is also beset with hairs, and is notched off in a small rounded lobe a little way behind the tip. In the Persian Gulf specimens, which, in addition to being more hairy than those from the other localities, show one or two



TEXT-FIG. 8.—*Charybdis (Goniosoma) merguiensis* (de Man). *a.* Left anterior pleopod of male : $\times 5$ . *b.* Tip of the same enlarged : $\times 31$ .

other minor differences also, the male appendages are quite similar to those in examples from the more eastern parts of the Indo-Pacific region.

The tips of all the teeth on the antero-lateral borders, of all the spines on the chelipeds, and of the two spines (one on the merus and the other on the carpus) on the last legs are of a dark brown colour, even in specimens that have long been preserved in spirit. The distal portions of the fingers and their inner margins are also of the same colour.

The species is represented in the Indian Museum collection by specimens from Hongkong, Singapore, Mergui Archipelago, Andaman Islands, Karachi and the Persian Gulf. Monod and Steinitz have recorded it from the coasts of Palestine in the Mediterranean. *C. merguiensis* appears to be one of the few species that, with the opening of the Suez Canal, have been able to penetrate into the Mediterranean Sea. Unlike *Neptunus pelagicus* (*vide supra* p. 477) the present species does not appear to have become very common in the eastern parts of Mediterranean so far, but, as remarked by Steinitz, the presence of young individuals along the coast of Palestine, shows that it is getting firmly

established there. The range of the species, as at present known, is, therefore, from Hongkong to the coast of Palestine in the Mediterranean.

The present is the first record of the species from the eastern coast of the Indian Peninsula.

***Charybdis (Goniosoma) miles* (de Haan).**

1899. *Charybdis (Goniosoma) miles*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 62, 63.

In the Sandheads collection there are three examples referable to the present species; these are registered as under:—

|          |                                                      |                                  |                                     |
|----------|------------------------------------------------------|----------------------------------|-------------------------------------|
| C 1767/1 | Sandheads, off the<br>mouth of the<br>Hooghly River. | "Fraser"<br>22nd March,<br>1923. | 2 ♀♀, non-<br>ovigerous.            |
| C 1768/1 | Ditto.                                               | "Lady Fraser"<br>May<br>1928.    | 1 ♂, cara-<br>pace length<br>35 mm. |

Of the two females, one has a carapace length of 18.5 mm., while the other is a very immature specimen, having its carapace about 11 mm. long only.

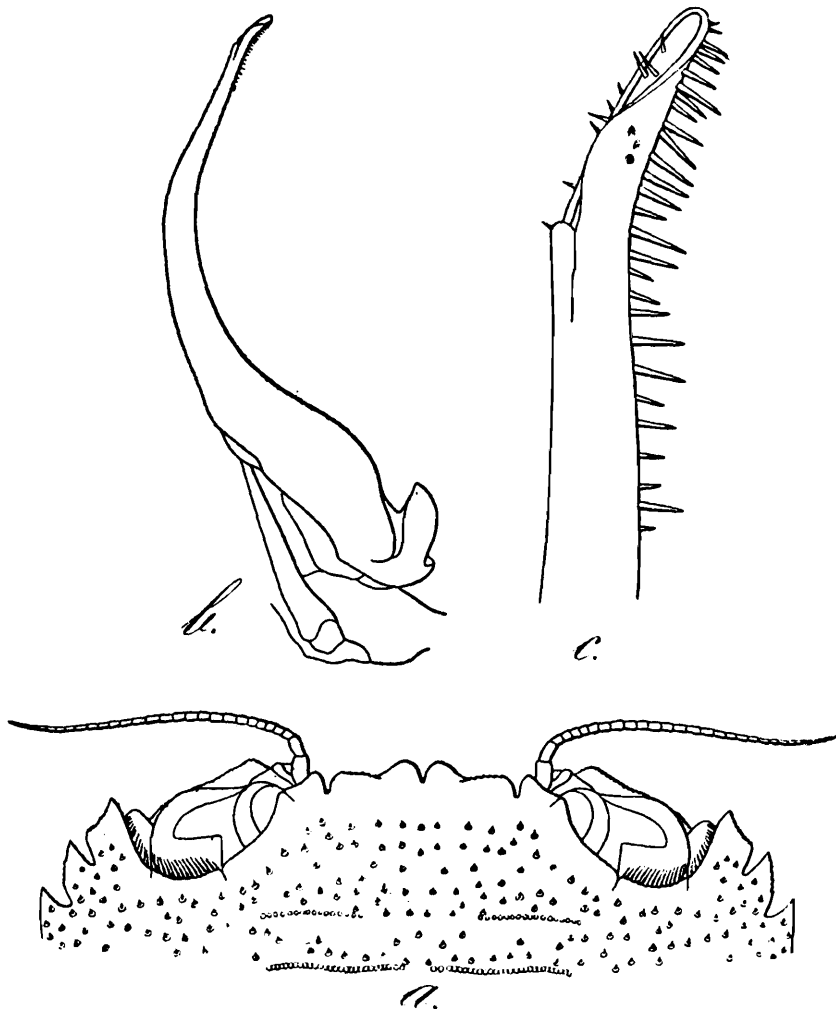
The length of the carapace in the present examples, as also in the three specimens already in the Indian Museum collection, is slightly less than three-fourths of its extreme breadth (ranging from 0.68 to 0.72). A very characteristic feature of the present species is that the orbits show a considerable dorsal inclination, and their greatest diameter (a distance in a straight line measured between the tips of the supra-internal and supra-external orbital teeth of one side) is about half of the frontal breadth or the distance between the orbits (measured between the tips of the two inner supra-orbital teeth). In this respect it is seen that in the young example from the Sandheads that I have examined (text-fig. 9a) the front is proportionately narrower, so that the greatest diameter of the orbit, measured as indicated above, is considerably more than half of the frontal breadth. It should also be noticed that in de Haan's<sup>1</sup> figure of the species the distance between the orbits is considerably more than twice their greatest diameter.

As remarked by de Man<sup>2</sup> in the case of *Charybdis merguiensis*, I have noticed in the present species also that in very young specimens the frontal teeth are blunt and rounded, and that they assume the shape characteristic of this species only when the individual grows in size. In the small Sandheads specimen referred to above the median teeth are only bluntly rounded lobes, separated from one another by a somewhat deep incision. The teeth of the next pair are not sharply separated off from those of the median pair; these are separated from the sub-median teeth by deep and broad incisions. The inner supra-orbital angles are barely noticeable; they are in the form of broad lobes, hardly separated off either from the upper orbital border or from the front proper. The outer supra-orbital angle, or the first tooth of the antero-lateral border, is a large broad tooth faintly notched in the middle and with its anterior angle sharply acute.

<sup>1</sup> De Haan, *Faun. Japon. Crust.* p. 41, pl. xi, fig. 1 (1835).

<sup>2</sup> De Man, *Journ. Linn. Soc. London (Zool.)* XXII, pp. 84, 85 (1887).

The anterior male appendages are as illustrated in the accompanying text-fig. 9b and c. They have a general resemblance to those of *C. merguiensis*, but the inner margin is less hairy, and the rounded lobe on this margin is somewhat nearer to the tip.



TEXT-FIG. 9.—*Charybdis (Goniosoma) miles* (de Haan). a. Fronto-orbital region of a young female from the Sandheads, with a carapace length of about 11 mm.:  $\times 5$ . b. Left anterior pleopod of male:  $\times 5$ . c. Tip of the same enlarged:  $\times 31$ .

Alcock has described the colour of the species in life. A specimen collected in the Gulf of Martaban after the publication of Alcock's work has the following note on its colouration: "Reddish brown on dorsum, with white spots  $\frac{1}{4}$  inch from posterior (?) antral angles. Points of clippers vermilion red. Ventrums white and pinkish in parts."

In Indian waters the species was so far collected in the Gulf of Martaban only at a depth of 53-67 fathoms. The present specimens are from much shallower waters (about 20 fathoms).

Parisi<sup>1</sup> gives the distribution of the species as: Japan, Sagami Bay, Kii, Honkong and Gulf of Martaban. The present record from the Sandheads only slightly extends the range of the species westwards. *C. miles* is thus so far known to be restricted to the eastern part of the Indo-Pacific area only.

<sup>1</sup> Parisi, *Atti. Soc. Ital. Sci. Nat.* LV, p. 175 (1916).

**Charybdis (Goniosoma) variegata** (de Haan).

1899. *Charybdis (Goniosoma) variegata*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 60, 61.

1922. *Charybdis variegata*, Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, pp. 104, 105 (*partim*).

Balss has expressed the opinion that the form described by Miers<sup>1</sup> as *Goniosoma variegatum*, var. *bimaculatum*, which Alcock<sup>2</sup> considered as a distinct species of the subgenus *Gonioneptunus* of the genus *Charybdis*, is referable to the *forma typica*. He believes that the chief character on which Alcock separated the species *bimaculata*, namely the inclusion of the antennal flagellum in the orbital hiatus, on account of the lobular projection at the outer angle of the basal antennal joint not touching the front, is only a feature of young specimens in the genus *Charybdis*. With this view I can express only partial agreement, for in some young examples that I have seen the flagellum is almost totally excluded from the orbit. In the Indian Museum collection, in addition to the two young specimens that Alcock referred to Miers' *bimaculata*, there is one of the *Challenger* duplicates. This is a large male specimen and even in this the lobular projection of the basal antennal joint does not touch the front, so that the flagellum clearly lies in the upper part of the orbital hiatus. In addition there are some other characters also, which Balss seems to have overlooked, in which *C. bimaculata* differs from the present species. The broad tooth on the lobule at the outer angle of the basal antennal joint, so characteristic of *C. variegata*, is not represented in Miers' species. The junction formed between the posterior and the postero-lateral borders of the carapace is more angular in *bimaculata* than in de Haan's species; there is a distinct terminal spine on the posterior border of the arm, which is totally absent in *C. variegata*; and the sixth segment of the male abdomen has a totally different shape in the two species. There are other differences also, but those mentioned above are sufficient to show that *C. bimaculata* (Miers) is a distinct species, as Alcock considered it, and cannot be regarded as a synonym of *C. variegata*, as suggested by Balss.

I refer to the present species two specimens, a large male and a very young female, from the Sandheads collection. They agree in every respect with the named material in the Museum collection.

The carapace is proportionately broad in the present species, the length being a little over half to about four-sevenths of the extreme breadth. The frontal teeth, especially those of the two middle pairs, are considerably more blunt in young individual than in grown up specimens.

The eyes have a strong dorsal inclination, and the greatest diameter of the orbit, *i.e.*, the distance between the tips of the outer and inner supra-orbital teeth of one side, is half (or even a little more than half) of the inter-orbital space, or the distance between the tips of the two inner supra-orbital teeth. Alcock has mentioned this distance as about two-fifths, but in a number of specimens that I have measured for this

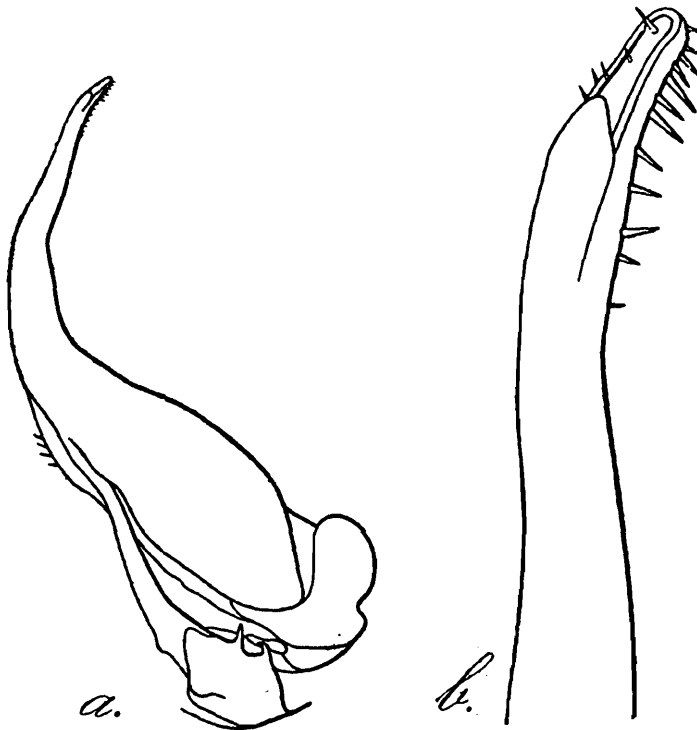
<sup>1</sup> Miers, *Challenger Brachyura* (Zool. XVII), p. 191, pl. xv, fig. 3 (1886).

<sup>2</sup> Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 69, 70 (1899).

purpose I have found it to vary from .48 to .55. In young individuals the orbits are slightly larger proportionately.

The large, broad tooth on the lobule at the outer angle of the basal antennal joint is a very characteristic feature of this species, which, according to Alcock, is not shared by any other Indian species of the genus.

The anterior abdominal appendages of the male, as seen in text-fig. 10, are only slightly different from those of the three preceding species. The distal part of the outer margin is sparsely clad with hairs and there is no distinct lobule on the inner margin behind the tip.



TEXT-FIG. 10.—*Charybdis (Goniosoma) variegata* (de Haan). a. Left anterior pleopod of male :  $\times$  ca. 8. b. Tip of the same enlarged :  $\times$  45.

*Charybdis variegata* is represented in the Indian Museum collection by numerous specimens from Nagasaki, Hongkong, the Ganjam and Madras coast, the Palk Strait and the Persian Gulf. Balss has mentioned the Red Sea also as one of the localities from which the species has been recorded. *C. variegata* has thus a wide range over the Indo-Pacific region, occurring from Japan to the Red Sea.

### ***Charybdis (Goniosoma) callianassa* (Herbst).**

(Plate IX, fig 1.)

1899. *Charybdis (Goniosoma) callianassa*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 57-59.

1925. *Charybdis (Goniosoma) callianassa*, de Man, *Treubia* VI, pp. 324-326.

The two specimens from Sumatra referred to the present species by de Man agree fairly closely with the descriptions of the species by Alcock and A. Milne-Edwards,<sup>1</sup> as also with our named material. There are, however, two points in which, as pointed out by de Man, the

<sup>1</sup> A. Milne-Edwards, *Arch. Mus. Hist. Nat. Paris* X, pp. 382, 383 (1861).

Sumatran examples differ from typical examples from the Indian waters. A faintly marked granular ridge is always present on the cardiac region of the carapace in the Indian specimens; in de Man's examples it is said to be totally absent, although the cardiac region itself is convex. The second point of difference refers to the spines on the wrist of the cheliped. Both Milne-Edwards and Alcock have described the wrist as having a large spine on the inner angle and three spinules at the outer angle. In de Man's specimens there are only two spinules at the outer angle, "the granular ridge on the upper side not terminating in a spine." In a very large number of the Indian Museum specimens that I have examined, a ridge is always present on the cardiac region, though in several instances it is very faint. Similarly there are three small spines on the outer surface of the wrist, and though the spine terminating the ridge on the upper side is always the smallest of the three, and in some cases is very minute, all the three of them can always be made out more or less distinctly. There are, however, in the Museum collection two specimens, one from Bombay and the other from Karachi, which differ from other specimens in the two points mentioned above, namely, the ridge on the cardiac region is missing and there are only two spinules at the outer angle of the wrist. It is thus seen that these two characters are constant in some specimens, which otherwise very closely resemble typical examples of *C. callianassa*; these possibly represent a distinct variety of this species.

There are two specimens referable to the present species in the Sandheads collection. One of these is an ovigerous female, and the other a very young example of the same sex. Both the specimens agree closely with typical examples of the species.

As remarked by previous workers the last spine on the lateral border is proportionately longer in the female, so that the carapace length as compared to its extreme breadth is more in the male than in the female. In the Indian specimens that I have measured, the carapace length in the males is generally  $\cdot 63$  or  $\cdot 64$  of its extreme breadth, while in the female it may be as low as  $\cdot 56$ . In the specimens described by de Man the length in the male is about three-fourths ( $\cdot 74$ ) of the breadth, while in the female even it is about two-thirds ( $\cdot 67$ ).

On account of the short thick pile on the carapace the ridges across its surface are generally not very prominent, and the one on the cardiac region is sometimes somewhat indistinct.

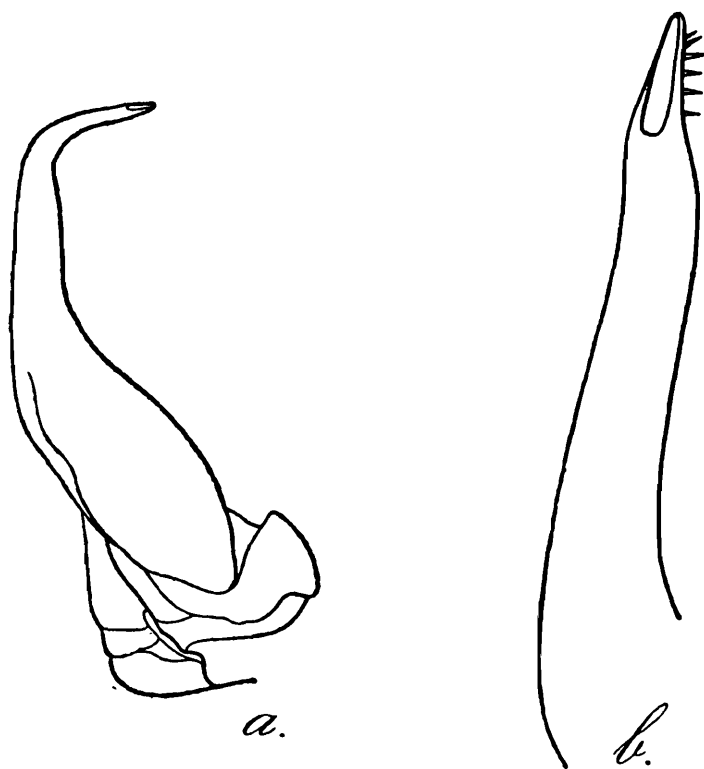
The orbits (Plate ix, fig. 1) have a fairly pronounced dorsal inclination (though not quite as much as in *C. variegata*), and the distance between the outer and inner supra-orbital angles of one side is only a little less than half of the distance between the tips of the two inner angles. In de Man's figure this distance is slightly more than half, while according to Alcock the major diameter of the orbit is a little more than a third of the inter-orbital distance.

The chelipeds are as described by Alcock and de Man. In all the examples that I have seen there are only two large spines on the anterior border of the arm—though sometimes a third smaller spine is present proximal to these two—and three spinules on the outer angle of the wrist; the spinule terminating the ridge on the upper surface of the

wrist is always reduced. The greatly inflated palm is a very characteristic feature of this species.

The abdomen of the male is as described by de Man, and the short transverse carina on the fourth somite is clearly seen in the Indian examples also. The sixth somite is broader than long; its sides in the basal half are more or less parallel, while in the distal half they are curved. The angles adjoining the seventh somite are rounded.

The anterior male appendages are markedly different from those of all the preceding species of this genus. They are sharply bent a little way behind the tip, which is also somewhat more sharply pointed. There are only a few hairs on the outer border quite close to the tip.



TEXT-FIG. 11.—*Charybdis (Goniosoma) callianassa* (Herbst). a. Left anterior male appendage :  $\times$  ca. 8. b. Tip of the same enlarged :  $\times$  45.

*Charybdis callianassa* is represented in the Indian Museum collection by a large number of specimens from the east coast of the Indian Peninsula, and from Bombay and Karachi. It is now recorded from the Sandheads for the first time. The range of distribution of the species over the Indo-Pacific area is not very extensive; except from the Indian waters it has only been recorded from the Gulf of Siam by Miss Rathbun<sup>1</sup> and from the coast of Sumatra by de Man. Kemp<sup>2</sup> has also recorded the species from the mouth of the Talé Sap in Siam.

***Charybdis (Goniosoma) rostrata* (A. M. Edwards).**

1899. *Charybdis (Goniosoma) rostrata*, Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 59, 60.

1925. *Charybdis (Goniosoma) rostrata*, de Man, *Treubia* VI, pp. 326-328.

*Charybdis rostrata* appears to be one of the commonest Portunids at the Sandheads, for besides the specimens in the present collection,

<sup>1</sup> Rathbun, *Skript. K. Dansk. Vidensk. Selsk. Copenhagen* (7) V, p. 364 (1910).

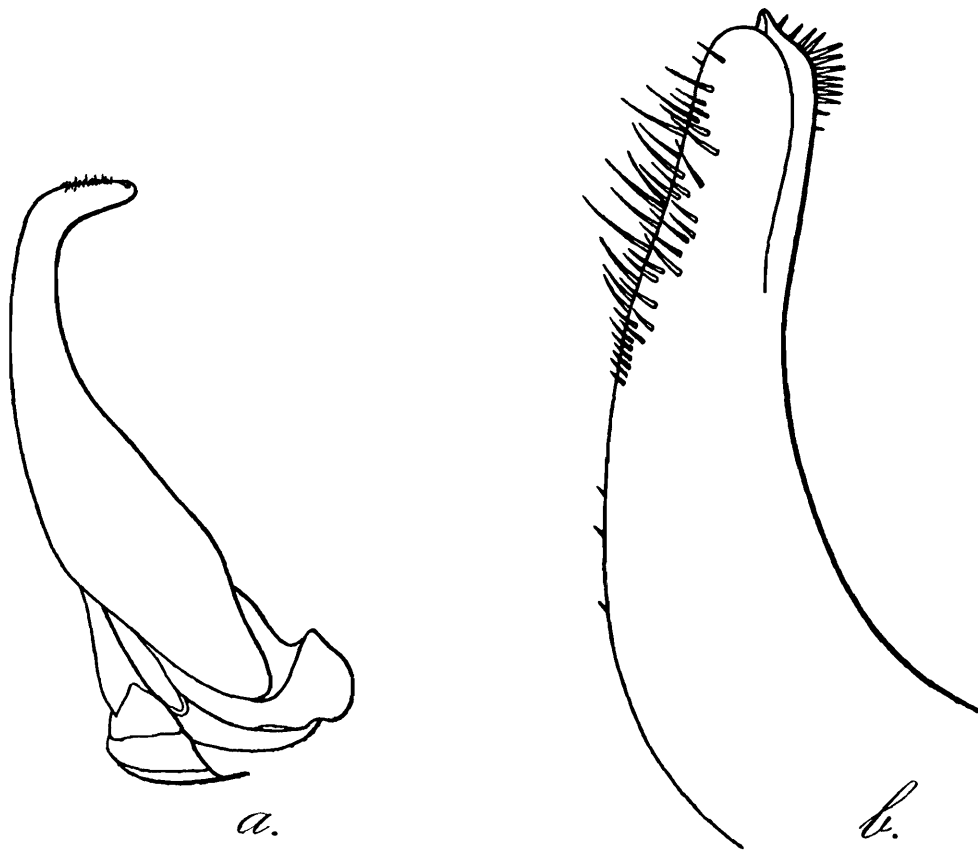
<sup>2</sup> Kemp, *Mem. As. Soc. Bengal* VI, p. 250 (1918).

the species is represented in the Museum collection by numerous examples collected from this locality on previous occasions also. I now refer to this species seven specimens, one female and six males, with the carapace ranging in length from 17.4 to 24.5 mm., and in breadth (including the spines) from 23.9 to 32.8 mm.

Apart from several other characters the present species is easily recognised by its comparatively large and prominent median frontal teeth. The teeth of the next pair are broad and slope outwards, while those of the outermost pair are narrow and almost straight.

The last spine on the antero-lateral borders is proportionately longer in the female than in the male, so that the carapace is proportionately longer (as compared to its extreme breadth) in the males than in the other sex. In a number of male specimens that I have measured the length (including the median frontal teeth) is between .70 and .75 of the carapace breadth, including the lateral spines. In females, on the other hand, the length ranges between .64 and .67 only of the extreme breadth. The greatest diameter of the orbit is, in most cases, only a little less than half of the distance between the two inner supra-orbital angles.

In the chelipeds the arm has two large spines on the anterior border, though there is sometimes a knob-like projection, or one or two small teeth, proximal to these spines. The wrist has, in all the specimens that I have examined, only two spinules at the outer angle, the ridge on the



TEXT-FIG. 12.—*Charybdis (Goniosoma) rostrata* (A. M.-Edw.) a. Left anterior male appendage :  $\times$  ca. 8. b. Tip of the same enlarged :  $\times$  45.

upper surface of the wrist having no spine at its end. The palms are greatly inflated, considerably more so in the male than in the female, and bear only two spines on the upper surface, one near the wrist joint, and the other a little way behind the junction of the dactylus. In one

or two specimens the spine near the finger joint is missing. The fingers, especially those of the smaller chela, are thin and long.

As mentioned by de Man the lower border of the orbit is considerably more concave in the present species than in preceding one.

The anterior male abdominal appendages are sharply bent a little behind the tip as in *C. callianassa*, but the tip itself is thick and bluntly rounded. The inner margin is also thickly hairy.

*Charybdis rostrata* is represented in the Indian Museum collection by a large number of specimens from the Mergui Archipelago, the Gulf of Martaban, the Delta of the Irrawady, the Andaman Islands, the Delta of the Ganges and the Chilka Lake on the Orissa coast. Alcock has also mentioned specimens from off Ceylon. De Man's example was collected in the Amphitrite Bay in the Strait of Malacca.

As at present recorded the geographical distribution of *C. rostrata* appears to be limited to the Bay of Bengal only. It is a shallow water species occurring all along the coast from the Malacca Straits to the coast of Ceylon.

### ***Charybdis (Goniohellenus) vadorum* Alcock.**

(Plate IX, fig. 2.)

1899. *Charybdis (Goniohellenus) hoplites*, var. *vadorum*, Alcock, *Journ. As. Soc. Bengal* LXVIII, p. 67.

1931. *Charybdis (Goniohellenus) sinensis*, Gordon, *Journ. Linn. Soc. London (Zool.)* XXXVII, pp. 534-536.

From Miss Gordon's somewhat brief description and figures of the species recently described by her under the name of *C. sinensis*, it appears that her specimens are referable to Alcock's variety *vadorum* of *Charybdis hoplites* (Wood-Mason). Unfortunately the description published by Alcock is too meagre for the proper recognition of his variety, and he has given no figures to illustrate it. A careful examination of the specimens preserved in the Museum collection has, however, made it abundantly clear that *sinensis* of Miss Gordon is synonymous with Alcock's *vadorum*.

The two principal characters on which Miss Gordon relied for the setting up of her species refer to the shape of the sixth abdominal somite of the male, and the shape of the anterior male appendages. I have figured both these parts from a typical specimen of *vadorum* in our collection, and a comparison of my figures (text-fig. 13, *b*, *c* and *d*) with those of Miss Gordon (text-fig. 12, *c*, *d*, *d'*) establishes the essential similarity between the two. Alcock described the sixth segment of the male abdomen in *C. hoplites*<sup>1</sup> as "truncate-triangular, having almost no curve to the sides," and this description, though quite accurate for this species (as also seen in Miss Gordon's text-figure 12*a*), is not applicable to his variety. In the latter the sixth somite is exactly as described by Miss Gordon; it is broadest in the middle, narrowing somewhat abruptly at the two ends, and the lateral borders are deeply curved inwards. The anterior male appendage also markedly differs from that of *C. hoplites*, the difference being clearly seen from Miss Gordon's figures 12 *b*, *b*<sup>1</sup>,

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<sup>1</sup> Alcock, *Journ. As. Soc. Bengal* LXVIII, pp. 66, 67 (1899); *Ill. Zool. Investigator, Crust.*, pl. xxili, fig. 6 (1897).

on the one hand and 12 *d*, *d'* on the other. The comparatively strong spine on the inner border, a little way behind the tip seems to be a characteristic feature of the present species, and this is clearly brought out both in my figure and Miss Gordon's. The three or four hairs on this border distal to the spine are not shown in Miss Gordon's figure, but these may have been rubbed off in her specimen.

In addition to the two points mentioned above, Miss Gordon enumerates a few other minor characters also in which her species differs from *C. hoplites*; almost all of them are equally applicable to *vadorum* also.

On account of the important difference in the shape of the sixth abdominal segment of the male, the structure of the male appendages, and in some other characters also, I am of the opinion that Alcock's variety *vadorum* deserves specific rank. I give below a description of the species.

In the characters of the carapace, as also in several other respects, the present species very closely resembles *C. hoplites* (Wood-Mason). The carapace (Plate ix, fig. 2) is somewhat sparsely covered with a short tomentum, and is rather depressed. The regions are well defined and are areolated; the convexities of the areolae are prominent and some of them are granular. As usual the gastric region is subdivided into three subregions, the cardiac into two and on the inner part of each branchial region there is a very prominent convexity, which is always granular. The length of the carapace is half, or slightly more than half of its greatest breadth, including the last spines of the antero-lateral borders. In females the carapace is slightly broader proportionately, owing to the lateral spines being somewhat longer than in males. A slightly sinuous granular ridge transversely crosses the middle of the gastric region, and anterior to this the two subregional convexities of this region are also somewhat ridge-like. There is another prominent granular ridge on each branchial region; it starts from the tip of the last spine of the antero-lateral border, runs strongly arching forwards and terminates well before reaching the middle of the carapace.

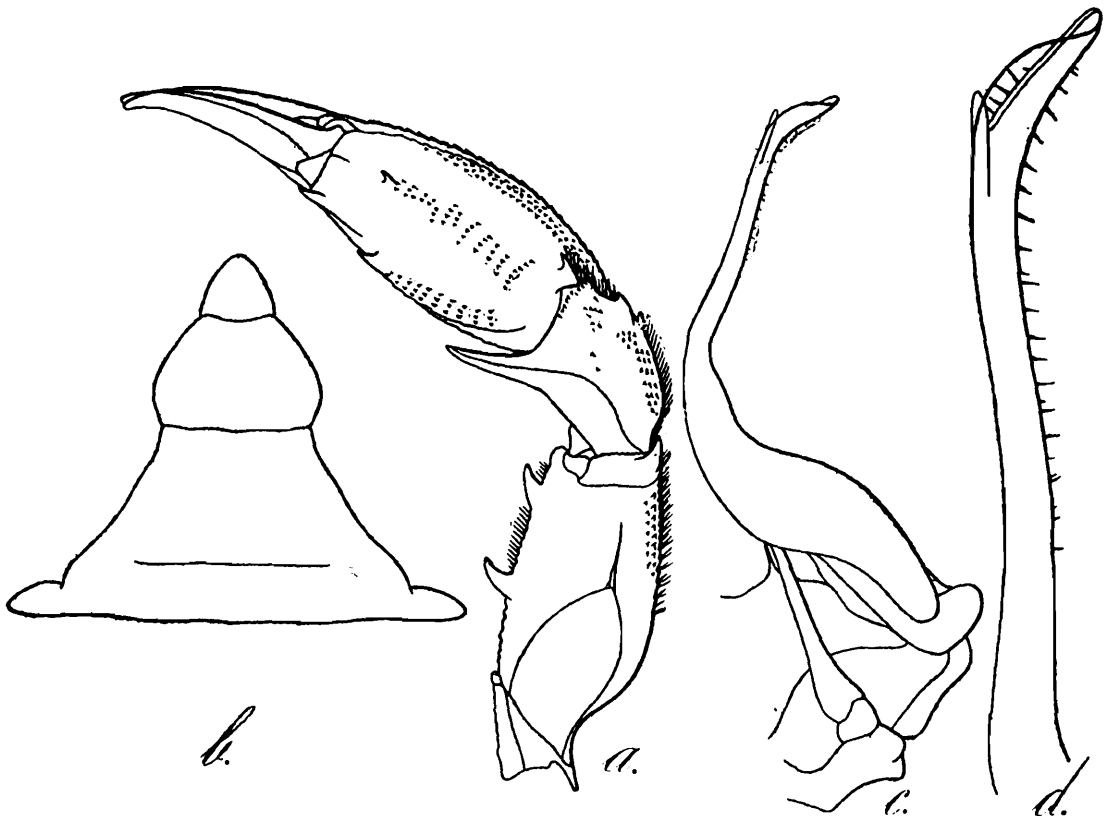
As usual the front is cut into six rounded lobes, in addition to the dentiform inner supra-orbital angles. The median lobes are large and rounded and slightly project beyond the others; they are separated from one another by a prominent median fissure. The lobes of the next outer pair are rather small, are also bluntly rounded and are only indistinctly separated from those of the median pair. The outermost lobes are separated from those of the submedian pair by deep and wide gaps, and are not quite as blunt as those of the two inner pairs. The inner supra-orbital angle is in the form of a fairly large broad tooth, with a more or less acutely-pointed apex.

The orbits have a pronounced dorsal inclination, and the distance between the outer and the inner supra-orbital angles of one side is slightly more than half the breadth of the front. The upper border of the orbit is finely crenulate and the fissure near its outer end is somewhat obscure, while that on the inner side is rather deep and broad. The lower border is also crenulate in the middle and its inner angle is produced into a large bluntly rounded lobe.

The antero-lateral borders are cut into six teeth (including the outer orbital angles) separated from one another by fairly deep notches.<sup>1</sup> The first teeth, as also some of the others, are more or less acutely pointed, while those of the last pair are large, outwardly-directed spines, very much longer than the teeth preceding them. The posterior margins of the first five teeth are minutely serrate.

The posterior border of the carapace is straight, and forms a prominent "dog's eared" angle at its junctions with the postero-lateral borders.

The chelipeds (Plate ix, fig. 2, and text-fig. 13*d*) are as in *C. hoplites*. They are a little more than twice the length of the carapace, and are, as usual, covered with granular squamiform markings. There are two large spines on the anterior border of the arm, and one somewhat smaller spine at the distal end of the posterior border. The spine at the inner angle of the wrist is very long, and there are only two spinules at the



TEXT-FIG. 13.—*Charybdis (Goniohellenus) vadorum* Alcock. *a.* Right cheliped of male from a specimen in the type-series, upper view:  $\times 3\frac{1}{2}$ . *b.* Terminal part of male abdomen of a Sandheads specimen:  $\times 5$ . *c.* Left anterior male appendage of a type-specimen:  $\times$  ca. 12. *d.* Tip of the same enlarged:  $\times 30$ .

outer angle. In *C. hoplites* there are always three spinules at the outer angle, but in the present species the ridge on the upper surface does not terminate in a spinule. The squamiform markings on the palm are much less developed in the present species than in *C. hoplites*, though in general shape, etc., the palm in the two species is very similar. There are four spines on the palm, one near the junction with the wrist and the other three at the distal end, one quite close to the finger-joint, and the remaining two placed more or less side by side a little way behind it. The

<sup>1</sup> The incisions between the marginal teeth superficially appear to be less deep than they really are; this is due to the presence of long and thick hairs under the margins of the carapace. On removing the hair and cleaning the specimen the incisions are seen to be deep, giving the teeth the appearance of somewhat square-cut lobes, more or less like those seen in *C. hoplites*.

fingers are proportionately longer and thinner in the smaller chela than in the larger one. They have large teeth on their cutting edges and the pointed tips cross one another when the fingers meet.

In the last pair of legs the merus is a little less than two-thirds as broad as long, and in addition to the usual strong spine at the distal end of its posterior margin, has the outer angle of its distal border also strongly spiniform. Both these spines are clearly seen in figure 2 on Plate ix. The second spine is present in *C. hoplites* also, and though not mentioned by Alcock in his description of the species, is clearly seen in his illustration (*Ill. Zool. Investigator, Crust.*, pl. xxiii, fig. 6). There are five or six spinules on the posterior border of the propodus.

The abdomen in both the sexes has the second and third terga transversely carinate, in addition to there being a shorter carina on the fourth tergum also. The sixth segment in the male (text-fig. 13b) is somewhat barrel-shaped and is much broader than long. It has its maximum breadth about the middle, and narrows considerably at both ends. The lateral margins are strongly convex. The seventh segment is short, triangular and broadly rounded at the tip. The anterior male appendages (text-fig. 13c and d) are as shown in the accompanying text-figure. The large bluntly-pointed spine on the inner border, a little behind the tip appears to be a characteristic feature of the species.

*C. vadorum* does not grow to a large size, egg-laden females in the collection have a carapace length of about 12.5 mm. The males are slightly larger.

Alcock gave the locality of his variety as Orissa coast, Persian Gulf and the Arakan coast, but in addition to these there are also specimens in the Museum collection, which Alcock had presumably examined, from the Delta of the Irrawady, the Vizagapatam coast and the Gulf of Oman. I have carefully re-examined all the specimens in our collection, and have come to the conclusion that the examples from the Persian Gulf and the Gulf of Oman cannot be referred to the present species. The sixth abdominal segment of the male and the anterior male appendages in these specimens are not like those of *C. vadorum*, and in some other characters also there are rather important differences. It is possible that these specimens may be referable to Alcock's dwarf variety *pusilla*<sup>1</sup> of *C. hoplites*. The two examples from the Gulf of Oman are very young, but in the larger of the two, a male, the sixth segment of the abdomen is like that of Wood-Mason's species or of its variety *pusilla*.

*C. vadorum* is represented in the Sandheads collection by two examples registered as under :—

|          |                                                      |                                   |                                 |
|----------|------------------------------------------------------|-----------------------------------|---------------------------------|
| C 1770/1 | Sandheads, off the<br>mouth of the<br>Hooghly River. | " Fraser "<br>20th Feb.,<br>1923. | 1 ♀ ovig.,<br>12.8 mm.<br>long. |
| C 1771/1 | Ditto.                                               | " Lady<br>Fraser "<br>June, 1932. | 1 ♂, 13.2 mm.<br>long.          |

Both the specimens agree closely with the description given above, as also with our named examples. The species is recorded from the Sandheads for the first time.

<sup>1</sup> Alcock, *Journ. As. Soc. Bengal* LXVIII, p. 67 (1899).

As at present recorded the geographical range of the species is restricted only to the eastern parts of the Indo-Pacific area. In Indian waters it is confined to the Bay of Bengal only (Delta of the Irrawady, Arakan coast, Sandheads, Orissa and Vizagapatam coasts). Miss Gordon's record from Hongkong considerably extends its range eastwards. The species lives in shallow waters only, all our specimens having been, collected in depths ranging between 7½ and 20 fathoms. *C. hoplites*, on the other hand, is mostly found in comparatively deep waters.

Alcock did not designate any specimens as types, and as specimens from a number of localities are now mixed up in one bottle, the task of selecting one specimen as the type becomes difficult. The three examples from east of the Terribles (Arakan coast) are still preserved separately, but all of these are females, and as the species is primarily based on male characters, it is not desirable to select these as the types. I have, therefore, to designate the remaining nine specimens from the Indo-Burmese coast (Delta of the Irrawady, Orissa and Vizagapatam coast) as the type-series.

C 1769/1

Indo-Burmese coast,  
Bay of Bengal.

Marine Survey

44 ♂♂, 3 ♀♀ (ovig.)  
& 2 Juv.  
TYPE-SERIES.

Measurements, in millimetres, of four specimens from the type-series and two from the Sandheads are given below :—

|                            |    |    | Type-series. | Sand-heads. | Type-series. | Sand-heads. |
|----------------------------|----|----|--------------|-------------|--------------|-------------|
| Sex                        |    |    | ♂            | ♂           | ♀            | ♀           |
| Carapace length            | .. | .. | 12.9         | 13.7        | 12.5         | 12.6        |
| Carapace breadth (maximum) | .. | .. | 24.6         | 27.4        | 24.1         | 25.3        |
| Fronto-orbital breadth     | .. | .. | 12.0         | 13.5        | 13.0         | 13.6        |
| Breadth of front           | .. | .. | 6.5          | 6.8         | 6.2          | 6.5         |
| Breadth of orbit           | .. | .. | 3.5          | 3.7         | 3.5          | 3.7         |

\* The last antero-lateral spine of one side is slightly broken.

As indicated above the present species resembles very closely *C. hoplites* (Wood-Mason), but can be easily distinguished from it by the characters enumerated by Alcock and Miss Gordon.

### Subfamily *CAPHYRINAE*.

### *Lissocarcinus arkati* Kemp.

(Plate IX, fig. 3.)

1923. *Lissocarcinus arkati*, Kemp, *Rec. Ind. Mus.* XXV, pp. 405-408, pl. x,  
fig. 1.
1931. *Lissocarcinus arkati*, Gordon, *Journ. Linn. Soc. London (Zool.)* XXXVII,  
p. 523.

Kemp described the present species in 1923 from specimens obtained at the Sandheads, basing his description chiefly on characters of female individuals. Later Miss Gordon recorded the species from Hongkong, but her specimen also was a female. Since the publication of Kemp's

description six more specimens of this species, all collected at the Sand-heads, have been added to the Museum collection. Four of these are large males, having a carapace length ranging from 16.2 to 21.5 mm., and two are ovigerous females 11.6 and 20.5 mm. long. It is, therefore, now possible to compare Kemp's excellent and detailed description with male examples, and to indicate the few minor points in which the two sexes differ.

The specimen examined by Miss Gordon differs from Kemp's description and figures in two points. The transverse ridges on the carapace, so characteristic of the species, are restricted to the anterior part only, and the posterior border of the carapace is equal to the fronto-orbital breadth. According to Kemp, the ridges extend practically on the entire surface of the carapace and the posterior border of the carapace is distinctly shorter than the fronto-orbital. Four out of the six present specimens agree with Miss Gordon's example in the character of the carapace ridges, but in all of them the posterior breadth of the carapace is shorter than the breadth at the fronto-orbital border.

The general shape of the carapace is as described by Kemp. The length is about four-fifths of the breadth, but in smaller individuals the carapace is slightly longer proportionately. The carapace is broad posteriorly, slightly more so in females than in males. In the four large males that I have examined the posterior border is a little over half (about .55) of the carapace breadth; in the females, as described by Kemp, it is only a little less than two-thirds (.62 to .65).

The carapace is convex in both directions, but the convexity is more marked in females than in males. The transverse setose ridges on the carapace, described by Kemp, are a very prominent feature of the species, but the extent of these ridges on the carapace in my specimens differs markedly from what is shown in Kemp's figure. In three male specimens the ridges are confined only to the anterior half, or a little less than half, of the carapace (Plate ix, fig. 3), stopping short well in front of the cardiac region. On the sides, however, they extend further backwards, but stop considerably in advance of the bases of the last pair of legs. In the remaining male and the larger of the two females, the ridges extend a little further backwards, but even in these two specimens only a little more than half of the anterior surface of the carapace in the middle line has ridges on it. In the small female the ridges are as described by Kemp.

The fronto-orbital border is very broad, and in large individuals is somewhat less than three-fourths the greatest breadth of the carapace, but in smaller examples is proportionately broader. Unlike Miss Gordon's specimen, the fronto-orbital border is broader than the posterior margin of the carapace in all the Indian specimens. The front is as described by Kemp, but is slightly broader in smaller individuals than in adults. The front is distinctly notched in the middle line, though in one of Kemp's ovigerous females the frontal margin is practically entire.

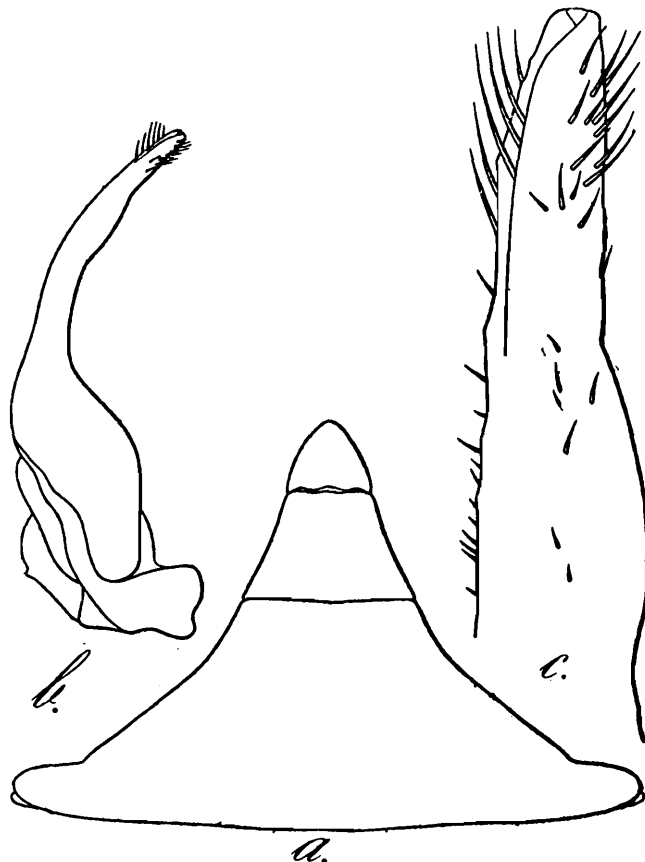
The antero-lateral margins and the marginal teeth are similar in the two sexes.

The basal antennal segment is strongly produced at its antero-external angle, where it is almost bluntly dentiform, and, as mentioned by Kemp, is carinate. The merus of the external maxilliped is not prominently produced at its antero-external angle.

The chelipeds are markedly unequal in large males, and less so in females and smaller males, the chief difference being in the thickness of the palm. In all our specimens the right chela is larger than the left. The detailed description of the female cheliped given by Kemp equally applies to the males also; the tuft of setae are equally abundant in both the sexes. The fingers of the larger cheliped are short and stout, with the tips blunt, while in the smaller cheliped the fingers are long and narrow and their tips are sharp and overlapping. The fingers, except near the base, are conspicuously dark slate-grey.

The first three walking legs are subequal, and are shorter than the chelipeds. All the legs are as described in the female.

In the male abdomen (text-fig. 14a), as is usual, segments 3-5 are fused, though the third segment is somewhat indicated on the sides by notches. The whole abdomen is in the shape of a large triangle, very broad at the base, and with sides strongly concave. The second segment has a low inconspicuous carina running transversely from side to side. The sixth segment is somewhat rectangular, with the



TEXT-FIG. 14.—*Lissocarcinus arkati* Kemp. a. Terminal part of male abdomen :  $\times 3\frac{1}{2}$ . b. Left anterior male appendage :  $\times 7$ . c. Tip of the same enlarged :  $\times 30$ .

distal margin shorter than the proximal. The lateral margins are concave, and the length of the segment is considerably less than its proximal breadth. The terminal segment is triangular in outline, with the tip rounded. The anterior male appendages are rather stout and straight, without any bend near the tip. The inner margin is sparsely

hairy behind the tip, while the tip itself, which is blunt, is beset with a small number of longish hairs. There are a few scattered hairs on the upper surface also.

*Lissocarcinus arkati* appears to be fairly common at the Sandheads, and has been collected there on a number of occasions. The only other record of the species is that of Miss Gordon from Hongkong. One of the present specimens has a small Cirripede attached to the arm of the right cheliped (Plate ix, fig. 3).

The measurements, in millimetres, of the present Sandheads specimens and proportions of certain measurements in all the specimens so far recorded are given below :—

| Sex                           | Sandheads specimens. |      |      |      |              | Kemp's specimens Sandheads. |              |              |     |                 | Miss Gordon's specimen Hong-kong. |
|-------------------------------|----------------------|------|------|------|--------------|-----------------------------|--------------|--------------|-----|-----------------|-----------------------------------|
|                               | ♂                    | ♂    | ♂    | ♂    | ♀<br>(ovig.) | ♀<br>(ovig.)                | ♀<br>(ovig.) | ♀<br>(ovig.) | ♀   | ?♂ <sup>1</sup> | ♀<br>(ovig.)                      |
| Carapace length               | 21.5                 | 20.0 | 16.2 | 20.0 | 20.5         | 11.6                        | ..           | ..           | ..  | ..              | ..                                |
| Carapace breadth              | 25.7                 | 23.9 | 19.5 | 24.3 | 25.0         | 13.4                        | ..           | ..           | ..  | ..              | ..                                |
| Fronto-orbital breadth        | 17.3                 | 16.1 | 13.5 | 16.6 | 17.2         | 10.0                        | ..           | ..           | ..  | ..              | ..                                |
| Breadth of front <sup>2</sup> | 8.2                  | 7.8  | 6.4  | 8.2  | 8.4          | 4.6                         | ..           | ..           | ..  | ..              | ..                                |
| Breadth of posterior margin   | 14.1                 | 13.5 | 11.0 | 13.2 | 16.0         | 8.6                         | ..           | ..           | ..  | ..              | ..                                |
| Carapace length               | .83                  | .83  | .83  | .82  | .82          | .86                         | .85          | .80          | .83 | .90             | .81                               |
| Carapace breadth              |                      |      |      |      |              |                             |              |              |     |                 |                                   |
| Fronto-orbital breadth        | .67                  | .66  | .69  | .68  | .68          | .74                         | .72          | .68          | .70 | .80             | .67                               |
| Carapace breadth              |                      |      |      |      |              |                             |              |              |     |                 |                                   |
| Frontal breadth               | .31                  | .32  | .32  | .33  | .33          | .34                         | .32          | .31          | .32 | .37             | .33                               |
| Carapace breadth              |                      |      |      |      |              |                             |              |              |     |                 |                                   |
| Posterior breadth             | .55                  | .56  | .56  | .54  | .64          | .64                         | .63          | .62          | .65 | .59             | .67                               |
| Carapace breadth              |                      |      |      |      |              |                             |              |              |     |                 |                                   |

<sup>1</sup> A careful examination of this very immature specimen has shown it to be a female. The abdominal appendages are of the female type.

<sup>2</sup> The inner orbital angles are excluded, when measuring the frontal breadth.

### Family CORYSTIDAE.

#### *Gomeza distincta* (de Haan), var. *indica*, nov.

(Plate IX, figs. 4 and 5.)

1905. *Gomeza distincta*, var., MacGilchrist, *Ann. Mag. Nat. Hist.* (7) XV, p. 263.

The carapace (Plate ix, fig. 4) is oval in outline, and is strongly convex both antero-posteriorly and from side to side. The regions are strongly demarcated, and form more or less independent swellings, considerably raised above the general level of the carapace. The gastric and the hepatic regions are indicated by grooves practically all round, and the cardiac and the intestinal regions are similarly separated from the branchial. The subregions of the gastric and the branchial regions are only faintly indicated, and there is an indistinct groove a little on the inside of the carapace margins, giving the impression of the raised central parts of the carapace being marked off from a marginal rim.

The general surface of the carapace is very profusely and prominently covered with minute granules, in addition to a large number of tubercles, more or less arranged in three longitudinal rows. Several of these tubercles are surmounted by short blunt spines. In the median row there are four tubercles (three rather large and one small) on the gastric region, one large one on the cardiac and two on the intestinal; in the outer row of each side there is one tubercle on the hepatic and four or five on the branchial region. On the outside of this row there is one tubercle on each epibranchial region. On the anterior part of the gastric region, in addition to the tubercles there are some minute, sharp spines, with comparatively broad bases. Of these, there are two placed side by side in the middle line near the anterior edge of the gastric region, and behind these there are four in a transverse row, one on each hepatic lobe near its anterior edge, and the other two on the two protogastric lobes. The fronto-orbital region is rather broad, and is divided into two by a longitudinal groove in the middle line. Like the rest of the carapace, this part also is thickly studded with granules, and has, in addition, two minute spines, one on each side of the groove.

The carapace is distinctly longer than broad, the greatest breadth, measured between the tips of the third lateral spines, is about three-fourths of the length, in the middle line, including the frontal teeth.

The front is prominent, narrow and laminated, and ends in two conspicuous, sharp spines, with broad bases and more or less parallel outer margins. The bases of the spines and the frontal margin are strongly serrate, and the tips of the spines are sharply marked off from the broad basal portions. The front is projecting, the tips of the frontal spines almost reaching to the end of the second segment of the antennal flagellum.

The orbits are very slanting. The inner supra-orbital tooth has a very broad base, forming a sort of hood over the small eye. It is separated from the frontal spine of its side by a broad and deep gap, and does not quite reach the tip of the latter. It ends in a sharp spine, distinctly marked off from the base, and points forwards and somewhat outwards. The upper margin of the orbit is very prominently serrate, some of the serrations being almost spine-like. The true orbital margin, as distinct from the margin of the hood-like projection formed by the base of the inner supra-orbital tooth, is short, and has an inconspicuous fissure near its outer angle. The outer supra-orbital tooth, or the first tooth of the antero-lateral border, is much smaller than the inner, but has a broad base with serrated margins, and a sharply-pointed tip. The inferior orbital border (Plate ix, fig. 5) is also slanting, and is markedly serrate. The infra-orbital spine is much shorter than the inner supra-orbital, and has the usual broad base, and the sharply marked-off pointed tip.

The pterygostomian regions (Plate ix, fig. 5) are finely granular, and have a strong granular ridge running longitudinally from the base of the infra-orbital spine to the level of the fourth spine on the lateral margin.

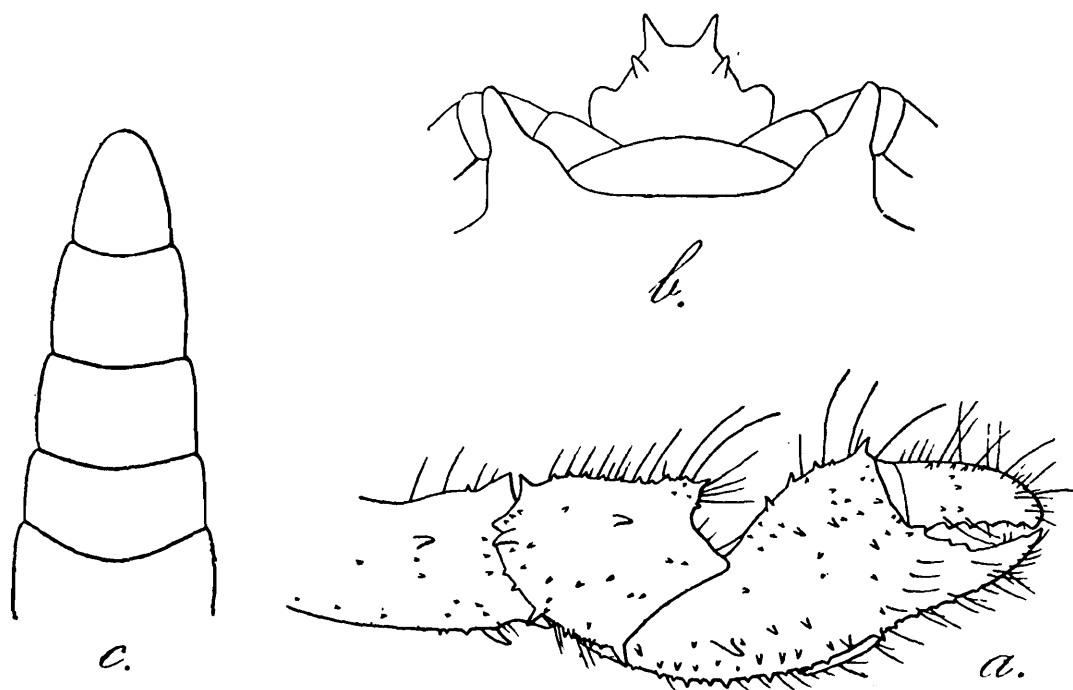
The antennules fold longitudinally. The basal antennal joint is broad, and is wedged in the orbital hiatus, which it completely fills to the total exclusion of the antennal flagellum. The basal joint has a

few minute, sharp spinules, chiefly near its outer margin. The flagella are very long, profusely hairy, and some of the basal segments are serrate on the margins.

The ridge bordering the buccal cavern (Plate ix, fig. 5) is strongly developed, and near its anterior end, where it curves inwards, has a few small spinules on it. The outer maxillipeds leave a large gap in the middle, and have a somewhat pediform cast. The ischium is considerably longer than broad and the merus has its antero-external angle rounded. The flagellum is articulated on the inner border of the merus near its antero-internal angle. The flagellum of the exognath is well developed and plumose.

The lateral margins of the carapace are regularly arched, and there is no demarcation between the antero- and postero-lateral margins. The lateral borders are armed with ten strong spines, with broad serrate bases, and sharply marked-off tips. The first four spines are larger than the others; of the former the second is the largest, first and third are subequal, while the fourth is the smallest. The remaining six spines are considerably smaller than the first four, but the disproportion in size between these two sets of spines is much less than that shown in de Haan's<sup>1</sup> figure of *G. distincta* or in Balss's<sup>2</sup> figure of the variety *formosae*. The last pair of spines are larger than those immediately preceding them and are placed at the junctions of the lateral and posterior margins. The broad basal parts of all the spines, and the margin of the carapace between the spines are serrate.

The posterior margin of the carapace is short and straight, and is not serrate.



TEXT-FIG. 15.—*Gomeza distincta*, var. *indica*, nov. a. Right cheliped of male, outer and somewhat upper view:  $\times ca.$  22. b. Basal two segments of male abdomen:  $\times ca.$  40. c. Terminal part of male abdomen:  $\times ca.$  40.

The chelipeds (text-fig. 15a) are stouter, but not appreciably longer than the walking legs. They are thickly clothed with long hairs,

<sup>1</sup> De Haan, *Faun. Japon. Crust.* pl. xiii, fig. 2 (1835).

<sup>2</sup> Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, pl. ii, fig. 5 (1922).

especially on and near the margins. The arm is trigonous, with the outer surface having a few scattered, minute granules, and the inner and the lower surfaces smooth. There is a sharp spine near the distal end of the upper margin, and a small, blunt, tooth-like lobe with serrated margins, followed by a sharp spine, at the distal end of the outer margin, which also is finely serrate. The wrist is studded with granules, its free margins are serrate, and it has a sharp terminal spine with broad base, and sharp tip, at the inner margin. There is also a small, somewhat blunt spine at the proximal end of this margin. On the outer border of the wrist the granules are sharp, and some of these are like small spinules, among which at least one comparatively large spine is noticeable. On the outer surface of the wrist also two somewhat large spines, one behind the other near the inner margin, and three shorter ones arranged in a longitudinal row about the middle can be seen. On the outer surface of the palm, especially in its lower half, the granules are arranged in longitudinal rows. Most of the granules are sharp, some being spine-like, and are interspersed with hairs. On this surface two or three spines arranged in a row, one just in front of the wrist joint, and one or two in the middle, stand out as much larger than the others. The upper margin of the palm is sharply serrate, one or two serrations being almost spine-like; the lower margin is also serrate. The inner surface of the palm appears to be smooth. The fingers are broad at the base and taper to finely pointed tips. The dactylus is arched, and the fingers leave a small gap when their tips meet. Their cutting margins are provided with four or five subequal sharp teeth. The fingers, like the other parts of the chelipeds, are fringed with long hairs, and their margins, the upper margin of the dactylus and the lower margin of the fixed finger, are finely serrate. The dactylus is longer than the upper border of the palm.

The walking legs are long, and are fringed with long hairs. The lower border of the merus is faintly serrate.

The male<sup>1</sup> abdomen (Plate ix, fig. 5 and text-fig. 15b and c), in the single, possibly immature specimen that I have examined, is very short and slender, in the natural position not even reaching up to the bases of the second pair of walking legs. In front of the abdomen there is a deep groove extending forwards to the bases of the chelipeds. All the seven segments are distinct, though the line of demarcation between the fifth and the sixth segments is somewhat less clearly marked than those between the other segments. The second segment (text-fig. 15b) has four spines in two rows on about the middle of its surface. Of these the two in proximal row are small, while the distal ones are large and prominent. All the four spines can be seen from the dorsal surface, but the two large ones are visible from below also. At its base the second segment has two lobular projections, one on each side. The sixth segment (text-fig. 15c) is anteriorly narrowed and has straight and convergent sides. The seventh segment is somewhat triangular, with a rounded tip. On account of the small size of the specimen and its delicate nature the abdominal appendages have not been examined.

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<sup>1</sup> The abdominal appendages have not been examined, but the shape of the abdomen is very much like that of a male specimen.

*Type-specimen*.—C 1766/1, Zoological Survey of India (*Ind. Mus.*).

*Locality*.—The single specimen, on which the present variety is based, was collected by the Pilot vessel "Lady Fraser" in February, March, 1928, at the Sandheads, off the mouth of the Hooghly River. The depth of water in this locality is about 20 fathoms, and the bottom for the most part consists of soft ooze-like mud, with admixture of sand here and there. MacGilchrist's specimen, which is referred to this variety, was collected in the Persian Gulf, at a depth of 53 fathoms.

The measurements and proportion of the single specimen of the present variety, and, for purposes of comparison, those of *G. distincta*, and of its variety *formosae*, are given below. The measurements in the case of the two latter forms have, for the most part, been taken from their published figures, and as Balss' illustration of *formosae* is rather poor, the measurements may not be accurate.

|                                                                | var. <i>indica</i> . | <i>G. distincta</i> . | var. <i>formosae</i> . |
|----------------------------------------------------------------|----------------------|-----------------------|------------------------|
| Length of carapace to the tips of frontal spines               | 6.1                  | 43.0                  | ?40.0                  |
| Breadth of carapace including 3rd lateral spines               | 4.6                  | 30.0                  | ?26.0                  |
| Breadth of carapace between tips of outer supra-orbital spines | 3.3                  | 23.0                  | ?19.0                  |
| Breadth of carapace between tips of inner supra-orbital spines | 1.8                  | 9.0                   | 8.5                    |
| Breadth of carapace between tips of infra-orbital spines       | 2.2                  | 12.0                  | 13.0                   |
| Carapace breadth                                               |                      |                       |                        |
| Carapace length .. ..                                          | .75                  | .70                   | ?65                    |
| Breadth at outer supra-orbital spines                          |                      |                       |                        |
| Carapace breadth ..                                            | .71                  | .76                   | ?73                    |
| Breadth at inner supra-orbital spines                          |                      |                       |                        |
| Carapace breadth                                               | .39                  | .30                   | ?36                    |
| Breadth at infra-orbital spines                                |                      |                       |                        |
| Carapace breadth ..                                            | .47                  | .40                   | ?50                    |

From the foregoing description it is seen that the present form very closely resembles de Haan's *Gomezia distincta*, of which it appears to be only a local variety. De Haan's description is rather meagre, but his figure considerably helps one in properly diagnosing his species. The Indian variety resembles the *forma typica* in the general shape of the body, and in having a thickly granular carapace, with three longitudinal rows of tubercles more or less similarly arranged. In both, the borders of the carapace are provided with four large and six smaller spines. The front and the supra-orbital teeth are similar; the chelipeds are thickly granulated in both; and the disposition of the spines and teeth is not very different in the two. The Indian form can, however, be easily distinguished from de Haan's species by the shorter infra-orbital spines, and by the fact that the posterior six spines on the lateral border of the carapace, though definitely smaller than the first four, are proportionately larger. The number and disposition of the tubercles and spines on the dorsal surface of the carapace is not exactly similar; the granules on the chelae are arranged in regular rows in the Indian variety; and the number of spines on the different segments of the

chelipeds appears to be larger in the present form. Further, the upper margin of the orbit proper, as distinct from the outer margin of the basal part of the inner supra-orbital spine, is distinctly serrate; in de Haan's figure it is shown as smooth. The antennal flagella and the walking legs are less hairy in the new variety, and most of the spines consist of broad bases with strongly serrate, or even spinose, margins, and long, abruptly-narrowed, bare tips.

The variety of de Haan's species described by Balss under the name of *formosae* differs from the typical species in having the upper surface of the carapace uniformly granulated, without any large tubercles or spines on it; in having the upper margin of the orbit serrate; and the granules on the palm arranged in rows. The Indian variety agrees with *formosae* in the last two characters, but differs from it in having a number of large tubercles and spinules on the carapace. The infra-orbital spine is also much shorter than shown in Balss' figure.

The Persian Gulf specimen, which MacGilchrist considered to represent a variety of *G. distincta*, is no doubt referable to the present variety. Unfortunately this specimen cannot at present be found in the Indian Museum collection, but the two characters mentioned by MacGilchrist, in which his specimen differed from de Haan's species, are shared by the present variety also. In any case the Persian Gulf specimen is not referable to Balss' variety *formosae*.

Like *G. distincta*, the present form differs from *G. bicornis*<sup>1</sup> Gray, among several other characters, in the different shape of the frontal teeth, and in having a large number of prominent tubercles on the carapace. Laurie<sup>2</sup> considers *G. bicornis* as a very variable form, but it is possible that he was dealing with more than one species. The short infra-orbital spines in some of his examples suggest the presence of the new variety also in his material.

### Family XANTHIDAE.

#### Subfamily XANTHININAE.

#### **Halimede tyche** (Herbst).

(Plate IX, fig. 6.)

1801. *Cancer tyche*, Herbst, *Crabben und Krebse* III, Heft 2, pp. 35, 36, pl. lii, fig. 3.  
1893. *Halimede thurstoni*, Henderson, *Journ. Linn. Soc. London* (2) V, p. 360, pl. xxxvi, figs. 13, 14.  
1910. *Halimede tyche*, Rathbun, *Skrift. K. Dansk. Vidensk. Selsk. Copenhagen* (7) V, p. 352 (*partim*).  
1922. *Halimede tyche*, Balss, *Arch. Naturgesch.* LXXXVII, Heft 11, p. 129 (*partim*).  
1925. *Halimede tyche*, Odhner, *Goteborgs Vetensk. Handl.* XXIX, No. 1, pp. 81, 82.

On the authority of Miss Rathbun it had been believed generally that de Haan's<sup>3</sup> *Halimede fragifer* from Japan is the same form as Herbst

<sup>1</sup> Gray, *Zool. Miscell.*, p. 39 (1831). De Haan's *vigntispinosa* [*Faun. Japon. Crust.*, p. 44, pl. ii, fig. 5 (1835)] is no doubt identical with Gray's *bicornis*, but it appears to me somewhat doubtful if the form described by A. Milne-Edwards [*Nouv. Arch. Mus. Paris* X, pp. 52, 53, pl. iii, fig. 5 (1874)] under de Haan's name is really referable to Gray's species.

<sup>2</sup> Laurie, *Ceylon Pearl Oyster Fish. Rep.* V, pp. 421, 422 (1906).

<sup>3</sup> De Haan, *Faun. Japon. Crust.*, p. 47, pl. xiii, fig. 4 (1835).

had described in 1801 under the name of *Cancer tyche*. She recognised three species as referable to the genus *Halimede* de Haan, viz., *H. tyche* (= *H. fragifer*), *H. thurstoni* Henderson and *H. ochtodes* (Herbst). Odhner on an examination of a photograph of Herbst's type-specimen of *Cancer tyche*, deposited in the Berlin Museum, has expressed the opinion that *tyche* and *fragifer* are quite distinct, while, on the other hand, Henderson's *H. thurstoni* is only a synonym of Herbst's *tyche*. Thus according to Odhner also there are three species in the genus *Halimede*, viz., *H. fragifer*, the genotype, *H. tyche* (= *H. thurstoni*) and *H. ochtodes*. The form recently described by Balss<sup>1</sup> as *H. dofleini* is, according to Odhner, only a variety of the Japanese *fragifer*, while Nobili's<sup>2</sup> *H. hendersoni* and Haswell's<sup>3</sup> *Medaeus nodosus* are synonymous with *H. ochtodes* (Herbst).

The chief difference between the three species is in the abundance, or otherwise, of the flattened, raised prominences on the carapace and the chelipeds. In *H. fragifer* the carapace is profusely covered with these prominences, which even in small specimens are said to be well developed. In *H. tyche*, according to Odhner, these are confined to the orbital and the lateral margins and the hepatic regions of the carapace, exactly as described by Henderson for *H. thurstoni*; in *H. ochtodes* there are no raised, flattened prominences on the carapace.

In the Sandheads collection there is one specimen that I refer to *Halimede tyche* (Herbst) :—

|          |                                                      |                                             |      |
|----------|------------------------------------------------------|---------------------------------------------|------|
| C 1764/1 | Sandheads, off the<br>mouth of the River<br>Hooghly. | " Lady<br>Fraser "<br>Feb., March,<br>1928. | 1 ♂. |
|----------|------------------------------------------------------|---------------------------------------------|------|

The specimen is rather small, with a carapace length of 7.4 mm., and a breadth of 8.8 mm. It agrees closely with Henderson's description of *H. thurstoni*, but differs from it in having the two lobes of the front much broader and more or less square cut. The deep incision between the lobes is well marked and the margins of the lobes are finely, but distinctly crenulate. According to Henderson's description and figure the anterior margins of the lobes are strongly convex, but in my specimen these are practically straight (Plate ix, fig. 6) and somewhat slanting outwards. The lobes are broad like those of *H. fragifer*, but their anterior borders are not concave.

The carapace is covered with short tufts of hairs, arising from groups of small clustered granules. The raised, flattened tubercles, so characteristic of *H. fragifer*, are here reduced to two only, one on each hepatic region, opposite the second blunt tooth on the antero-lateral margin. In addition to these two flattened prominences, there is another on the right protogastric lobe; on the left side this is missing, but its place is indicated by a cluster of small granules. This prominence is not mentioned by Henderson. The prominence at the outer orbital angle and the flattening of the infra-orbital border is exactly as described by Henderson.

<sup>1</sup> Balss, *Arch. Naturgesch.* LXXXVIII, Heft 11, p. 129, pl. ii, figs. 1, 2 (1922).

<sup>2</sup> Nobili, *Bull. Sci. France Belgique* XL, pp. 123-125, pl. vi, fig. 31 (1906).

<sup>3</sup> Haswell, *Cat. Australian Crust.*, pp. 52, 53 (1882).

Of the three teeth on the antero-lateral border of the carapace, the first, a little behind the flattened outer orbital tooth, is the smallest, and the third the largest. Between the outer orbital angle and the first tooth of the lateral border a small sub-hepatic tooth is visible even from above.

The orbits are very slanting, have a strong dorsal inclination, and most of the infra-orbital border is visible from above. There is a large groove between the front and the upper orbital border, where the antennal flagellum is lodged. There are two other fissures near the outer end of the upper border, which is serrate, especially near its inner end. The eyes are small. The infra-internal angle of the orbit is markedly pronounced.

The chelipeds are subequal and are considerably stouter, but not very much longer, than the walking legs. The raised, flattened tubercles are present only on the upper and outer surface of the wrist, and the upper surface of the palm; on the outer surface of the palm there are ordinary tubercles or granules arranged in longitudinal rows. At the inner angle of the wrist there are two short, thick and blunt spines. The fingers are broad and stout and do not leave any gap when they meet. The somewhat pointed tips overlap when the fingers are apposed. On the basal part of the upper surface of the dactylus there are some small, sharp tubercles, more or less arranged in rows.

The walking elgs are thickly clothed with tufts of hairs. There are traces of a carina on the posterior surface of the carpus, and the dactylus is only slightly longer than the propodus.

The abdomen of the specimen is missing, but judging by the groove in which the abdomen is lodged, it must have been long, narrow and somewhat acutely pointed.

Herbst's figure of the species is rather poor, but the flattened tubercles on the carapace and the chelipeds appear to be greatly reduced, as in Henderson's *H. thurstoni*. There does not seem to be any doubt that Henderson's species is synonymous with *H. tyche* (Herbst).

The form recently described by Balss<sup>1</sup> as *Medaeus rouxi* from the Gulf of Manaar is very much like the present species, at least superficially. In Balss' specimen the front is, however, more slanting outwards, the last tooth on the lateral margin is not the largest, and the flattened tubercles on the chelipeds are somewhat different in number and disposition. The male abdomen also is not long and narrow, as is the case in the genus *Halimede*. Except for the character of the male abdomen, one would be inclined to include Balss' species in the genus *Halimede*. Through the courtesy of Dr. Gravely, Superintendent, Madras Museum, I have examined one of the two specimens (a female from Krusadai Island, preserved in the Madras Museum) on which Balss based this species, and find that in a very large number of characters this example shows a close resemblance to the genus *Halimede*.

As so far recorded the genus *Halimede* appears to be rather rare. *H. tyche* was described by Herbst from "Ostindien". The only other authentic records of the species are those of Henderson, under the name *H. thurstoni*, from Tuticorin and of Miss Rathbun, under the same

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<sup>1</sup> Balss, *Rec. Ind. Mus.* XXXVII, pp. 45, 46, pl. ii, figs. 1, 2 (1935).

name, from the Gulf of Siam. From Miss Gordon's<sup>1</sup> record of the species from Hongkong one cannot be sure whether the species she had in her collection was the true *tyche*, or de Haan's *fragifer*. The occurrence of the species off the mouth of the River Hooghly is of interest.

***Liagore rubromaculata* de Haan.**

1898. *Liagore rubromaculata*, Alcock, *Journ. As. Soc. Bengal* LXVII, pp. 93, 94.

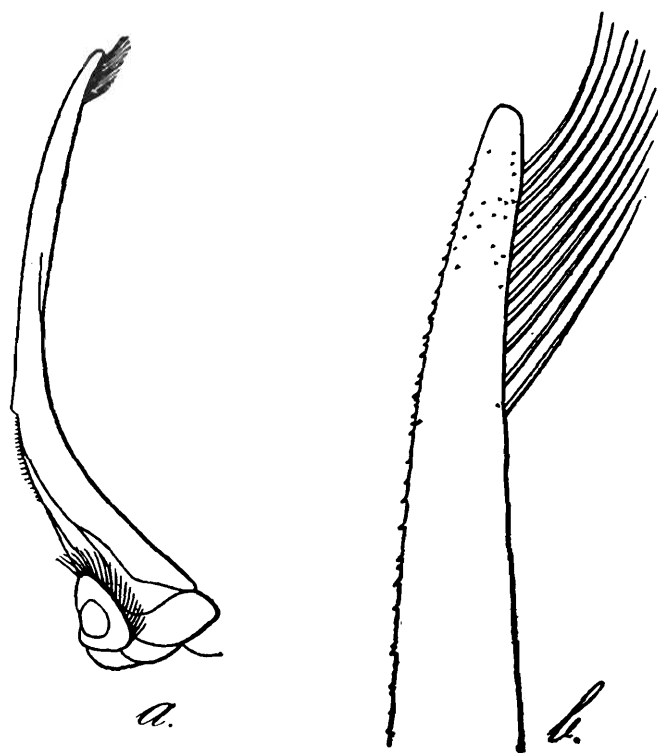
1923. *Liagore rubromaculata*, Kemp, *Rec. Ind. Mus.* XXV, pp. 408, 409, pl. x, fig. 2.

I refer to this somewhat rare species two male specimens from the Sandheads :—

|          |                    |             |       |
|----------|--------------------|-------------|-------|
| C 1763/1 | Sandheads, off the | "Lady       | 2 ♂♂. |
|          | mouth of the       | Fraser"     |       |
|          | Hooghly River.     | Nov., 1923. |       |

The larger of the two specimens has a carapace length of 24 mm., and a breadth of 33 mm., while the other specimen is 20.5 mm. long and 29 mm. broad. The specimens agree very closely with Alcock's description as also with our named specimens.

As mentioned by Kemp, the antero-lateral borders of the carapace are obscurely divided into four blunt lobes. The front is divided into two lobes by a notch, and there is a very short and somewhat deep groove running longitudinally behind the notch. This groove is not shown in Kemp's figure, but can be made out more or less clearly in most of our specimens.



TEXT-FIG. 16.—*Liagore rubromaculata* de Haan. *a.* First left pleopod of male :  $\times 5$ .  
*b.* Tip of the same enlarged :  $\times 30$ .

The first pleopods of the male (text-fig. 16) are long and straight. The tip is somewhat bluntly pointed and a short portion of the outer

<sup>1</sup> Cordon, *Jour. Linn. Soc. London (Zool.)* XXXVII, p. 528 (1931).

margin just behind the tip is beset with close long setae. The inner margin is finely crenulate.

The larger of the two present specimens is completely bleached, but the smaller one still shows the red spots on the carapace, as illustrated by Kemp.

In the Indian Museum there are specimens of *L. rubromaculata* from Hongkong, mouth of the Irrawady, mouth of the Hooghly, and the Persian Gulf. The species was originally described from Japan, and has also been recorded from China. Miss Gordon<sup>1</sup> also obtained the species from Hongkong.

### ***Galene bispinosa* (Herbst).**

1898. *Galene bisponosa*, Alcock, *Journ. As. Soc. Bengal* LXVII, pp. 136, 137.

This is the commonest Xanthid found at the Sandheads. In the present collection there are nine specimens that are referable to this species; of these six are males, and the other three non-ovigerous females. The largest male has a carapace length of 41 mm., and a breadth (excluding the short, blunt spines of the antero-lateral margins) of 55 mm., while the smallest male is 33 mm. long and 43 mm. broad across the carapace. Of the females the largest is 38 mm. long and 53 mm. broad, while the smallest has a carapace length of 25 mm. and a breadth of 33 mm.

Alcock has referred to the variability of this species in the amount of granulation on the carapace and the chelipeds. The present specimens also illustrate this point very clearly. The carapace is generally sparsely granulate a little on the inside of the lateral borders, but sometimes there are a few granules near the outer limits of the hepatic and the epibranchial regions also. The general surface of the carapace, however, though sometimes pitted, is never granulate. On the ventral surface the sub-hepatic regions, and sometimes the median thoracic sternal plate, are also granular. In the same way the chelipeds may be almost smooth, or small, but sharp, granules may cover almost entirely the surface of the wrist and a greater part of the outer surface of the palm. Generally, however, the distal part and the upper half of the outer surface of the palm is smooth.

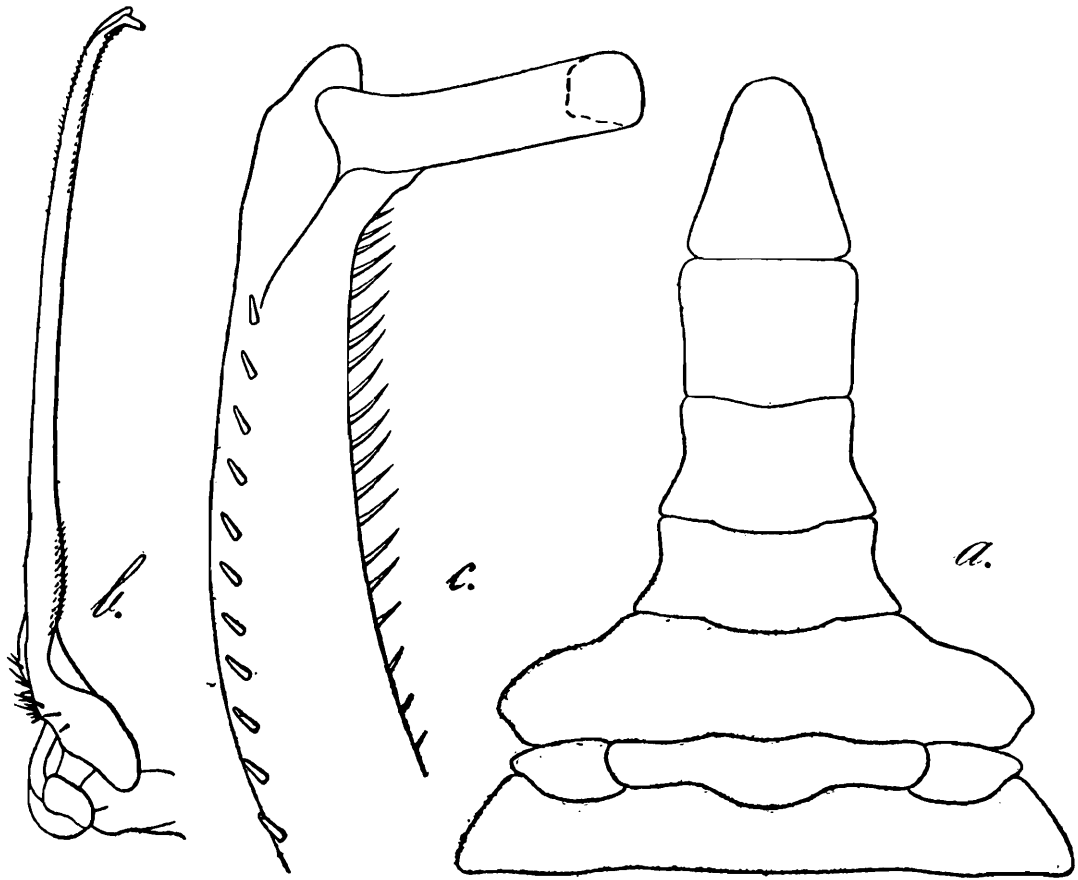
The male abdomen (text-fig. 17a) is long and narrow, and has all the seven segments distinct. The three basal segments are laterally expanded and occupy almost the entire space between the bases of the legs. The sixth segment is rectangular, with the breadth exceeding the length, and the sides are practically straight or only slightly concave about the middle. In the female also all the seven somites are distinct, but the first somite only is laterally expanded. The anterior pleopod of the male is as illustrated in the accompanying text-figure. The blunt, finger-like process on the outer margin just behind the tip appears to be a very unusual, but characteristic feature of the present species. These appendages are long and straight.

*Galene bispinosa* appears to be a somewhat rare species. Alcock recorded it from Hongkong, Tenasserim and the Vizagapatam coast; there is also in the Museum collection one large male specimen from

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<sup>1</sup> Gordon, *Journ. Linn. Soc. London (Zool.)* XXXVII, p. 528 (1931).

the Matlah River in the Gangetic Delta. The comparative abundance of the species at the Sandheads is noteworthy.



TEXT-FIG. 17.—*Galene bispinosa* (Herbst). a. Distal part of male abdomen :  $\times 3$ . b. First left pleopod of male :  $\times$  ca. 4. c. Tip of the same enlarged :  $\times 32$ .

Herbst has not given the provenance of his specimen. De Haan's material was from Japan, and Parisi's<sup>1</sup> record is also from the same locality. Miss Gordon<sup>2</sup> again obtained the species at Hongkong.

### ***Galene granulata* Miers.**

(Plate IX, fig. 7.)

1848. *Galene granulata*, Miers, "Alert" Crust. p. 208, pl. xx, fig. A.

1903. *Galene granulata*, Nobili, Boll. Mus. Zool. Torino XVIII, No. 455, pp. 32-34.

This species resembles very closely the preceding one, but according to Miers and Nobili differs from it in three, more or less important, characters. The entire surface of the carapace and the chelipeds is profusely granular, whereas in *G. bispinosa* (Herbst) only the borders of the carapace, the outer surface of the wrist and the proximal parts of the palm are sparsely granulate ; there are three teeth on each lateral margin of the carapace, whereas in Herbst's species there are only two, the anteriormost being more or less obsolete ; and of the two teeth on each frontal lobe the outer one is very much reduced, and the inner far more prominent than the outer, whereas in *G. bispinosa* both the teeth are more or less equally developed.

<sup>1</sup> Parisi, Atti. Soc. Ital. Sci. Nat. LV, p. 183 (1916).

<sup>2</sup> Gordon, Journ. Linn. Soc. London (Zool.) XXXVII, p. 527 (1931).

In the Sandheads collection there are two specimens that are referable to the present species :—

|          |                                                      |                                             |           |
|----------|------------------------------------------------------|---------------------------------------------|-----------|
| C 1761/1 | Sandheads, off the<br>mouth of the River<br>Hooghly. | " Fraser "<br>24th April,<br>1925.          | 1 ♀.      |
| C 1762/1 | Ditto.                                               | " Lady<br>Fraser "<br>Feb., March,<br>1928. | 1 juv. ♀. |

The specimens are rather small, and even the larger of the two is probably immature. In the larger specimen the length of the carapace from the posterior margin to the tip of the inner frontal tooth is 13.0 mm., while the greatest breadth of the carapace between the tips of the third lateral spines is 17.5 mm. The smaller example is only 4 mm. long and 5.2 mm. broad.

Both the specimens agree fairly closely with Miers' description, as also with the more detailed account of Nobili.

The length of the carapace is about three-fourths of its greatest breadth, more or less like that of the preceding species, but the regions of the carapace are better defined. The grooves and the granules on the carapace agree exactly with Nobili's description, but there are two shallow longitudinal grooves one on each side of the frontal region and another transverse one behind each orbital margin. These grooves are indicated in Miers' figure also. The first tooth on the antero-lateral border is much smaller than the two succeeding ones, especially in the larger specimen, but all the three of them are distinct, and almost as large as shown in Miers' figure. The teeth are somewhat sharper in the smaller example than in the other. The front is distinctly divided into two lobes by a deep and broad notch, and the margins of each lobe are more or less straight. In the larger specimen, of the two teeth on each frontal lobe the outer one is much smaller than the inner, but in the smaller example, it is the inner tooth which is obsolete, the outer one being fairly large. In this respect the smaller specimen appears to be abnormal<sup>1</sup>.

The grooves on the upper border of the orbit are not clearly seen. There is a wide gap at the inner end of the lower border of the orbit, and on account of the shortness of the basal antennal joint the antennal flagellum lies in this gap. Both the upper and the lower borders of the orbit are crenulate, and there is a prominent lobe at the inner angle of the lower border, which is visible from above.

The anterior border of the merus of the external maxillipeds is concave about the middle and the flagellum is articulated at the antero-internal angle.

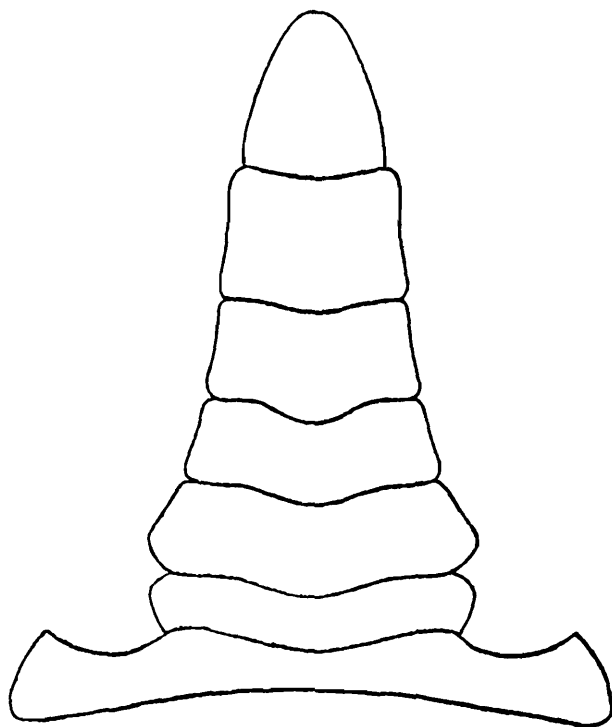
The chelipeds are as described by Nobili, except that there are two teeth at the inner angle of the wrist, the lower one of which, in the larger specimen, is bispinose. They are more hairy than in the preceding

<sup>1</sup> Dr. H. Balss of München has kindly examined this specimen at my request, and has identified it as *Galene granulata*.

species, and the sharp tubercles on the outer surface of the wrist and palm are almost spine-like. The disposition of the tubercles is more or less as described by Nobili. In the larger chela the fingers are broad at the base, somewhat bluntly pointed at the tips, and have large molariform teeth. In the smaller chela the fingers are comparatively thin and sharply pointed and the teeth are smaller.

The legs are as described by Nobili.

In both the specimens before me all the seven somites of the abdomen are distinct. The first segment is laterally expanded and occupies the entire space between the bases of the last pair of legs. The other seg-



TEXT-FIG. 18.—*Galene granulata* Miers. Abdomen of young female :  $\times 7\frac{1}{2}$ .

ments are narrowed, and the abdomen has more or less the appearance characteristic of the male.

*Galene granulata* was described by Miers from a specimen from Port Darwin on the coast of North Australia, while Nobili's example was collected at Singapore. The record of the species from the Sandheads extends its range considerably. The species seems to be rather rare.

All the specimens of *G. granulata* so far recorded are small and were probably immature. The type-specimen from Port Darwin is only 11.5 mm. long, while that of Nobili from Singapore has a carapace length of only 8 mm. The larger example from the Sandheads is slightly bigger than Miers', but, judging from the shape of the abdomen, is no doubt immature. As suggested by Miers, it is, therefore, possible that *G. granulata* is only a young form of *G. bispinosa* (Herbst). Some of the characters in which Miers' species differs from Herbst's probably vary to a certain extent with age. All the specimens of *G. bispinosa* that I have seen are large. A comparison of the male appendages of *Galene granulata* with those of Herbst's species will probably settle the question of the validity of the former species.

## Family GONOPLACIDAE.

## Subfamily RHIZOPINAE.

**Scalopidia spinosipes** Stimpson.1900. *Scalopidia spinosipes*, Alcock, *Journ. As. Soc. Bengal* LXIX, pp. 325-326.1918. *Scalopidia spinosipes*, Tesch, *Siboga Exped. Rep.* XXXIX C<sup>1</sup>, pp. 224-226, pl. xiv, fig. 3.

One specimen in the Sandheads collection is referred to this somewhat rare species :—

|          |                                                      |                                   |      |
|----------|------------------------------------------------------|-----------------------------------|------|
| C 1765/1 | Sandheads, off the<br>mouth of the River<br>Hooghly. | " Fraser "<br>11th Jan.,<br>1924. | 1 ♀. |
|----------|------------------------------------------------------|-----------------------------------|------|

The specimen agrees very closely with Alcock's description and our two named examples from Hongkong, but differs from Tesch's account in one or two rather minor points.

The length of the carapace is about three-fourths of the breadth. In all the specimens so far recorded the breadth varies between 1.30 and 1.39 of the length. The surface is minutely punctate, and the grooves are rather shallow and somewhat indistinct, as described by Tesch. The front is deflexed, and in dorsal view is prominently notched, but in frontal view the anterior border appears to be straight and entire. Tesch failed to find any spine at the junction of the antero- and postero-lateral borders, but in all the three examples that I have seen a distinct, though small, spine is always present.

The chelipeds are unequal, the right one being larger than the left, but the difference in size between the two chelae is not marked as mentioned by Tesch. The detailed description of the chelipeds given by Tesch applies more or less exactly to our specimens also, but the granulation on the various segments is better developed in at least one of the Hongkong examples. All the three margins of merus are more or less crenulate and the two small teeth, one sub-terminal on the upper border, and the other about the middle of the inner border (in the large chela only), are clearly seen in both the Hongkong specimens, but the last mentioned tooth is missing in the Sandheads specimen. The inner angle of the wrist is sharply spiniform, but in addition there is a distinct, sharp spinule at the outer angle also, as described by Alcock. In the Hongkong example, referred to above, there are sharp granules on the distal border of the wrist, and a few scattered ones on the upper surface also. In the example from the Sandheads there are similar granules on the upper and lower margins of the palm; these are better seen in the smaller chela. The palm and the fingers are as described by Tesch, but the arrangement of the teeth on the cutting edges of the fingers is somewhat different in all the three examples.

The third walking legs are remarkably long, being about three times the length of the carapace. The merus is broad and flattened, its breadth being about one-third of the length, is trigonous like some of the other segments, and has its margins more or less evenly spiny. All the legs are profusely spiny as described by Alcock, and the dactyli of the last pair are characteristically curved.

One of the Hongkong specimens is a male and its abdomen is exactly as described and figure by Tesch. In the female all the seven segments are distinct and the margins are hairy. The third segment is not laterally projecting as in the male, but the two longitudinal grooves on it can be indistinctly made out.

*Scalopidia spinosipes*, as so far recorded, appears to be a somewhat rare species. In the Indian Museum there were so far only the two Hongkong examples mentioned by Alcock, though the species had also been recorded from Indian waters by Henderson<sup>1</sup> from the Gulf of Martaban and by Laurie<sup>2</sup> from the Gulf of Manaar. The only other records of the species, so far as I am aware, are from Hongkong, the type-locality, by Stimpson<sup>3</sup>, Alcock and Miss Gordon<sup>4</sup>, from the Gulf of Siam by Miss Rathbun<sup>5</sup> and from Lombok and Macassar in the Flores Sea by Tesch.

The measurements, in millimetres, of the Sandheads example and of the two specimens from Hongkong are given below :—

|                                  |       | Sandheads. | Hongkong. | Hongkong. |
|----------------------------------|-------|------------|-----------|-----------|
|                                  |       | ♀          | ♂         | ♀         |
| Length of carapace               | .. .. | 13·2       | 11·5      | 11·2      |
| Breadth of carapace              |       | 18·0       | 15·2      | 14·9      |
| Breadth of front                 | ..    | 4·5        | 3·8       | 3·6       |
| Breadth of Fronto-orbital border |       | 8·0        | 6·6       | 6·4       |
| Length of third walking leg      | ..    | 40·0       | 35·0      | 34·0      |

<sup>1</sup> Henderson, *Trans. Linn. Soc. London (Zool.)* V, pp. 379, 380 (1893).

<sup>2</sup> Laurie, *Ceylon Pearl Oyster Fish. Rept.* V, p. 424 (1906).

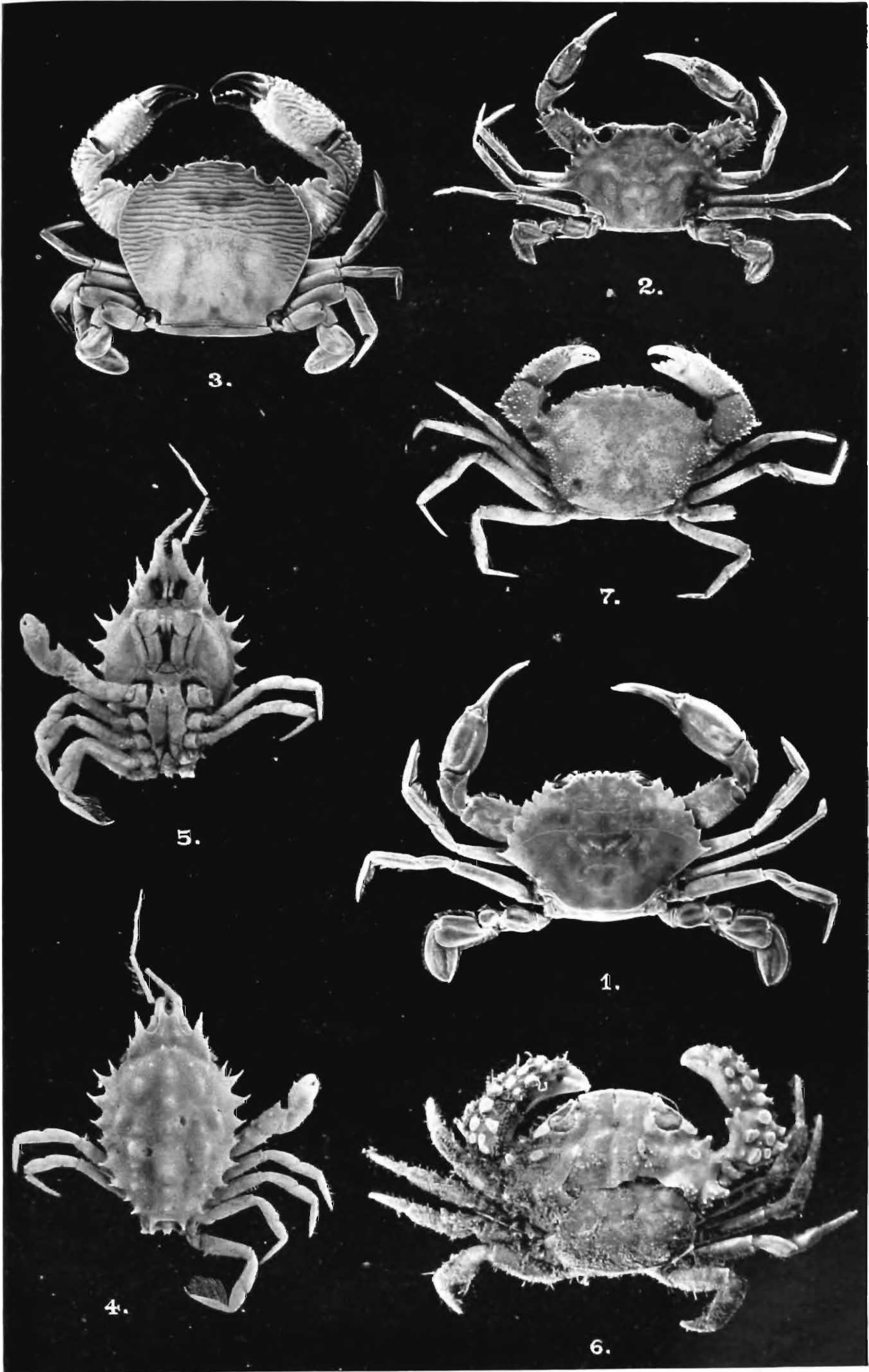
<sup>3</sup> Stimpson, *Proc. Acad. Nat. Sci. Philadelphia*, 1858, p. 95 (1858).

<sup>4</sup> Gordon, *Journ. Linn. Soc. London (Zool.)* XXXVII, p. 528 (1931).

<sup>5</sup> Rathbun, *Skrift. K. Dansk. Vidensk. Selsk. Copenhagen* (7) V, p. 344. pl. ii, fig. 2 (1910).

#### EXPLANATION OF PLATE IX.

- FIG. 1.—*Charybdis (Goniosoma) callianassa* (Herbst), dorsal view of male from Bombay : Nat. size.
- FIG. 2.—*Charybdis (Goniohellenus) vadorum* Alcock, dorsal view of male from type-series :  $\times 1\frac{1}{5}$ .
- FIG. 3.—*Lissocarcinus arkati* Kemp, dorsal view of male :  $\times 1\frac{1}{5}$ .
- FIG. 4.—*Gomezia distincta*, var. *indica*, nov., dorsal view of male :  $\times 5\frac{3}{5}$ .
- FIG. 5.—*Gomezia distincta*, var. *indica*, nov., ventral view of male :  $\times 5\frac{3}{5}$ .
- FIG. 6.—*Halimede tyche* (Herbst), dorsal view of male :  $\times 4$ .
- FIG. 7.—*Galene granulata* Miers, dorsal view of female :  $\times 1\frac{3}{5}$ .



S. Mondul, Photo.

Crabs from Sandheads.