

Records of the Zoological Survey of India

A Journal of Indian Zoology

**Issued by the Director
Zoological Survey of India, Calcutta**

RECORDS
OF THE
Zoological Survey of India

Vol. 77 Parts 1-4



Edited by the Director, Zoological Survey of India
1980

© Copyright 1980, Government of India

Published : December, 1980

Price : Inland : Rs. 100.00
Foreign : £ 11.00 \$ 33.00

PRINTED IN INDIA BY SAAKHAR MUDRAN 4 DESHAPRAN SHASMAL
ROAD CALCUTTA 700 033 AND PUBLISHED BY THE CONTROLLER
OF PUBLICATIONS CIVIL LINES DELHI 110 006

SPECIAL NUMBER

**ON ZOOLOGY OF
ANDAMAN AND NICOBAR ISLANDS**

PREFACE

The Andaman and Nicobar Islands, commonly known as the Bay Islands, occupy a unique position zoogeographically. Falling within the Indo-West Pacific region, the inland fauna and flora of these islands exhibit dual zoogeographical affinity. Separated by the Ten-degree Channel, the northernly Andaman group shares greater faunal and floristic affinities with the Indo-Chinese subregion of the Indian Region ; the Nicobar group of islands, on the other hand, has more Indo-Malayan elements, both in flora as well as in the fauna. More interesting, from faunistic point of view, is the complete absence of large mammals from these islands, the most conspicuous endemic mammals being the Andaman and Nicobar pigs, as also the puzzling occurrence of the exotic genus of the gecko *Phelsuma* in some of the islands in the Andaman group. Detailed investigations have revealed not only a certain degree of endemism in the fauna of these islands, but evidence of varying degrees of speciation among bats, rodents and birds inhabiting different islands.

In order to get an insight into the faunal characteristics of the Bay Islands, the Zoological Survey of India has been conducting continuous field surveys of these islands for sometime past. A large mass of material has been collected. The present volume of the Records contains results of studies completed so far on different groups collected by the Zoological Survey of India. As more papers gather more such volumes will be issued which, I believe, will accumulate sufficient factual data to arrive at generalisation about the origin and growth of these islands on the basis of zoogeographic evidence, among others.

Dated : 31. 12. 1980
Calcutta

K. K. TIWARI
Director
Zoological Survey of India

RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

(A Journal of Indian Zoology)

Vol. 77 Parts 1-4

1979

Pages : 1—362

CONTENTS

	PAGE
SOOTA, T. D. and HALDER, K. R.—Further records of Earthworms from the Andaman and Nicobar Islands, India.	1
ARORA, G. S.—The Lepidopterous fauna of the Andaman Islands : Family Ctenuchidae ...	7
AHMED, S.—On a collection of Centipedes (Scolopendromorpha : Scolopendridae and Cryptopidae) from Andaman and Nicobar Islands ...	25
LAKSHMINARAYANA, K. V., (MISS) VIJAYALAKSHMI, S. and TALUKDAR, B.—The Chewing-Lice (Phthiraptera : Insecta) from Andaman and Nicobar Islands with remarks on some host relationships. ...	31
SUBBA RAO, N. V.—On the Conidae of Andaman and Nicobar Islands ...	39
NANDI, N. C. and MANDAL, A. K.— <i>Haemoproteus megapodius</i> Sp. Nov. in <i>Megapodius freycinet abbotti</i> Oberholser (Megapodiidae) from the South Nicobar.	51
SOOTA, T. D., MISRA, A. and CHAKRABORTY, R.K.—Polychaete fauna of Andaman and Nicobar Islands.	55
SUBBA RAO, N. V.—New record of <i>Nerita (Theliostyla) patula</i> Recluz 1841 (Mollusca : Gastropoda) from Andaman and Nicobar Islands with a note on the species.	71
HAFAEEZULLAH, M. and DUTTA, I. B.—Digenetic Trematodes of Marine fishes of Andaman. ...	75
SOOTA, T. D.—New locality record of <i>Pipistrellus camortae</i> Miller from Car Nicobar and its systematic status.	83
SAHA, S. S. and DASGUPTA, J. M.—The Malayan Serpent Eagle, <i>Spilopins cheela malayensis</i> (Swann), in the Great Nicobar Island, an addition to the Indian avifauna	89
BOSE, GEETA—A further contribution to the study of termite fauna of Andaman and Nicobar Islands	93

GUPTA, Y N.—Some Spider mites (Acarina : Tetranychidae) from Andaman and Nicobar Islands with descriptions of three new species	111
SAHA SUBHENDU SEKHAR—Notes on some mammals recently collected from Andaman and Nicobar Islands.	119
CHATURVEDI, Y.—Mammals of the Andamans and Nicobars : their Zoogeography and faunal affinity	127
ARORA, G. S. and NANDI, D. N.—On the Butterfly fauna of Andaman and Nicobar Islands (India). I. Papilionidae.	141
CHANDRASEKHARA RAO, G.—On the Zoogeography of the Interstitial meiofauna of the Andaman and Nicobar Islands, Indian Ocean	153
DAS, A. K. and DEV ROY, M. K.—On the Wood-boring molluscs of South Andamans, India	179
GUPTA, S. K.—Some Prostigmatid Mites (Acarina) from Andaman and Nicobar Islands	189
SUBBA RAO, N. V., DAS, A. K. and MITRA S. C.—On Fresh-water molluscs of Andaman and Nicobar Islands.	215
GHOSH, S. K.—On a small collection of Neuroptera from Andaman and Nicobar Islands	247
BISWAS, S. and SANYAL, D. P.—A report on the Reptilia fauna of Andaman and Nicobar Islands in the collection of Zoological Survey of India	255
MANDAL, D. K. and BHATTACHARYA, D. P.—On the Pyraustinae (Lepidoptera : Pyralidae) from the Andaman, Nicobar and Great Nicobar Islands, Indian Ocean.	293
SEN, S.—On a collection of Thysanoptera (Insecta) from Andaman Island	343
TIWARI, K. K. DAS A. K. DEB ROY, M. K. AND KHAN, T N.—On the wood borers of Mangroves of Andaman and Nicobar Islands, India, with note on the Gallery Pattern of some Insect borers	357

FURTHER RECORDS OF EARTHWORMS FROM THE ANDAMAN AND NICOBAR ISLANDS, INDIA

By

T D. SOOTA and K. R. HALDER
Zoological Survey of India, Calcutta
(With 2 Tables)

INTRODUCTION

Soota and Julka (1970) and Julka and Halder (1975) dealt with some earthworms from the Andaman and Nicobar Islands. Since then some more material comprising ten species belonging to nine genera spread over five families has been examined. The present paper supplements the information given in the earlier paper. Six among the ten species reported here are recorded for the first time from these islands. Additional data about interesting variations in these species have also been furnished along with descriptive notes where necessary. The classification followed here is after Jamieson (1971), Sims and Easton (1972); Gates (1972) and Easton (1976).

Family MONILIGASTRIDAE

Drawida nepalensis Michaelsen, 1907

Material : 5 exs., Z. S. I. reg. no, An 652/1, locality — Govt. Agriculture garden, Camorta Is., Nicobars, 5.x.1972, Coll. *K. Reddiah* ; 2 exs., Z. S. I. reg. no. An 653/1, locality — Govt. rest house compound, Camorta Is., Nicobars, 5.x.1972, Coll. *K. Reddiah* ; 1 ex. ; Z. S. I. reg. no. An 654/1, Nancowry village, Nancowry Is., Nicobars, 5.x.1972, Coll. *K. Reddiah* ; 3 exs., Z. S. I. reg. no. An 655/1 locality — garden nr. Civil Hospital, Camorta Is., Nicobars, 11.x.1972 ; 1 ex, Z. S. I. reg. no. An 656/1, locality — Bara balu village nr. Chiria Tapu, S. Andamans, 27.x.1972, Coll. *K. Reddiah* ; 1 ex., Z. S. I. reg. no. An 657/1, locality — Govt. rest house compound, Delanipur, Port Blair, S. Andamans, 1.xi. 1972, Coll. *K. Reddiah*. 3 exs., Z. S. I. reg. no. An 1059/1, locality — Mathura, S. Andamans, 20.v.1978, Coll. *M. Sil*.

Remarks : The following morphological variations were noted in these specimens. The single specimen from Chiria Tapu is well clitellate ; genital markings as two broad transversely oval midventral cushions on ix and x, the anterior cushion smaller than the posterior. The single specimen from Nancowry Is. is also clitellate ; genital markings as 2 pairs of half moon — shaped ventral cushions on x and xi, the anterior pair larger than the posterior.

This species is recorded for the first time from the Nicobar Islands.

Family MEGASCOLECIDAE

Pontodrilus bermudensis Beddard, 1891

Material : 1 ex., Z. S. I. reg. no. An 651/1, locality—Passa Bridge, Car Nicobar, 26.iii.1959, Coll. K. K. Tiwari ; 4 exs., Z. S. I. reg. no. An 659/1, locality—East Katchal Is., Nicobars ; 28.i.1976, Coll. G. Ramakrishna.

Lampito mauritii Kinberg, 1867

Material : 21 exs., Z. S. I. reg. no. An 660/1, locality—Nancowry village, Nancowry Is., Nicobars, 6.x.1972, Coll. K. Reddiah ; 37 exs., Z. S. I. reg. no. An 661/1, locality—nr. Camorta jetty, Camorta Is., Nicobars, 7.x.1972, Coll. K. Reddiah. 40 exs., Z. S. I. reg. no. An 662/1, locality—Andaman forest rest house compound, Chiria Tapu, S. Andamans, 26.x.1972, Coll. K. Reddiah. 1 ex., Z. S. I. reg. no. An 663/1, locality—Bara balu village nr. Chiria Tapu, S. Andamans, 27.x.1972, Coll. K. Reddiah ; 27 exs., Z. S. I. reg. no. An 664/1, locality - nr. Govt. rest house, Delanipur, Port Blair, S. Andamans, 1.xi.1972, Coll. K. Reddiah.

Remarks : This species is recorded for the first time from the Nicobar Islands.

Amyntas alexandri Beddard, 1900

Material : 3 exs., Z.S.I. reg. no. An 665/1, locality—Thobang village, Nancowry Is., Nicobars, 9.iii.1972, Coll. A. G. K. Menon. 14 exs., Z.S.I. reg. no. An 1057/1, locality—Mathura, S. Andamans, 30.v.1978, Coll.—M. Sil. The following data is of specimens from Nicobars.

Remarks : Genital markings as a pair of large circular discs with smooth surface, placed between papillae of male pores ; 6-8 setae intervene between discs (In one specimen there is also a seta in inner wall of each disc) ; faint ridges present laterally on both sides ; prostates much cut up in to lobes in xvii-xix ; cushions corresponding to discs present internal to prostates ; intestinal caecae originate from xxvi and extend up to xxiv ; spermathecal ampulla bulbous.

This species is recorded for the first time from the Nicobar Islands.

Amyntas osmastoni (Michaelsen, 1907)

Material : 1 ex., Z.S.I. reg. no. An 669/1, locality-Horticulture

and Zoological garden, Port Blair, S. Andamans, 27. xii. 1974, Coll. S. K. Bhattacharya. 1 ex., Z.S.I. reg. no. An 670/1, locality-Port Blair, 30. xii. 1974, Coll. S. K. Bhattacharya. 3 exs., Z.S.I. reg. no. An 1058/1, locality-Aniket, S. Andamans, 8. xii. 1977, Coll. M. Sil.

Remarks : The following morphological variations were noted in both the specimens from Port Blair. In one specimen, genital markings are as a pair of broad ventral cushions in *a* to *h*, postsetal on *x*, each covering $\frac{3}{5}$ of the segment. The cushions are rectangular with rounded angles, the right cushion with 125 porophores and the left with 140 porophores. There is also a porophore presetal on the right side of *x*. In the other specimen, the genital markings are as a pair of broad, transversely oval cushions in *c* to *h*, postsetal on *x*, each covering $\frac{2}{3}$ of the segment with 95 porophores on the right cushion and 90 on the left one.

***Metaphire peguana* (Rosa, 1890)**

Material : 2 ex., Z.S.I. reg. no. An 671/1, locality-Horticulture and Zoological garden, Port Blair, S. Andamans, 27. xii. 1974, Coll. S. K. Bhattacharya.

Remarks : This species is recorded for the first time from the Andaman Islands.

***Metapheretima elongata* (Perrier, 1872)**

Material : 9 exs., Z.S.I. reg. no. An 666/1, locality-Govt. rest house compound, Camorta Is., Nicobars, 5. x. 1972, Coll. K. Reddiah. 4 exs., Z.S.I. reg. no. An 667/1, locality-Govt. Agriculture garden, Camorta Is., Nicobars, 5. x. 1972 ; 7 exs., Z.S.I. reg. no. An 668/1, locality-Chiria Tapu village, S. Andamans, 28. x. 1972, Coll. K. Reddiah.

Remarks : The following abnormal variations in the number of spermathecae (Table 1) and the location of genital markings (Table 2) were noted in these specimens.

Table 1.—Variations in the number of spermathecae in *Metapheretima elongata* from the Andaman and Nicobar Islands.

Left side	Segment V		Left side	Segment VI		No. of specimens
	—	Right side		—	Right side	
0		0	0		0	9
1		2	2		0	1
2		0	0		0	1
0		1	0		0	1

1	0	0	1	1
3	4	3	4	1
4	4	4	4	1

Table 2.—Location of genital markings in *Metapheretima elongata* from the Andaman and Nicobar Islands.

Segment No.	No. of specimens
xix—xxii	1
xix—xxiii	9
xix—xxiii, absent on left side of xix.	1
xix—xxiii, absent on left side of xxi.	1
xix—xxiii, absent on right side of xxiii.	2
xix—xxiv, absent on right side of xix and on left side of xxiii and xxiv.	1

This species is recorded for the first time from the Nicobar Islands.

***Perionyx excavatus* Perrier, 1872**

Material : 16 exs., Z.S.I. reg. no. An 672/1, locality-Cowriaghat, S. Andamans, 11. iv. 1964, Coll. *B. S. Lamba*.

***Dichogaster bolaui* (Michaelsen, 1891)**

Material : 1 ex., Z.S.I. reg. no. An 673/1, locality-Nancowry village, Nancowry Is., Nicobars, 6. x. 1972, Coll. *K. Reddiah*.

Family GLOSSOSCOLECIDAE

***Pontoscolex corethrurus* (Fr. Muller, 1857)**

Material : 12 exs., Z.S.I. reg. no. An 674/1, locality-Wright Myo, S. Andamans, 30. vii. 1972, Coll. *A. K. Mardal*. 7 exs., Z.S.I. reg. no. An 675/1, locality-Malacca village, Car Nicobar, 26. ix. 1972, Coll. *K. Reddiah*. 3 exs., Z.S.I. reg. no. An 676/1, locality-garden nr. Civil hospital, Camorta Is., Nicobars, 11. x. 1972, Coll. *K. Reddiah*.

Remarks : This species is recorded for the first time from the Nicobar Islands.

SUMMARY

The paper deals with ten species of earthworms from the Andaman and Nicobar Islands. Six of the records are new for the area. Interesting morphological variations in three species have been included.

ACKNOWLEDGEMENT

We are thankful to Dr. S. Khera, Joint Director (In-charge), Zoological Survey of India, Calcutta, for his kind encouragement in the preparation of this paper.

REFERENCES

- EASTON, E. G. 1976. Taxonomy and distribution of the *Metapheretima elongata* species-complex of Indo-Australian earthworms (Megascolecidae : Oligochaeta). *Bull. Br. Mus. nat. Hist. (Zool.)*. London : 30 (2) : 31-53.
- GATES, G. E. 1972. Burmese earthworms, an introduction to the systematics and biology of Megadrile Oligochaetes with special reference to southeast Asia. *Trans. Amer. Phil. Soc.*, 62 (7) : 1-326.
- JAMIESON, B. G. M. 1971. A Review of the Megascolecoid Earthworm Genera (Oligochaeta) of Australia. Part I. Reclassification and Checklist of the Megascolecoid Genera of the World. *Proc. R. Soc. Qd.*, 82 (6) : 75—86.
- JULKA, J. M. and HALDER, K. R. 1975. Record of *Pheretima malaca* Gates (Oligochaeta - Megascolecidae) from Andaman Islands. *Newsl. zool. Surv. India*, 1 (4) : 65-66.
- SIMS, R. W and EASTON, E. G. 1972. A numerical revision of the earthworm genus *Pheretima* auct. (Megascolecidae : Oligochaeta) with the recognition of new genera and an appendix on the earthworms collected by the Royal Society North Borneo Expedition. *Biol. J. Linn. Soc.*, 4 (3) : 169-268.
- SOOTA, T. D. and JULKA, J. M. 1970. Notes on earthworms of the Andaman and Nicobar Islands, India. *Proc. zool. Soc. Calcutta*, 23 : 201-206.

THE LEPIDOPTEROUS FAUNA OF THE ANDAMAN ISLANDS : FAMILY CTENUCHIDAE

By

G. S. ARORA

Zoological Survey of India, Calcutta.

(With 5 Text figures)

I. INTRODUCTION

The present study is based on some 60 specimens, representing three genera and five species, collected by various survey parties of Zoological Survey of India during the last one decade or so, from North, Middle and South Andaman Islands. Two of these species, *Amata* (A.) *cingulata* (Weber) and *Ceryx imaon* (Cramer), are reported from these islands for the first time (Arora, 1976). Zerny (1912) and Fletcher (1925) listed five species in all, excluding the above-mentioned species, from these islands. One species, *Amata* (A.) *pectoralis* (Walker), was not collected in the present surveys and the description is based on earlier published literature. It has also been briefly reported (Arora, 1976), that while *A. (A.) cingulata* (Weber) is a first specific report from India, particularly from the Andaman Islands, the other species, *Ceryx imaon*, is well known from the Indian mainland and the present record from the Andaman Islands constitutes the first record, thus bringing the total to seven species so far recorded from these islands.

II. SYSTEMATIC ACCOUNT

Family CTENUCHIDAE

Proboscis well developed or aborted. Labial palpi present, short and porrect, long and down-curved or upturned. Frons simple, rounded. Antennae variable, being either simple or with short branches in males, or simple in both the sexes. Tibiae with the spurs short. Fore wing with vein 3A forming a fork with 2A ; 1A absent ; M_2 from near the lower angle of cell ; R_5 stalked with R_3+R_4 . Hind wing small ; Sc absent, rarely rudimentary from base and not reaching costa, or forming a fork with Rs ; frenulum present, retinaculum bar-shaped ; 3A often absent.

Key to the identification of Andaman genera

1. Hind wing with the veins Rs- M_1 coincident ; M_2 and Cu_{1b} present. Fore wing with the veins R_1 - R_5 stalked. Antennae normal	...	...	...	...	...	...	2.

- Hind wing with the veins Rs-M₁ not coincident ; M₂ and Cu_{1b} absent. Fore wing with the veins R₁ free, R₂-R₅ stalked. Antennae with the medial part of shaft dilated *Euchromia* Hübner (1 species)
2. Hind wing with the veins M₂ and Cu_{1a} absent *Ceryx* Wallengren (1 species)
- Hind wing with the veins M₂ absent, Cu_{1a} present 3.
3. Hind and mid tibia with two pairs and one pair of spurs, respectively *Amata* Fabr. (3 species)
- Hind and mid tibia each with one pair of minute spurs *Eressa* Walker (2 species)

Genus *Euchromia* Hübner

1820. *Euchromia* Hübner, *Verz. bek. Schmett.* : 121.

Type : *Zygaena guineensis* Fabr., 1775.

Diagnosis.—Labial palpi upturned, not reaching vertex of head. Antennae slightly dilated at the middle, bipectinate, with moderate branches. Legs with the tibial spurs short. Fore wing with vein R₁ free ; R₂-R₅ stalked ; M₁ from upper angle of cell ; M₂, M₃ and Cu_{1a} from lower angle of cell or Cu_{1a} from near angle. Hind wing with the cell moderate ; Rs-M₁ stalked or connate ; M₂ and Cu_{1b} absent ; M₃ and Cu_{1a} stalked or from angle of cell.

Distribution.—African, Oriental, Malaysian and Australian regions.

Remarks.—One species, *E. polymena* (Linn.), is known to occur in Andaman Islands.

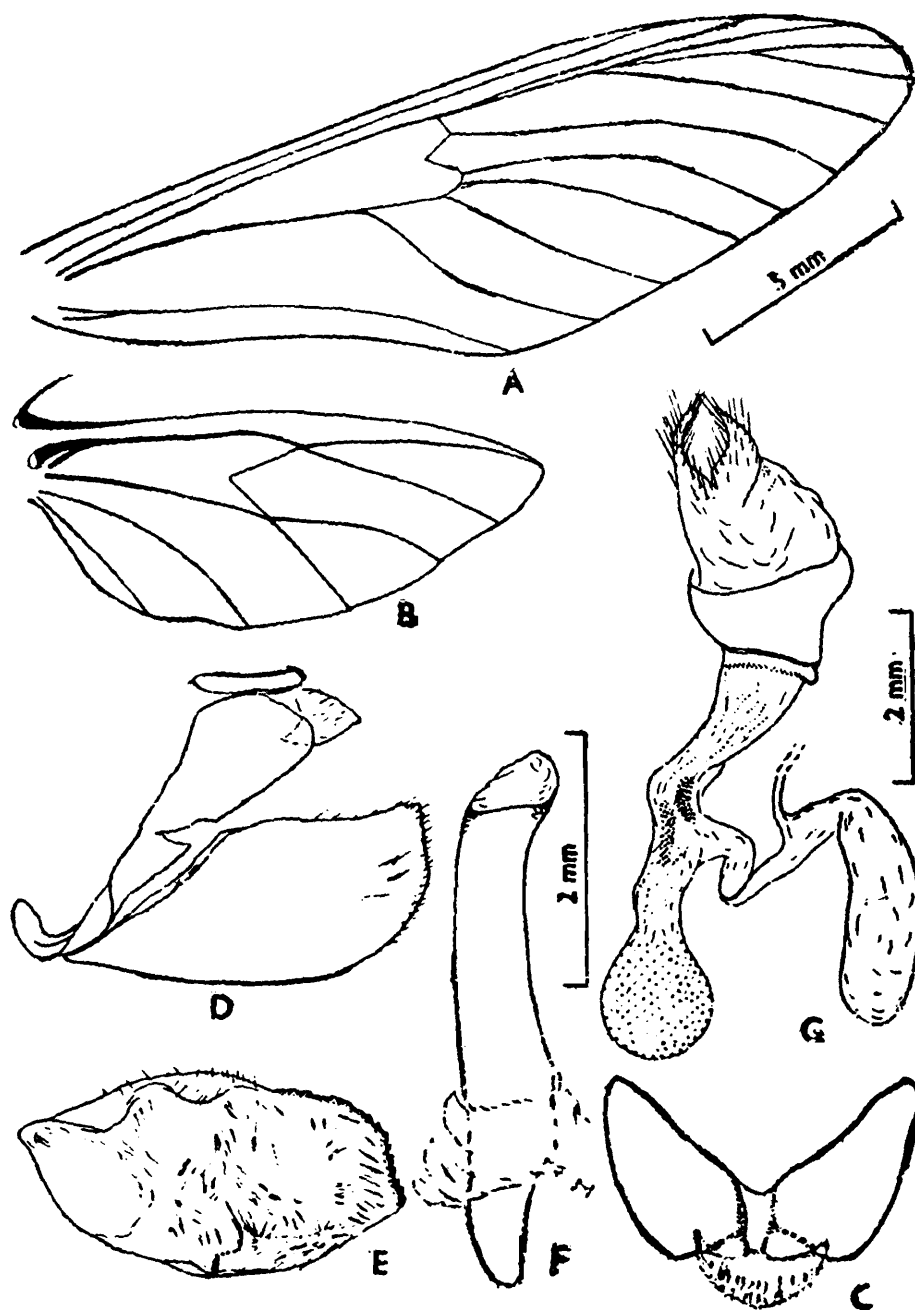
1. *Euchromia polymena* (Linn.)

(Text-fig. 1A-G)

1758. *Sphinx polymena* Linn., *Syst. Nat.*, Ed. X : 494 (*Type loc.*—Asia).

Black brown. Head with the frons white ; tegulae crimson ; patagia with a white patch at its base ; white patches also present laterally on thorax and on coxae. Abdomen generally with crimson band on 1st, 4th & 5th segment, sometimes one or all the bands become yellowish ; 2nd and 3rd segment with bluish lustre, becoming whitish on sides. Wings with the ground colour same as of the body ; patches yellowish ; blue lustre present at the base and along discocell,

ular ; an elongate wedge-shaped spot present in the cell, continued below the median vein up to the inner vein into an equally large quadrate spot ; a spot also present at the base between median and inner vein ; four spots present beyond the cell between veins R_s and Cu_{1a} . Hind wing with the patches of the same colour as on the fore wing ; three wedge-shaped spots from base to one-third of the cell and a row of four large spots beyond the cell between R_s and Cu_{1a} .



Text-fig. 1.—*Euchromia polymena* (Linnaeus) : A & B—Fore and hind wing venation respectively, C—Uncus with tegumen, in dorsal view, D—♂ genitalia, in lateral view, E—Clasper, inner view, F—Aedeagus, G—♀ genitalia. (A & B of the same magnification and C-E same magnification as F).

Head with the frons smooth. Antennae bipectinate from basal 5th or 6th segment onwards, nearly up to a few segments from the

tip, which is simple ; shaft slightly dilated at the middle, with the branches longest in the middle, about the length of three segments. Labial palpi nearly porrect or with the 3rd segment slightly upturned. Legs with a single pair of spurs on mid tibia and two pairs on hind tibia ; tarsi with minute spines, tarsal claws with arolium.

Venation (Text-fig. 1, A-B).—Fore wing with vein R_1 arising free from before the cell angle ; R_2 - R_5 stalked, R_2 arising between R_5 and cell angle, rather nearer to R_5 than to the angle ; M_1 from just below the angle ; M_2 - M_3 above the lower angle ; Cu_{1a} from lower angle, Cu_{1b} from behind. Hind wing with the veins R_s present and not coincident with M_1 ; M_2 - Cu_{1b} absent ; M_3 - Cu_{1a} from near the lower angle of cell.

Genitalia.—Male (Text-fig. 1, C-F) : Uncus simple, short, dome shaped. Tegumen long, about twice as broad apically as its base ; vinculum U shaped, with very short, blunt and upturned obsolete saccus. Claspers short and broad ; the apical margin denticulate. Aedeagus simple, long and narrow ; the base blunt, with the ductus ejaculatorius entering on one side ; cornuti wanting. Female (Text-fig. 1, G) : Ostium bursae well protected by a broad, highly sclerotised plate ; ductus bursae long and broad, membranous for the most part, with a few sclerotised patches, the surface of which is ornamented with very minute spines ; corpus bursae heavily granulate and sclerotised, pea-shaped ; receptaculum seminalis large, broadly bean-shaped, membranous ; papillae anales well developed, short and broad.

Material examined.—INDIA : West Bengal, Calcutta, 5 ♂♂, 9 ♀♀ ; Assam, Cachar, 2 ♀♀, Sibsagar, 1 ♂, (no other data) ; South Andaman, Chiriatapu, 1 ♀, 19. iii. 1975 (G. K. Srivastava coll.). SRILANKA : Peradeniya, 1 ♀, - xi. 05. BURMA : Rangoon, 1 ♀, -xii. 1886.

Expanse.—Male, 42-49 mm ; Female, 44-52 mm.

Distribution.—India : Maharashtra (Bombay) ; Tamil Nadu (Nilgiris, Coimbatore) ; Kerala (Travancore) ; Nagaland ; Andamans. Also Bangladesh (Dacca) ; Sri Lanka ; Philippines ; Burma ; and Indonesia.

Remarks.—*Euchromia polymena* (Linn.) is reported (Fletcher 1925, Seitz, 1933) to occur in the Andaman Islands, besides on the Indian mainland. Presently, the species is represented from these areas by a single female example.

Genus *Ceryx* Wallengren

1863. *Ceryx* Wallengren, *Wien. Ent. Mon.*, 7 : 140.

Type : *Naclia anthraciformis* Wallengren (1860).

Diagnosis.—Labial palpi porrect, not extending beyond the frons. Fore wing with vein R_1 – R_5 stalked; M_1 from or from below the upper angle of cell. Hind wing with Rs coincident with M_1 ; M_2 present; M_3 and Cu_{1a} absent; Cu_{1b} from behind the angle of cell. Mid and hind tibia each with a minute terminal pair of spurs, hind tibia rarely with two pairs.

Distribution.—Mainly Indo-Australian regions. Also in part of African region.

Remarks.—Fletcher (1925) recorded eight species of *Ceryx* from the Indian region, including one from Burma but none from the Andaman Islands. The present record of the *Ceryx imaon* extends the known distribution of the genus (Hampson, 1898) from the Indian mainland to the Andaman Islands.

2. *Ceryx imaon* (Cramer)

(Text-fig. 2, A-F)

1780. *Sphinx imaon* Cramer, *Papil. Exot.*, 3 : 94, pl. 248, fig. E.

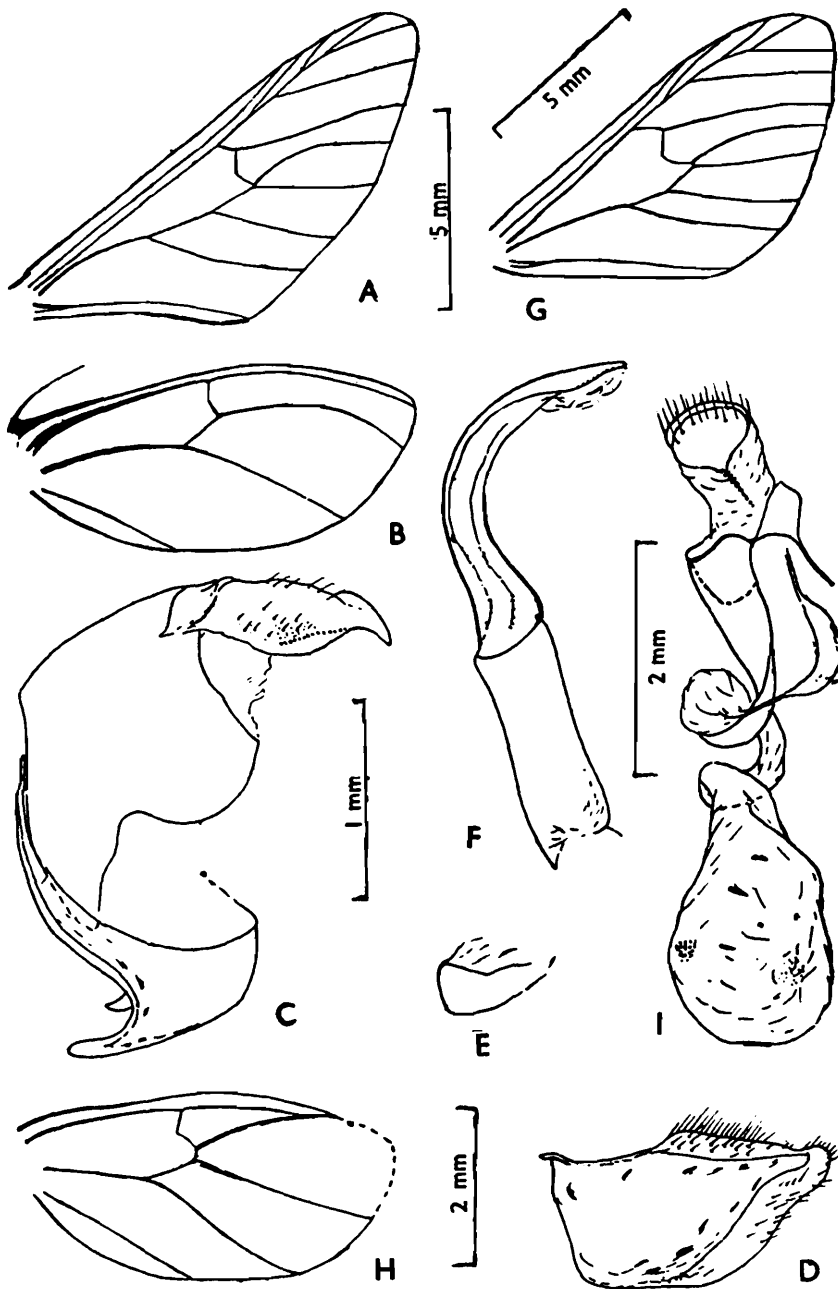
Head with the frons whitish; labial palpi black. Antennae black throughout except at some apical segments which are whitish; collar orange. Thorax black; orange spots present on the underside. Abdomen black, with two orange bands. Fore wing black; a large wedge shaped hyaline patch present in end of cell; an elongate spot below cell and vein Cu_{1b} , and a short spot above Cu_{1b} present; two conjoined spots between M_3 and Cu_{1a} and a large wedge-shaped spot above vein R_5 with an extremely small one above it. Hind wing with three large conjoined spots, covering the space below the cell, in the cell and a little beyond it. Legs with whitish scaling on tarsal segments.

Frons smooth. Labial palpi short and porrect. Antennae simple. Legs with a single pair of minute tibial spurs on mid and hind tibiae.

Venation (Text-fig. 2, A-B).—Fore wing with the veins R_1 – R_5 stalked, R_1 arising a little before the origin of vein R_5 , R_2 equidistant between R_3 and R_5 . Hind wing venation as given for the genus.

Genitalia.—Male (Text-fig. 2, C-F) : Uncus short, sclerotised lightly and beset with some hairs on the upper side; the base broader than the tip which is sharply bent downwards and pointed; the basal part raised mid dorsally into a ridge. Tegumen broader throughout except at its ventral part which is narrowed and continued into narrow vinculum, the latter produced inwardly into short prolongations, instead of a single saccus. Claspers simple, the mid-dorsal margin sclerotised and beset with some setae; the apex narrowed; juxta simple, slightly sclerotised, forming almost a cup-shape under the

aedeagus ; the latter with a well developed base, the apical part about twice the length of basal part, smoothly curved in the middle giving it a 'sickle shape', the tip narrow and without any cornutal spine. Female. Not known.



Text-fig. 2.—*Ceryx imaon* (Cramer) : A & B—Fore and hind wing venation, respectively, C—♂ genitalia in lateral view, D—Clasper in inner view, E—Juxta, F—Aedeagus ; *Amata phoenicozona* (Hampson) : G & H—Fore and part of the hind wing venation, respectively, I—♀ genitalia. (B of same magnification as H and D—F same as C).

Material examined.—North Andaman ; Mayabunder, 1 ♂, 26.iii. 1969, (T. D. Soota coll.).

Expanse.—26 mm.

Distribution.—India : Assam (Khasi Hills, Cachar) ; Meghalaya (Shillong) ; Sikkim ; West Bengal ; Kashmir ; Himachal Pradesh ; Maharashtra (Bombay) ; and Tamil Nadu (Nilgiris). Also Indonesia ; Sri Lanka ; and Burma.

Remarks.—*Ceryx imaon* (Cramer) was known previously from the Indian mainland, Hongkong, Sri Lanka and Burma. The present report is a new record for the Andaman Islands, and is of zoogeographical interest.

Genus *Amata* Fabricius

1807. *Amata* Fabricius, *Illiger's Mag.*, 6 : 289.

Type : *Zygaena passalis* Fabr., 1775.

Diagnosis.—Head with the frons mostly smooth. Antennae in male either pectinate or simple, slightly broadened beyond middle. Labial palpi short, down-curved and hairy ; 3rd segment extremely reduced. Fore wing long and rather narrow ; veins R_1 - R_5 stalked ; M_1 from near upper angle of cell ; M_2 - M_3 from lower angle or stalked. Hind wing with the vein R_s coincident with M_1 ; M_3 absent ; M_2 and Cu_{1a} from angle or stalked, rarely M_2 slightly above the angle. Hind tibia with two pairs of spurs.

Distribution.—Europe, the whole of African, Oriental and Australian regions.

Remarks.—Fletcher (1925) recorded as many as forty species from India, including three from Andaman Islands : *A. pectoralis* (Walker), *A. phoenicozona* (Hampson) and *A. wimberleyi* (Swinhoe). Another species, *A. cingulata* (Weber), is here added to the Andaman fauna. The present study of the wing venation has shown that in *A. phoenicozona* veins M_2 - Cu_{1a} in hind wing are quite separate at base as in the genus *Eressa* Walker but the species can be differentiated from that genus in having two pairs of spurs on the hind tibia. In *Eressa* there is only a single terminal spur.

Obraztsov (1966), revising the palaearctic species of the genus *Amata* Fabr., divided it into two subgenera, *Amata* Fabr. and *Syntomis* Ochsenheimer, on the basis of male genitalic characters, about as follows :

- Basal process of both claspers undeveloped, or simple and fused together with the membranes of aedeagus above through the tip ... Subgenus *Amata* Fabr.
- Basal process of at least one of the claspers well developed, with the end free, fused together with the aedeagus above only at basal part ... Subgenus *Syntomis* Ochsenheimer.

Key to Andaman species based on external characters

1. Antennae bipectinate in male, serrate in female. Abdomen with the markings crimson. Hind wing with the patches hyaline, the veins and margin black	...	...	...	...	2
— Antennae simple in both sexes. Abdomen with the markings yellow or orange	...	...	...	...	3
2. Frons whitish	...	...	...	<i>A. pectoralis</i> (Walker)	
— Frons black	...	...	...	<i>A. phoenicozona</i> (Hampson)	
3. Wings with the markings orange. Frons orange. Abdomen with orange marking on each segment	...	...	...	<i>A. wimberleyi</i> (Swinhoe)	
— Wings with the markings hyaline. Frons black. Abdomen with orange marking on 1st and 5th segment only	...	...	...	<i>A. cingulata</i> (Weber)	

3. *Amata pectoralis* (Walker)

1854. *Syntomis pectoralis* Walker, *List Lep. Het. Brit. Mus.*, 1 : 133 (Type loc.-Moulmein).

“♀ : Black, shot with metallic blue green, frons, patagia and tips of antennae white ; thorax with crimson patches behind the mid legs ; metathorax and first two segments of abdomen crimson. Fore wing with wedge-shaped milky hyaline patch in cell ; an elongate patch below cell and vein 2 ; a spot above origin of vein 2 ; patches between veins 3 and 5 extending almost to margin ; an elongate patch above vein 6 and spot above vein 7. Hind wing hyaline, the veins and margins narrowly black.

“*Ab.*—1. Forewing with no spot above vein 2.—Andamans

“*Hab.*—Moulmein (*Clerk*), type ; Tenasserim, Dawnat Hills (*de Niceville*) ; Cambodia (*Mouhot*). Type *basirufa* in Mus. Oxon.

“*Exp.*—26-32 millim” (Hampson, 1898)

Distribution.—India : Andamans. Also Burma and Cambodia.

Remarks.—Material of this species was not available for study and the description and nomenclature are taken from Hampson (1898) and Fletcher (1925), respectively. Accordingly, the species could be distinguished only on the basis of external characters.

4. *Amata* (Subgenus ?) *phoenicozona* (Hampson)
(Text-fig. 2, G-I).

1897. *Syntomis phoenicozona* Hampson, *J. Bombay nat. Hist. Soc.*, **11** : 284
(Type loc.—Andamans).

Head with the frons and labial palpi black. Antennae black except near the tip where the segments are whitish. Thorax black above; with crimson patch below; metathorax and the 1st abdominal segment crimson. Wings black; fore wing with almost wedge-shaped hyaline patch in the cell, a quadrate patch below the cell, a spot above M_1 and two spots between M_2 - Cu_{1a} . Hind wing with a spot below the cell and another between M_2 - Cu_{1b} .

Antennae bipectinate in male, the branches rather short and dilated distally (Hampson, 1898); minutely serrate in female. Legs with the spurs as given for the genus.

Venation.—(Text-fig. 2G-H) : Fore wing venation mainly as in the genus, with R_1 arising just before the origin of vein R_5 .

Genitalia.—Female (Text-fig. 2, I) : Ostium bursae simple, partly membranous, shaped like a pouch, with its inner wall highly sclerotised; ductus bursae very long, flattened and sclerotised, leading through partly membranous part at its base into the sac like membranous corpus bursae; two short, sclerotised patches, one on each side on corpus bursae; papillae anales weakly sclerotised.

Material examined.—South Andaman : Mannerghat, Mt. Harriet Range, 1 ♀, 3. iv. 1964 (*B. S. Lamba* coll.)

Expanse.—Male, 20 mm (*vide* Hampson, 1898); Female, 22 mm.

Distribution.—India : Andamans.

Remarks.—Hampson (*loc. cit.*) gave the description of the male. The present specimen is a female, slightly larger than the male, and is described above for the first time.

5. *Amata* (*Syntomis*) *wimberleyi* (Swinhoe)
(Text-fig. 3, A-I)

1889. *Syntomis wimberleyi* Swinhoe, *Proc. zool. Soc. Lond.* : 400, pl. 43, fig. 11 (Type loc.—Andamans).

Black brown. Frons, patagia, tegulae and sides of the head, between eyes, orange. Labial palpi black-brown. Antennae black brown throughout except one or two segments apically which are whitish. Metathorax and sides of thorax with orange patches. Legs black

brown throughout except for a white band on the 1st tarsal segment in all the legs. Wings and abdomen black brown; the former with six orange spots, the largest lying between the bases of veins Cu_{1b} and 1A the spot at the end of cell equally large and quadrate, those beyond the cell, above vein M_1 , and between M_2 - Cu_{1a} small, with two of them conjoined at the space between M_2 - Cu_{1a} . Hind wing with an orange spot below the cell and two spots between veins M_2 - Cu_{1a} . Abdomen with seven orange bands in male, six in female, running uninterrupted from dorsal to ventral surface.

Frons simple. Labial palpi short, porrect, hardly reaching frons. Antennae simple in both the sexes. Legs with spurs as given for the genus; the hind tibia dilated slightly from a little before middle and almost as long as, or slightly longer than, all the tarsal segments taken together.

Venation (Text-fig. 3, A-B).—Fore wing with vein R_1 - R_5 stalked, R_1 equidistant between angle of cell and R_5 ; M_1 from below the upper angle; M_2 - M_3 connate, Cu_{1a-b} from behind the angle. Hind wing venation as given for the genus.

Genitalia.—Male (Text-fig. 3, C-H): Uncus short and broad, smoothly curved towards apex which is narrow and beset with fine setae. Tegumen well developed, short and broad, extending both dorsally and laterally into lobes, abruptly ending at its ventral end; vinculum very long and narrow, broadly U shaped, ending into a short and narrow saccus. Claspers unequal in both length & width, as well as in the length of basal and mid-dorsal costal processes, the left-side clasper being longer and having a longer process, the right-side clasper with the basal process reduced, thick and hardly one third as long as that on the left clasper; juxta well developed. Aedeagus broader at the base than the apex, the latter with cornutal spines on retracted vesica. Female (Text-fig. 3, I): Ostium bursae cupped, with a shallow cavity; ductus bursae sclerotised; corpus bursae large, membranous, with one signum on each side and beset with very minute spines; anterior apodemes reduced, posterior apodemes long, but hardly projecting beyond the anterior; papillae anales well developed.

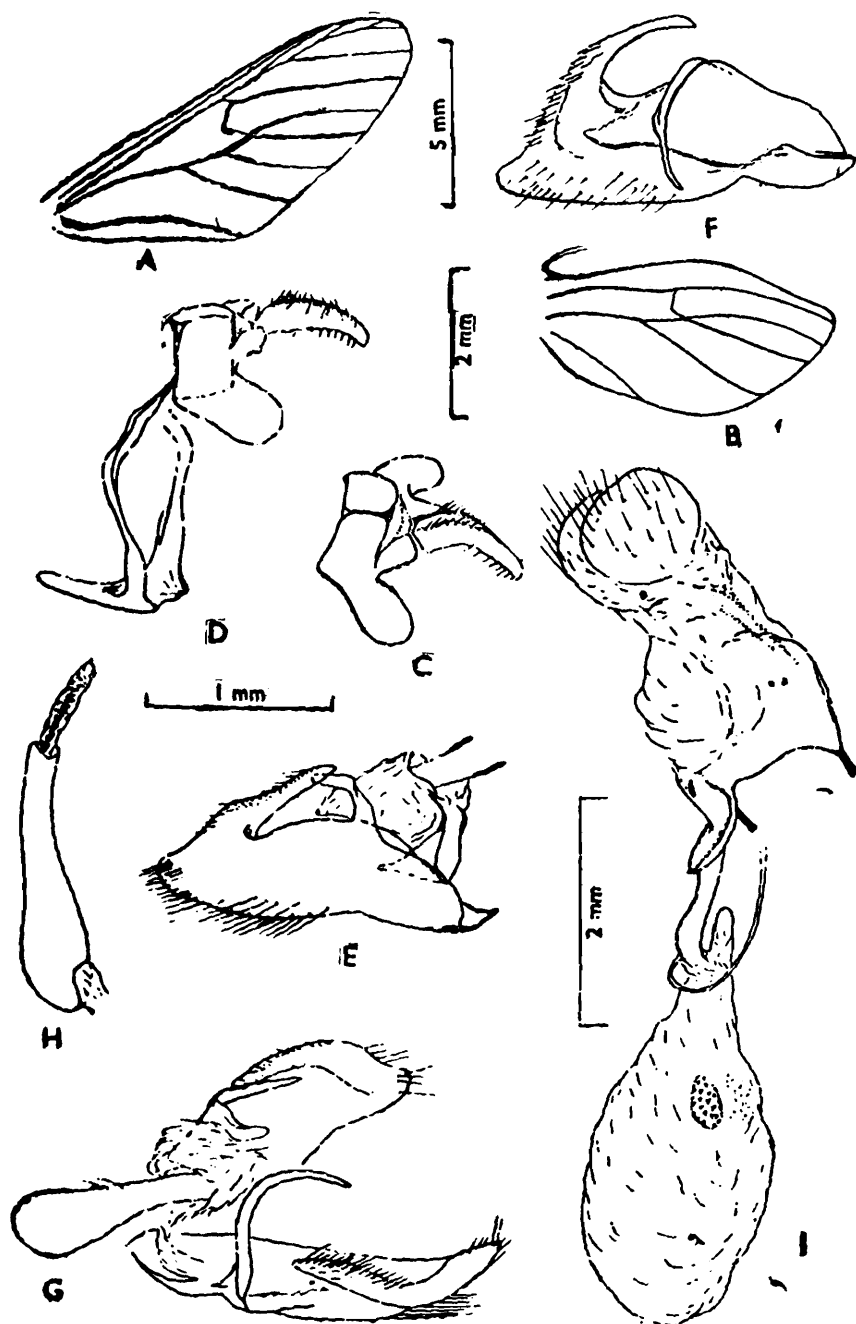
Material examined.—South Andaman: Cha Bagicha, Port Blair, 1 ♂, 29. ii. 1964; Wrafter's Creak, Baratang, 1 ♂, 19. iii. 1964; Burma Nallah 1 ♂, 1 ♀, 18. iv. 1964 (all *B.S. Lamba* coll.); Chiriatapu, 1 ♂, 20. i. 1972 (*B. Dutta* coll.). Mid Andaman: Long Island, Forest Rest House., 1 ♀, 16. v. 1971 (*B. K. Tikader* coll.).

Expanse.—Male, 23-28 mm; Female, 30 mm.

Distribution.—India: Andamans.

Remarks.—*Amata* (*Syntomis*) *wimberleyi* (Swinhoe) was hitherto placed either under *Amata* or *Syntomis*. Obraztsov's (1966) work on the

palaeartic *Amata*, however, helped in assigning the species correctly, especially on the basis of male genitalia. The species can easily be distinguished from *Amata* (*A.*) *cingulata* in the shape of claspers, and their basal as well as costal processes which are unequal. Accordingly, the latter species is placed in the subgenus *Amata* (*Amata*) (*vide infra*).



Text-fig. 3.—*Amata* (*S.*) *wimberleyi* (Swinhoe): A & B—Fore and hind wing, venation, respectively, C—Uncus, as seen laterodorsally, D—♂ genitalia lateral view, E & F—Right clasper in outer and inner view, respectively, G—♂ genitalia, with right and left claspers and part of aedeagus as seen dorsomesally, H—Aedeagus, I—♀ genitalia. (All ♂ genitalia figures of same magnification as of D).

The species is endemic to Andaman Islands and the present account gives additional informations on specific distribution of the species on the these Islands.

6. *Amata (Amata) cingulata* (Weber)
(Text-fig. 4, A-I)

1801. *Zygaena cingulata* Weber, *Obs. Ent.* : 109 (*Type loc.*—China).

Head with the frons, labial palpi antennae and vertex black, except at the apical third of antennae which is whitish; the whitish scaling may, however, be all around or confined to upper surface only. Legs with white scaling on the upper side of the hind tarsal segment; whitish scaling on middle leg confined to the 1st tarsal segment; the fore leg without whitish scaling on tarsi. Thorax black, with yellow spots laterally. Abdomen with a yellow patch each on 1st and 5th segment, sometimes faded or completely absent on the 1st segment. Fore wing black; with a short wedge-shaped spot in the end of cell; small quadrangular spot below the cell and a quadrate spot from below middle of cell along vein Cu_{1b} , reaching nearly up to inner margin; an elongate spot, beyond cell, above vein M_1 and two between M_2 and Cu_{1a} . Hind wing with a hyaline patch below the cell.

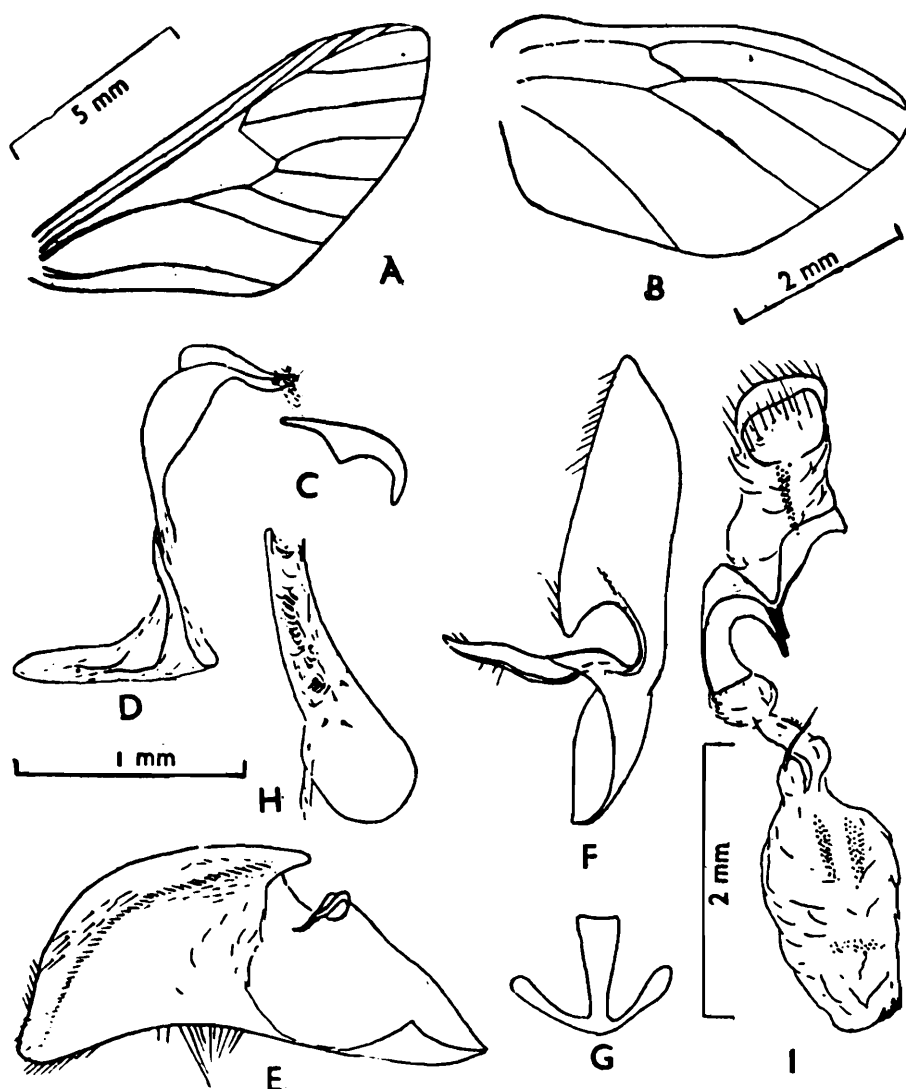
Head with the antennae simple in both the sexes. Legs with spurs as described for the genus; the hind tibia rather long, being slightly less than twice the total length of tarsal segments and dilated beyond middle.

Venation (Text-fig. 4, A-B).—Mainly as given for the genus; vein R_1 arising nearer to the cell angle than to the origin of R_5 .

Genitalia.—Male (Text-fig. 4, C-H): Uncus short, narrow and sharply curved towards the apex into a narrow, pointed tip. Tegumen short and narrow, produced into narrow prolongations, the latter continuing downwards into V shaped vinculum; saccus short and narrow. Clasper broad; the apical half with a dorsal, backwardly directed short process; the process at the dorso-basal area short and equal to that of the otherside-clasper and meeting above juxta, as compared to *A. (S.) wimberleyi* where these are unequal and curve inside. Aedeagus broader basally, with cornutal spines on the vesica. Female (Text-fig. 4, I): Ostium bursae simple, lightly sclerotised but well protected by sclerotisation on the dorsal as well as ventral sides of the opening; ductus bursae short, abruptly entering into a membranous sac-like corpus bursae, the latter with three elongated sclerotised patches on it; a short duct arises from corpus bursae and enters into the oviduct; papillae anales well developed, broad, with the posterior apodemes also short and not extending beyond the 8th segment.

Material examined.—44 ♂♂, 9 ♀♀: South Andaman: Cha Bagicha, 2 ♂♂, 29. ii. 1964; Wright Myo, Mt. Harriet Range, 3 ♂♂, 28. iii. 1964 (all *B. S. Lamba* coll.), 1 ♂, 27. ii. 1970 (*B. K. Tikader* coll.); Chiriatapu, Mandipahar, 2 ♂♂, 27. x. 1972 (*P. T. Cherian* coll.); Chiriatapu, 1 ♀, 20. xii. 1972 (*G. S. Arora* coll.), Forest Rest House campus, 1 ♂, 1 ♀, 12. i. 1976, Manjari, 2 ♂♂, 8. i. 1976 (*P. K.*

Maiti & Party coll.) ; Caddlegunj, 2 ♂♂, 1 ♀, 16. xii. 1972 (*G. S. Arora* coll.) ; Manglutan, 2 ♂♂, 1 ♀, 17. xii. 1972 (all *G. S. Arora & D. N. Nandi* coll.), 1 ♂, 1 ♀, 14. iii. 1975 (*G. K. Srivastava* coll.) ; Bedanabad, 5 ♂♂, 21. xii. 1976 ; Port Blair, R. G. Temple, 1 ♂, 1. i. 1973 (*G. S. Arora* coll.) ; Ferrargunj, 2 ♂♂, 15. i. 1973 (*G. S. Arora & D. N. Nandi* coll.) ; 1 ♂, 15. i. 1973 ; Anikhet, 3 ♂♂, 16. i. 1973 (All *K. S. Pradhan & G. S. Arora* coll.) ; Kala Pahar, Rut Island, 1 ♂, 9. i. 1976 (*P. K. Maiti & Party* coll.). Middle Andaman : Pitcher Nallah, roadside bush, 1 ♂, 3. ii. 1972 (*B. Datta* coll.) ; Shantipur 2 ♂♂, 5. i. 1973 (*G. S. Arora & D. N. Nandi* coll.) ; 1 ♀, 5. i. 1973 (*K. S. Pradhan & G. S. Arora* coll.) ; Yereta 1 ♂, 1 ♀, 5. 8. i. 1973 ; Panchwati, 1 ♂, 6. i. 1973 (all *G. S. Arora* coll.) ; Rangat, 1 ♂, 4. iii. 1975, 1 ♀, 5. iii. 1975 (*G. K. Srivastava* coll.) ; Bokultala, 2 ♂♂, 6. iii. 1975 (*G. K. Srivastava* coll.). North Andaman : Mayabunder, Tugapur, Forest Rest House, Stn. 16, 1 ♂, 8. v. 1971, 1 ♂, 1 ♀, 12. v. 1971, Stn. 17, 1 ♂ 11. v. 1971 (all *B. K. Tikader* coll.) ; Tugapur, 1 ♂, 10. i. 1973 (*G. S. Arora* coll.) ; Webi, 3 ♂♂, 8. iii. 1975 (*G. K. Srivastava* coll.).



Text-fig. 4.—*Amata (A.) cingulata* (Weber) ; A & B—Fore and hind wing venation, respectively, C—Uncus, D—♂ genitalia, without uncus, in a lateral view, E & F—Left clasper in inner and dorsal view, respectively, G—Juxta, H—Aedeagus, I—♀ genitalia. (All ♂ genitalia figures of same magnification as of D).

Expanse.—Male, 19-24 mm ; Female, 24-26 mm.

Distribution.—India : Andamans. Also China and Hongkong.

Remarks.—Hitherto reported to occur in the Indo-Australian region and the Indian region by Seitz (1913) and Obraztsov (1966), this nevertheless constitutes the first specific report of *A. cingulata* from India, especially from the Andaman Islands. The species is also reported to occur in Central and Eastern China, extending as far as Hong Kong, Swatow, and Foochow (Hampson, 1898, Seitz, 1910). The present report from India fills the distribution gap and is of zoogeographical interest.

A. (A.) cingulata is characterised by the presence of a crimson patch on the 1st as well as the 5th abdominal segment ; sometimes, however, the band on the 1st segment is obsolete or completely absent, but this is not associated with any difference in its genitalia ; patches on both the wings are hyaline as compared to *A. (Syntomis) wimberleyi* where the patches on both the wings as well as abdominal bands, are orange. Because of characters in male genitalia, the two species are placed in two subgenera as *Amata (Amata) cingulata* and *A. (Syntomis) wimberleyi*.

Obraztsov (1966) for the first time placed the name of this species in its present combination *Amata (A.) cingulata* (Weber).

Genus *Eressa* Walker

1854. *Eressa* Walker, *List Lep. Het. Brit. Mus.*, 1 : 149.

Type : *Glaucopis confinis* Walker

Diagnosis.—Proboscis small or well developed. Labial palpi short and porrect. Frons hairy, simple. Mid and hind tibia with a pair each of minute terminal spurs. Fore wing usually broad ; veins R_1 - R_5 stalked ; M_1 from below the upper angle of cell ; M_2 - M_3 from angle ; Cu_{1a} from well before the angle of cell. Hind wing with the vein R_s coincident with M_1 ; M_3 absent ; veins M_2 and Cu_{1a} quite separate at origin, M_2 well above the angle of cell.

Distribution.—Mainly Indo-Australian regions.

Remarks.—Although Zerny (1912) included ten species in this genus, Fletcher (1925) excluded one of its species, *Eressa simplex* Rothschild, as a synonym of *Trichaeta teneiformis* (Walker), thus reducing the number of Indian species to nine. Both, however, cited only *Eressa affinis* Moore from the Andaman Islands, and it has been collected by the survey parties from various localities in southern Andaman.

The genus *Eressa* is characterised by the presence of only single pair of terminal spurs in the hind tibia, unlike the genus *Amata*, which

has two pairs and to which it is otherwise closely allied because of the absence of vein M_3 and presence of Cu_{1a} on the hind wing. Hampson (1898) differentiated these two genera on the basis of the origin of vein M_3 in hind wing which he described as from lower angle of cell or shortly stalked with Cu_{1a} in the genus *Amata* and from well above angle of cell in *Eressa*. The character seems to be quite variable in the genus *Amata* where the origin of this vein may be from above the lower angle, as in *A. phoenicozona* (Hampson). Hence, it is not a reliable character for differentiating *Eressa* from *Amata*.

7. *Eressa affinis* Moore

(Text-fig. 5, A-E)

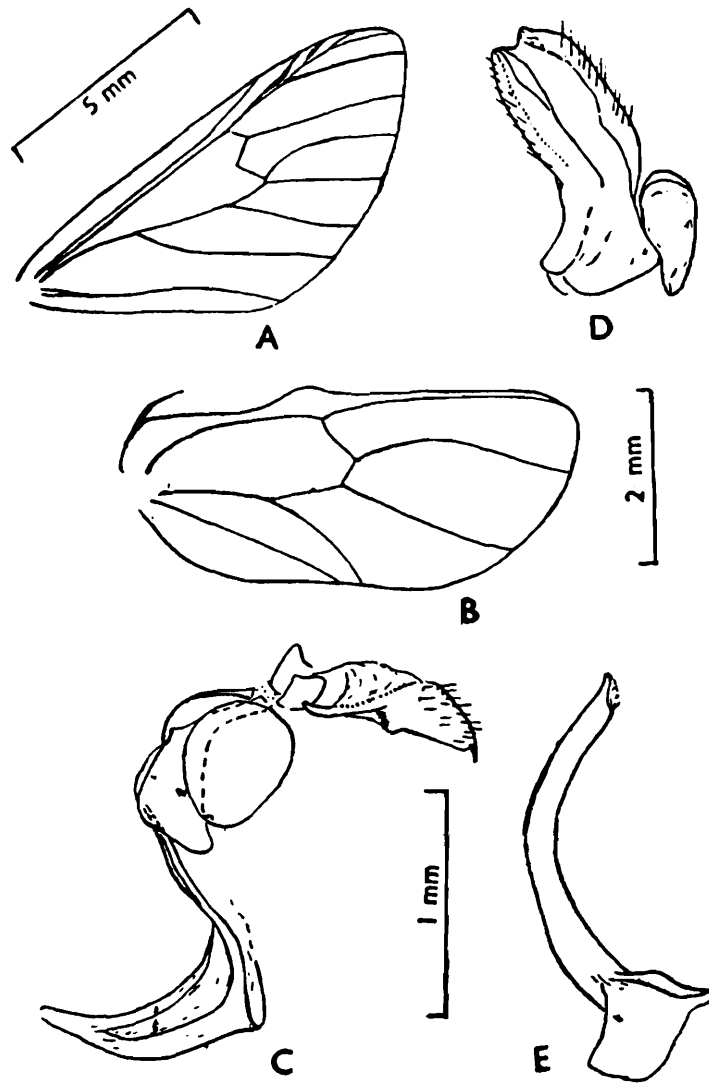
1877. *Eressa affinis* Moore, *Proc. zool. Soc. Lond.* : 596, pl. 59 (*Type loc.* Andamans).

Head with the frons brownish, hairy ; labial palpi brownish. Antennae brownish to basal three-fourths, the apical part whitish. Thorax with orange patches dorsally on meso, and metothorax ; unspotted ventrally. Abdomen blackish brown, with series of dorsal and lateral spots, more prominent than on ventral side which has prominent spots only beyond a few basal segments. Legs pale brown to brownish. Wings brownish, fore wing with hyaline patches below the middle of vein Cu_{1b} ; a spot above the base of Cu_{1b} , continuing above with a large patch in the end of cell ; four spots present between R_5 and Cu_{1a} the one above vein M_2 very small, sometimes becoming obsolete in female. Hind wing with one hyaline spot between M_2 - Cu_{1a} .

Head with the frons smooth. Antennae bipectinate to the tip in male ; the branches longest in the middle, being about twice the length of one shaft-segment. Mid and hind tibia each with a single pair of spurs ; the hind tibia slightly dilated beyond middle.

Venation (Text-fig. 5, A-B).—Fore wing with the veins R_1 - R_5 stalked, R_1 arising from beyond the cell angle, almost equidistant between the cell angle and R_5 ; M_1 from below the upper angle of cell ; M_2 - M_5 separate, both from angle of cell. Hind wing venation as for the genus.

Genitalia.—Male (Text-fig. 5, C-E) : Uncus narrowed apically, ending in a hooked-tip ; the base broader, with the sides connected through narrow arms to a lobe on each side ; two large side-lobes also present between uncus and tegumen. Tegumen continued into U shaped vinculum ; saccus narrow, triangular. Claspers short and broad, narrowed near the middle, the distal part beset with hairs ; two parallel ridges from near the middle, mesally and protruding beyond the distal end, giving latter a 'notched' appearance ; juxta cup-shaped, occupying the whole area between the bases of claspers. Aedeagus broader in basal half, narrowing distally, smoothly curved throughout giving it a crescent shape.



Text-fig. 5.—*Eressa affinis* Moore ; A & B—Fore and hind wing venation, respectively C—♂ genitalia in lateral view, D—Clasper with juxta in inner view, E—Aedeagus (All ♂ genitalia figures of same magnification as of C).

Material examined.—South Andaman : Humphrygunge, 1 ♂, 3.iii.1964, 3 ♂♂, 14.iii.1975 (G. K. Srivastava coll.) ; Wright Myo, Mt. Harriet Range, 3 ♂♂, 27.iii.1964 ; Mannerghat, Mt. Harriet Range, 2 ♂♂, 3.iv.1964 (all B. S. Lamba coll.) ; Chiriatapu, Manjari, 2 ♂♂, 8.i.1976 (P. K. Maiti & Party coll.) ; Middle Andaman : Long Island, 1 ♂, —vii.1931 (R. Hodgart coll.) ;

Expanse.—22 mm.

Distribution.—India : Andamans.

Remarks.—Hitherto known only from Andaman Islands, in general, the present report provides the first specific distributional record of the species from various localities, both in S. Andaman and Middle Andaman Islands.

III. SUMMARY

The present account lists seven species from the Andaman Islands, six of which were collected by various survey parties. Keys to identification of these genera and species are given on the basis of both the material studied and published literature.

Two species, *Amata* (A.) *cingulata* (Weber) and *Ceryx imaon* (Cramer) are recorded from Andamans for the first time. The former has been reported to occur in general from India, but it had, however, no known specific locality records. The latter species is widely distributed on the Indian mainland.

IV ACKNOWLEDGEMENTS

The author is greatly indebted to Dr. S. Khera, Joint Director-in-Charge, Zoological Survey of India, for providing necessary facilities and encouragement, and to Dr. O. B. Chhotani, Superintending Zoologist, for going through the manuscript and giving valuable suggestions.

V REFERENCES

- ARORA, G. S. 1976. On a collections of family Amatidae (Lepidoptera) from Andaman Islands.—*Newsl. zool. Surv. India*, **2** (3) : 110-111.
- FLETCHER, T B. 1925. Amatidae. *Cat. Indian Insects*, **8** : 35 pp.
- HAMPSON, G. F. 1898. Syntomidae. *Cat. Lep. Phal.*, **1** : 1-559 pp.
- HAMPSON, G. F. 1914. Amatidae. *Cat. Lep. Phal.*, Suppl. **1** : 1-388.
- OBRAZTSOV, N. S. 1966. Die palaearctischen *Amata* Arten.—*Veroff. Zool. Staatssamml. Munchen*, **10** : 1-383, 30 pls.
- SEITZ, A. (1910) 1913. Syntomidae. In Seitz, A., *Macrolepidoptera of the World*, **2** : 37-42.
- SEITZ, A. (1913) 1933. Syntomidae. In Seitz, A., *Macrolepidoptera of the World*, **10** : 61-92.
- ZERNY, H. 1912. Syntomidae. *Lepid. Cat.*, **7** : 179-pp.

ON A COLLECTION OF CENTIPEDES (SCOLOPENDROMORPHA : SCOLOPENDRIDAE AND CRYPTOPIDAE) FROM ANDAMAN AND NICOBAR ISLANDS

By

S. AHMED

Zoological Survey of India, Calcutta

INTRODUCTION

The scolopendromorph fauna of Andaman and Nicobar Islands has not been studied comprehensively. Gravely (1910) was the pioneer worker in this field and he recorded ten species of Scolopendromorpha from these Islands. Since then no work on the said group was done. The present study was undertaken with a view to record centipedes found to occur in these Islands and also comparing their distribution with the adjoining mainland of India. There is every possibility that some species are common with that of the mainland while a few are characteristic of their respective occurrence. The present paper is based on the centipede materials collected by survey parties of Zoological Survey of India from the said Islands.

LIST OF SCOLOPENDROMORPHS

Species recorded for the first time from these Islands.

1. *Asanada brevicornis* Meinert
- *2. *A. agharkari* (Gravely)
- *3. *Cormocephalus dentipes* Pocock
- *4. *C. pygmaeus* Pocock
5. *Ethmostigmus pygomegas* (Kohlrausch)
- *6. *Otostigmus* (*O.*) *insularis* Haase
7. *O.* (*O.*) *rugulosus* Porat
8. *O.* (*O.*) *scaber* Porat
- *9. *Rhysida longipes longipes* Newport
10. *Rhysida nuda immarginata* (Porat)
- *11. *Scolopendra amazonica* (Bucherl)

12. *S. cingulata* Latreille
13. *S. hardwickei* Newport
14. *S. morsitans* Linnaeus
- *15. *S. subspinipes subspinipes* Leach
- *16. *S. s. dehaani* Brdt
17. *Scolopocryptops melanostomus* (Newport)

1. *Asanada agharkari* (Gravely)

1912. *Pseudocryptops agharkari* Gravely. *Rec. Indian Mus.*, 7 : 417.

1968. *Asanada agharkari* Lewis. *J. nat. Hist.*, 2 : 173-176.

Specimens examined : 2 ex. Wimberly Gung, South Andaman, 2. xii. 1923, Kemp coll. (Reg. No. 4336/18)

Distribution : INDIA : Maharashtra.

Remarks : The author has observed some important characters of this species which are mentioned here. Anal legs—no groove on the surface of prefemur but a sulcus present more or less of whole of its length at posterior end ; deep groove on a little more than posterior half of femur ; no groove or sulcus on tibia claw of anal leg serrated. This species can easily be distinguished from other scolopendrids by its short, stumpy and spineless anal legs.

2. *Cormocephalus dentipes* Pocock

1891. *Cormocephalus (C.) dentipes* Pocock, *Ann. nat. Hist.*, 7 (6) : 66.

Specimens examined : 1 ex. Mount Harriet Range, South Andaman, 1. iii, 1964, B. S. Lamba coll. (Reg. No. 3474/18) ; 4 ex. Port Blair, South Andaman, 15. iii. 1915, Kemp coll. (Reg. No. 4329/18).

Measurements : Body length ranges from 24 mm. to 41 mm.

Distribution : INDIA : West Bengal.

Remarks : This species occurs in one colour variety—reddish green ; it is wide spread in South Andaman ; six glabrous segments of antenna instead of four as described by Pocock (1891).

3. *Cormocephalus pygmaeus* Pocock

1892. *Cormocephalus (C.) pygmaeus* Pocock, *J. Bombay nat. Hist. Soc.*, 7 (2) : 192.

Specimens examined : 1 ex. Chiria Tapu, South Andaman, 9.iv. 1964, B. S. Lamba coll. (Reg. No. 3491/18).

Distribution : INDIA : Tamil Nadu ; Maharashtra.

Remarks : This species is not having any tubercle on anal prefemur. This is, also, a common species like the previous one but here it is represented from South Andaman.

4. *Otostigmus (Otostigmus) insularis* Haase

1887. *Otostigmus carinatum* var *insularis* Haase, *Abh. Mus. Dresden*, 5 : 69.

1930. *O. (O.) insularis* : Attems, *Das Tierreich*, 54 : 154.

Specimens examined : 1 ex. Arial Bay, North Andaman, 25. iv. 1971, B. K. Tikader coll. (Reg. No. 3512/18) ; 1 ex. Mt. Harriet Range South Andaman, 9. ii. 1964, B. S. Lamba coll. (Reg. No. 3498/18).

Measurements : Body length ranges from 35 mm to 56 mm.

Distribution : INDIA : West Bengal.

Remarks : This is one of the common species of the genus *Otostigmus*. It is not widely distributed in these Islands.

5. *Otostigsmus (Otostigmus) rugulosus* Porat

1876. *Otostigmus rugulosus* Porat, *Bih. Svensk. A. Handl* 4 (7) : 21.

1930. *O. (O.) rugulosus* : Attems, *Das Tierreich*, 54 : 144.

Specimens examined : 4 exs. Mt. Harriet Range, South Andaman, 26. iii. 1264, B. S. Lamba coll. (Reg. No. 3558/18).

Measurements : The length of the body varies from 37 mm. to 46 mm.

Distribution : INDIA : Andaman.

Remarks : This is one of the common species of the genus *Otostigmus* but here it is represented only from South Andaman.

6. *Rhysida longipes longipes* (Newp.)

1845. *Branchiostoma longipes* Newport, *Tran. Linn. Soc. London*, 19 : 411.

1930. *Rhysida longipes longipes* Attems, *Das Tierreich*, 54 : 194.

Specimens examined : 2 ex. Ross Island, North Andaman, 30. iii. 1911, C. Paiva coll. (Reg. No. 3781/18).

Measurement : The length of the body ranges from 46 mm. to 47 mm.

Distribution : INDIA : Maharashtra ; West Bengal.

Remarks : This is a medium size centipede and is not uncommon in mainland but is not widely distributed in Andaman and Nicobar Islands. This species is being reported for the first time from Andaman Island.

7. *Scolopendra amazonica* (Bücherl)

1946. *S. morstans amazonica* Bücherl, *Men. Inst. Butantan*, 19 : 135.

1959. *S. amazonica* Jangi, *Ent. News*, 70 : 253.

Specimens examined : 1 ex. Port Blair, South Andaman, 13. ii. 1915. Kemp coll. (Reg. No. 4338/18) ; 1 ex. Corbyns Cove, South Andaman, 1. iii. 1975, G. K. Srivastava coll. (Reg. No. 4337/18).

Measurements : Body length ranges from 31 mm. to 61 mm.

Distribution : INDIA : Maharashtra.

Remarks : This is a common centipede and is found in two colour varieties, red and reddish brown. Dorsal sulci of the body begin from 3rd tergite instead of 2nd and lateral margination from 12th tergite in place of 16th as stated by Jangi (1955). The species has been recorded for the first time from Andaman Island.

8. *Scolopendra morsitans* L.

1758. *S. morsitans* Linnaeus, *Syst. Nat. Ed. 10* : 638.

Specimens examined : 1 ex. Wright Mayo, Mt Harriet Range, South Andaman, 31. iii. 1964, B. S. Lamba coll. (Reg. No. 3463/18) ; 1 ex. Aberdeen, Port Blair, South Andaman, 1. 6. 1935, H. S. Rao. coll. (Reg. No. 3534/18).

Measurements : Body length varies from 61 mm. to 115 mm.

Remarks : This species is one of the common centipede in the mainland and is widely distributed in these Islands, too.

9. *Scolopendra subspinipes dehaani* Brdt.

1840. *Scolopendra dehaani* Brdt., *Bull. Ac. Petersbourg*, 7 : 152.

1930. *S. subspinipes vaadehaani* Attems, *Das Tierreich*, 54 : 31.

Specimens examined : 2 ex. Rest House, Tugapur, Mayabunder, Middle Andaman, 8. v. 1971, B. K. Tikader coll. (Reg. No. 3481/18) ; 1 ex. Port Blair, South Andaman, 15. iii. 1916, Kemp coll. (Reg. No. 3625/18) ; Near Forest Department Camp, Smith Island, North Andaman, 27. iv. 1971, B. K. Tikader coll. (Reg. No. 3482/18).

Measurements : The length of the body ranges from 46 mm. to 139 mm.

Distribution : INDIA : West Bengal ; Tamil Nadu ; Andaman and Nicobar Islands.

Remarks : This species is one of the largest varieties of centipede. Out of these specimens, one is devoid of any spine on anal femur which is rarely seen. This species is found to occur both in dwelling houses and forest areas.

10. *Scolopendra subspinipes subspinipes* Leach

1815. *Scolopendra subspinipes* Leach, *Trans. Linn. Soc. London*, 1 : 383.

Specimens examined : 2 ex. Casurrina Bay, North Andaman, 11. iv. 1966, A. Daniel coll. (Reg. No. 3483/18) ; 1 ex. Campbell Bay, Great Nicobar, 21. iii. 1966, A. Daniel coll. (Reg. No. 3485/18).

Measurements : Body length varies from 45 mm. to 132 mm.

Distribution : INDIA : Tamil Nadu (Madras).

Remarks : This is, also, one of the larger varieties of centipede but is not so widely distributed as other species of the genus *Scolopendra*.

11. *Scolopocryptops melanostomus* (Newp.)

1845. *Scolopocryptops melanostoma* Newport, *Trans. Linn. Soc.*, 19 : 406.

1974. *S. melanostomus* : Bucherl, *Symp. zool. London*, No. 32 : 129-30.

Specimens examined : 1 ex. Magarnullah agriculture, Nicobar, Island, 14. 1. 1975, S. K. Bhattacharyya coll. (Reg. No. 4327/18) ; 1 ex. Rangat, Middle Andaman, 6. iii. 1975, G. K. Srivastava coll. (Reg. No. 4331/18).

Measurements : Body length varies from 35 mm. to 44 mm.

Distribution : INDIA : Nicobar Island.

Remarks : This species is endemic. Out of seven species and one subspecies belonging to the genus *Scolopocryptops*, only one is found to occur in Andaman and Nicobar Islands.

SUMMARY

This paper gives a systematic account of Scolopendridae and Cryptopidae from Andaman and Nicobar Islands, India dealing with 17 species under 7 genera. Out of these, 8 species are recorded for the first time from Andaman and Nicobar Islands. Distributional records of all the species are, included.

ACKNOWLEDGEMENTS

The author is grateful to the Director, Zoological Survey of India, Calcutta for providing necessary facilities and to Dr. S. K. Bhattacharyya, Superintending, Zoologist, Arachnology Division and to Dr. U. A. Gajbe, Zoologist, Arachnida Section for offering valuable suggestions.

REFERENCES

- ATTEMS, C. 1930. *Das Tierreich*, Lief 34, Scolopendromorpha, P. 61-114.
- GRAVELY, F. H. 1910. The Distribution of the Oriental Scolopendridae. *Rec. Indian Mus.*, Calcutta, 5 (3) : 161-172.
- JANGI, B. S. 1955. On the Chilopod Fauna of Nagpur, India. *Ann. Mag. nat. Hist.*, 8 (12) : 69-80.
- NEWPORT, C. 1844. Monograph of the class Myriapoda, order Chilopoda. *Trans. Linn. Soc. London*, XIX : 275, 419-425.

THE CHEWING-LICE (PHTHIRAPTERA : INSECTA) FROM ANDAMAN AND NICOBAR ISLANDS WITH REMARKS ON SOME HOST RELATIONSHIPS

By

K. V. LAKSHMINARAYANA, (MISS) S. VIJAYALAKSHMI AND B. TALUKDAR
Zoological Survey of India, Calcutta

During the survey tours of Drs. K. K. Tiwari, A. K. Mukherjee, and Mr. S. S. Saha of the Zoological Survey of India, they collected three samples of the chewing-lice comprising of three species from *Megapodius freycinet* Gaimard and *Collocalia esculenta affinis* Beavan. Of these, the former host has two subspecies in these Islands, and has considerable range of distribution in the Indo-Pacific, while the latter is endemic to the islands. Therefore, their parasites are of considerable interest from the point of distribution and study of host relationships, since the fauna of this region generally shows affinities with Burmese and Malayan fauna. Hither to, only three genera and species, viz., *Goniodes minor confusio* Clay, *Oxylipeurus appendiculatus* (Piaget) (Clay, 1938 ; 1940), and *Columbicola cavifrons* (Taschenberg) (Tendeiro, 1962) have been reported from these islands. The two first named species together with *Dennyus* (*Collodennyus*) *medwayi* Ledger (Ledger, 1970) are now reported from the above collection, and form the first new additions of chewing-lice from these islands to the National Zoological collections.

The material is mounted on slides, and the measurements are given in mm.

Suborder *AMBLYCEROPHTHIRINA* Lakshminarayana, 1976

(= *AMBLYCERA* Kellogg, 1896)

Family *MENOPONIDAE* Mjoeberg, 1910

Genus *Dennyus* Neumann, 1906

Dennyus (*Collodennyus*) *medwayi* Ledger, 1970

Dennyus (*Collodennyus*) *medwayi* Ledger, 1970. *J. ent. Soc. S. Afr.*, 33 (2) ; 245, figs. 8-11. Type host ; *Collocalia gigas* Hartert & Butler.

Material examined.—3 ♀ ♀, from *Collocalia esculenta affinis* Beavan, (ANB/72/186-190), Parka, c 14 km. off s. w. Malaka, Car Nicobar, 16. ii. 1972, coll. A. K. Mukherjee (Z. S. I. Reg. Nos. 706-708 H16).

Measurements :

	Length	♀ Width
Head	0.37-0.40	0.44-0.46
Prothorax	0.19-0.21	0.27-0.29
Mesothorax	0.10-0.11	0.42-0.44
Metathorax	1.12-0.19	0.47-0.48
Abdomen	1.24-1.30	0.63-0.66
Total	1.88-1.97	

Remarks.—Ledger (1970) described this species in detail from specimens off *Collocalia gigas* (Hartert & Butler), from Fraser's Hill, Pahang, Malaya, coll. Lord Medway, and named it after the collector. The present record on *Collocalia esculenta affinis* Beavan is quite interesting.

Dennysus (Collodennys) distinctus Ferris is the normal species of lice that harbours on *C. esculenta* and its different subspecies *cyanoptila*, and *desiderata* (Ledger, 1970). Ledger (*op. cit.*) examined material from Malaya, North Borneo, Java, New Guinea, Rennell Is. and New Hebrides. The specimens under discussion are referred however, to *D. (C.) medwayi* Ledger, instead of the usual species *D. (C.) distinctus* Ferris because of the following diagnostic characters which make it distinct from the latter: the sternite II wider in the middle, the presence of fewer tergo-central setae on abdominal tergites I & II, and the subgenital plate without any additional and smaller central setae in the female. The setae in the lateral brushes of the abdomen vary not only from individual to individual, but also from segment to segment and on the two sides.

D. (C.) medwayi comes very close to *D. (C.) distinctus*. Ledger (*op. cit.*) while discussing the host relationship of *Collocalia gigas*, the type host of *D. (C.) medwayi*, quoted Medway & Wells (1969) than the non-echolocating *gigas* shows morphological affinities with echo-locating 'grey swiftlets', though by behaviour it shows affinities with non-echolocating 'glossy swiftlets' to which group *C. esculenta* belongs. Medway & Wells (1969) contended that *gigas* may be a member of a monophyletic 'grey swiftlet' group which lost its capability of echolocation, or it evolved from an ancient non-echolocating 'glossy swiftlet' stock, which later acquired the features of the 'grey swiftlets' by convergence. Ledger (1970) supported the latter relationship, because *D. (C.) medwayi* found on *C. gigas* has its nearest relative in *D. (C.) distinctus* found on the 'glossy swiftlet', *D. esculenta*.

The present record helps us to go further to what Ledger suggested above. Here *D. (C.) medwayi* has been reported on a 'glossy swiftlet'

of the non-echolocating *esculenta* group viz., *C. esculenta affinis* Beavan, an endemic bird to these islands. The parasite species is also now being reported for the first time from Indian limits. *C. esculenta* as already stated is common in the Indo-Pacific, with its own parasite species, *D. (C.) distinctus*. We can only account for the present record in that possibly *D. (C.) medwayi* and *D. (C.) distinctus* are both sympatric species evolved on an ancestral stock of *C. esculenta* - *C. gigas*, and one of them might have been disappeared, and the other retained by different subspecies of *C. esculenta* and *C. gigas* ; or the second species *D. (C.) distinctus*, has not so far been encountered on *C. e. affinis* and *C. gigas* or *vice versa*. It indicates however, that *C. esculenta* and *C. gigas* possibly belong to the non-echolocating 'glossy swiftlet' stock, and *gigas* acquired the characters of 'grey swiftlet' group as has been contended by Medway & Wells and Ledger.

Suborder *ISCHNOCEROPHTHIRINA* Lakshminarayana, 1976

(= *ISCHNOCERA* Kellogg, 1896)

Family PHILOPTERIDAE Burmeister, 1838

Genus *Goniodes* Nitzsch, 1818

Goniodes minor (Piaget, 1880)

Goniodes minor (Piaget) (*Goniocotes*) 1880. *Pediculines* : 241, pl. 21 fig. 2. (*partim*). Type host ; (*Megapodius rubripes* var. *duperreyi*) *Megapodius r. reinwardi* Dumont.

Homocerus minor (Piaget) (*Goniocotes*) 1880 ; K  ler, 1939. *Nova Acta Leop.* (n. f.) 8 (51) : 120, fig. 64.

Goniodes minor (Piaget) : Clay, 1940. *Proc. zool. Soc. Lond.* (B), 110 : 102, figs. 69 & 70 a ; Hopkins & Clay, 1952. *Bull. Br. Mus. (nat. Hist.)* : 156.

Material examined.—10 ♂♂, 9 ♀♀, 4 ex (.), from *Megapodius freycinet* Gaimard, Campbell Bay, Great Nicobar Is., 4. iv. 1977, coll. K. K. Tiwari (Reg. Nos. 709-726/H 16) ; (on slides with 4 nymphs in alcohol) 8 ♂♂, 7 ♀♀, 5 ex (.), from the same host, 24 km. on N. S. Road, Nicobar, 9. iv. 1977, coll. S. S. Saha (Reg. Nos. 727-740 H 16) (both on slides and nymphs in alcohol).

Measurements :

	♂		♀	
	Length	Width	Length	Width
Head	0.43-0.48	0.64-0.69	0.45-0.50	0.67-0.73
Prothorax	0.15-0.19	0.39-0.43	0.15-0.19	0.39-0.45
Pterothorax	0.25-0.29	0.48-0.51	0.25-0.29	0.48-0.53
Abdomen	0.67-0.86	0.70-0.86	0.86-0.95	0.82-0.93
Genitalia	0.53-0.63			
Total	1.43-1.62		1.68-1.88	

Remarks.—Piaget (1880) collections according to Clay (1940) contain atleast three closely related species collected from different species and subspecies of *Megapodius*, though all of them were labelled as *Goniocotes minor* Piaget. Clay (1940) restricted the name *Goniodes minor* (Piaget) to those forms reported from *Megapodius r. reinwardt* Dumont. Another ♂ from the same series was assigned the name *G. ocrea* (Piaget), and Hopkins & Clay (1952) suggested that the type host was “probably *Eulipoa wallacei* (G. R. Gray)” Clay (1940) described another subspecies *G. minor confusio* Clay from (*M.n. nicobariensis*) *M. freycinet nicobariensis* Blyth from Nicobar Island. Ké'er (1939) included this species in his new genus *Homocerus*.

We refer our material to *M. minor* (Piaget), although the material has been collected from *M. freycinet*, and the measurements are slightly smaller (or some of them are identical) than with *G. minor s. str.*, or *G. m. confusio*, by the shape of the head, laterally drawn prothorax which is nearer to the pterothoracic width, without continuous rows of setae on IV abdominal segment, and the long and broader basal plate in the male and the flattened posterior margin of the ‘valve’ and its chaetotaxy, the minute spines and striations on the genital region in the female. We have examined a paratype slide of *G. minor confusio* Clay with 2 ♂♂, 2 ♀♀, from (*M. nicobariensis*) *M. f. nicobariensis* Blyth, Katchell, Nicobar Is., coll. Dr R. Meinertzhagen (BMNH No. 3008) lent to the senior author by the British Museum (Nat. History), and though our specimens are smaller than these specimens, the male genitalia appear distinctly sclerotized and stouter in proportion.

The present host *M. freycinet* Gaimard, otherwise harbours three more species of *Geniodes* besides *G. minor* viz., *G. major* (Piaget), *G. discogaster* (Taschenberg), (*vide* Clay, 1940), and *G. biordinatus* Clay (Emerson & Ward, 1958). *G. major* as the name indicates is a large form than *minor*, its prothorax not laterally produced, with numerous short setae on tergite IX, the very distinct male genitalia, and the shape of the female ‘valve’ and the chaetotaxy of the female genital region enables us to distinguish it from *minor*. *G. discogaster* can be recognized by the smaller size, expanded temples, large truncated conic, and the male genitalia which differ in *minor*. *G. biordinatus* can be recognized by the chaetotaxy of tergite IV, and female genital region. *G. ocrea* from *Eulipoa wallacei* (?) can be readily distinguished from all other species of *Goniodes* from the Megapodidae, by the distal prolongation of the post axial angle of the third antennal segment in the male at a glance.

The present record of *G. minor* (Piaget) collected from *M. freycinet* at two different places is interesting. In Nicobar Islands two subspecies are known, viz., *M. f. nicobariensis* Blyth and *M. f. abbotti* Oberholser from Great Nicobar. *G. minor s. str.*, is so far known from the type host, *M. reinwardt* Dumont (New Guinea), *M. r. yorki* Mathews (N. Queensland), *M. r. tumulus* Gould (no data), *M. f. cumingii* Dillwyn (Labuan & S. E. Celebes), and *M. f. pusillus* Tweeddale (Philippine Islands), and *G. m. confusio* Clay from *M. f.*

nicobariensis Blyth (Nicobar). The subspecific determination was not available for the two hosts, but since one of them is from Great Nicobar, it is likely that it may be identical with *M. f. abbotti* Oberholser; and if it turns out to be the same species as we expect, then it is a new host for *G. minor* (Piaget). Emerson & Price (1972) while describing a new genus *Megapodiella* from *Megapodius* provided a list of all species known to that date on Megapodidae.

Genus *Oxylipeurus* Mjoeberg, 1910

sp. near *Oxylipeurus appendiculatus* (Piaget, 1880)

Oxylipeurus appendiculatus (Piaget) (*Lipeurus*), 1880. *Pediculines* : 356, pl. 28 fig 8. Type host : (*Megapodium rubripes* var *gilberti*) *Megapodius freycinet gilbertii* G. R. Gray.

Oxylipeurus major (Piaget) (*Lipeurus*), 1880. *Pediculines* : 357 nec p. 346. Type host : (*Tinamus canus*. Error). *M. f. nicobariensis* Blyth.

Oxylipeurus oxycephalus (Taschenberg), (*Lipeurus*), 1882. *Nova Acta Leop*, 44 : 178, pl 6 fig. 7. Type hosts : *Oxylipeurus oxycephalus* (Taschenberg) ; Mjoeberg, 1910. *Arc Zool*, 6 (13) : 92 *Megapodius freycinet* Gaimard & *M. reinwardt* Dumont.

Oxylipeurus appendiculatus (Piaget) : Clay, 1938. *Proc. zool. Soc. Lond.* (B), 108 : 160 ; Hopkins & Clay, 1952. *Check List of Genera & Species of Mallophaga*, Bull. Brit. Mus. [nat. Hist.] ; 256, 258, 259.

Material examined.—2 ♂♂, 7 ♀♀, 9 ex (.), from *Megapodius freycinet* Gaimard, 24 km on N. S. Road, Nicobar, 9. iv. 1977, Coll. S. S. Saha. (Reg. Nos 741-749/H 16).

Measurements :

	♂		♀	
	Length	Width	Length	Width
Head	0.53-0.55	0.27-0.28	0.57-0.61	0.28-0.34
Prothorax	0.13-0.14	0.22-0.23	0.14-0.18	0.24-0.27
Pterothorax	0.28-0.29	0.32	0.28-0.29	0.33-0.35
Abdomen	1.59-1.61	0.39-0.42	1.67-1.76	0.41-0.49
Genitalia				
Total	2.53-2.56		2.70-2.89	

Remarks.—Two species of *Oxylipeurus* are known from *Megapodius reinwardt* Dumont, and *M. freycinet* Gaimard viz., *O. inaequalis* (Piaget) (the type species of the genus) on the former, and *O. appendiculatus* (Piaget) on the latter host. Taschenberg (1882) reported *O. appendiculatus* both on *M. reinwardt* and *M. freycinet* as *L. oxycephalus*. Clay (1938) revised the genus and grouped both the species in a single group, and redescribed the species.

The specimens before us approach very near to *O. appendiculatus* (Piaget), although our specimens exhibit minor differences from *O. appendiculatus*, we are not describing any new subspecies, since our material is not in good condition. We have also examined the slide with specimens (2 ♂♂, 2 ♀♀) from *M. f. nicobariensis* from Katchall Nicobar, Coll. Dr. R. Meinertzhagen (BMNH No. 3008) Our specimens are elongated, and narrow, with the first antennal segment stout and elongated in the male, the dorsal setae to the middle of the pre-antennal head are finer as indicated by Clay (1938), prothoracic margin straight, pterothoracic margin distinctly truncated and elongated, abdominal pluerites are with complicated head (simple in *inaequalis*); the male genitalia however, nearer to *inaequalis*; the female 'valve' with finer and fewer setae, the lobes of the apical segment are narrower in our specimens unlike *inaequalis*,

Clay (1938) examined Piaget's type material of (*M. nicobariensis gilbertii*) *M. f. gilbertii* G. R. Gray and (*M. n. nicobariensis*) *M. f. nicobariensis* Blyth from Katchall, Nicobar. The present record can be considered at best as a new valuable addition to the National Zoological collections of the Z. S. I.

SUMMARY

This paper deals with a small interesting collection of chewing-lice from Andaman & Nicobar group of Islands. One of the species is now being reported for the first time since its description and from India on a new host which throws considerable light on the host relationship; the other two species are valuable new additions to the National zoological collections of the Zoological Survey of India.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Z. S. I., for facilities and encouragement. Their sincere thanks are also due to Drs. K. K. Tiwari, Jt. Director, A. K. Mukherjee, Superintending Zoologist, Mr. S. S. Saha, Assistant Zoologist of the Higher Chordate Division, Z. S. I., for collecting the material for our study. The senior author is highly indebted to the Department of Science & Technology, Govt. of India, for facilitating a visit to the British Museum (Natural History) London, and the authorities of the same museum for placing their valuable collections at the author's disposal for study and the material lent for further study in India, and to Dr (Miss) Theresa Clay, for several courtesies during this visit and otherwise Miss Vijayalakshmi Swain expresses her gratitude to the Director, Z. S. I., for providing a research fellowship.

REFERENCES

- CLAY, T 1938. A revision of the genera and species of Mallophaga occurring on Gallinaceous hosts. Part I. *Lipeurus* and related genera. *Proc. zool. Soc. Lond.* (B), **108** : 109-204, 45 figs, 14 pls.
- CLAY, T 1940. Genera and species of Mallophaga occurring on Gallinaceous hosts. Part II. Goniodes. *Proc. zool. Soc. Lond.* (B), **110** : 1-120, 79 figs.
- EMERSON, K. C. and PRICE, R. D. 1972. A new genus and species of Mallophaga from a New Guinea Bush fowl. *Pacific Insects*, **14** (1) : 77-81, 3 figs.
- EMERSON, K. C. and WARD, R. A. 1958. Notes on Philippine Mallophaga I. *Fieldiana Zool.*, **42** (4) : 49-61, 15 figs.
- HOPKINS, G. H. K. and CLAY, T 1952. A Check List of the Genera and Species of Mallophaga. (*Bull. Br. Mus. nat. Hist.*). London : 362 pp.
- KELER, S. 1939. Baustoffe zu einer Monographie der Mallophagen. II. Teil : ueber familie der rirmoidea (I) *Nova. Acta. Leop.* (n.f.). **8** (51) : 1-254, 114 figs. 4 pls.
- LEDGER, J. A. 1970. A preliminary review of *Dennyus* (Mallophaga : Menoponidae) parasitic on swiftlets. *J. ent. Soc. S. Afr.*, **33** (2) : 239-260, 25 figs.
- MEDWAY, LORD, and WELLS, D. R. 1969. Dark orientation by the giant swiftlet *Collocalia gigas*. *Ibis*, **111** : 609-611.
- PIAGET, E. 1880. *Les Pediculines. Essai Monographique.* (E. J. Brill) Leiden. In 4° Text Band : 714 pp.; Plates (Separate) : 56 pls.
- TASCHENBERG, O. 1882. Die Mallophagen, mit besonderer Beruecksichtigung der von Dr Mayer gesammelten Arten systematisch bearbeiten. *Nova Acta Leop.*, **44** (1) : 244 pp., 7 pls.
- TENDEIRO, J. A. 1962. Estudos sobre Malofagos. Revisao Monografica do Genero *Columbicola* Ewing (Ischnocera, Philopteridae). *Mem. da Junta de Invest. do Ultramar*, Lisboa, (32) : 460 pp, 124 figs, 224 photomicrographs.

ON THE CONIDAE OF ANDAMAN AND NICOBAR ISLANDS

By

N. V. SUBBA RAO

Zoological Survey of India, Calcutta

INTRODUCTION

Andaman and Nicobar Islands can be considered as biological laboratories, housing a varied fauna, especially in the marine environment. The complex coral reef system fringing these islands offer micro and macroclimatic niches supporting a rich and conspicuous molluscan fauna. Although several papers have appeared in the past, none of them present a comprehensive picture of molluscs of the islands.

Recently, Rajagopal and Subba Rao (1974) dealt in detail on the chitons of these Bay Islands. The present paper is another in the series on the family Conidae, which includes a large number of sympatric species.

Cones are generally abundant in the shallow waters of tropical seas. The members of this genus possess a venom apparatus for paralysing the prey. They are carnivorous and feed on other molluscs, polychaetes or fishes. Depending on their feeding habits they can be classified as molluscivorous, vermivorous or piscivorous.

The author had an opportunity to participate in three surveys of these Islands during the period from 1970 to 1972. General notes were made on the habitats of some common cones. No observations could, however, be made on their feeding habits, because of their nocturnal activities and short durations of the tours.

A complete list of species of cones occurring on these islands with notes on the habitats of some common species is presented here. The list which includes 51 species is compiled after going through the named and unnamed collections of conidae present in the Zoological Survey of India and also from literature. Only 10 species were mentioned in the published records (E. A. Smith, 1878 ; Melvill & Sykes, 1898 ; Preston, 1908) and as such the rest of the species are reported for the first time from these islands.

HABITATS OF CONES

The coral reefs around Andaman and Nicobar Islands are fringing type. Benches or platforms formed around shore rocks of sand stone

and conglomerate are common features on many sloping shores (Reddiah, 1977). Molluscs constitute an important faunal element of these reefs.

Cones were collected mainly from reefs around Car Nicobar and Kamorta in the Nicobar group of Islands and leeward shores at Chiriatapu, Neil and Havelock islands in the Andaman group from the sands, sand under coral rocks and dead coral rocks or boulders covered with sand and Halimeda clumps.

Cones were seen in abundance on the windward reef platforms of Malacca, Car Nicobar (Sta. 9—K. Reddiah, 1972). The reef flat of about 70 m. width was exposed during low tide. It consisted of conglomerate rock in a beach formation. The flat was grooved by surge channels from about its middle to the reef front and occasionally reaching up to sandy beach. Maximum width of surge channel near sloping reef edge was one metre narrowing towards beach and merging in rock pools. The rock pools were wide and shallow with very little fauna except the usual brittle stars. The calcareous algae were growing on the periphery of the surge channels. Corals-*Acropora* sp. and *Favia* sp. and sea mats were noticed on the exposed flat adjoining surge channel. *Conus miles* Linnaeus was collected from the sandy patches and among the algae near the surf beaten zone near the surge channels. None of the specimens were collected out of water. Even during low tide specimens were found with 5 to 10 cms. of water above them. The other two species *Canus ebraeus* and *Conus lividus* were found extending further beachwards and were collected out of water. These were common on the flats exposed during low tide.

In Andamans the surge channels of the type found in Nicobars are absent, but there are wide erosion channels, some 20 m. in width intersecting the reef platforms at various places (Reddiah, 1977).

In Andamans also near Chiriatapu, and Neil Island *Conus litteratus* and *Conus ebraeus* were the common species. The former was always found slightly buried in sand in 0.5 m. depth of water. The shell was coated with sand and algae. *Conus ebraeus* was collected on the exposed flats and out of water.

Species of *Conus* known to occur in Andaman and Nicobar Islands.

Conus achatinus Hwass in Bruguiere

Conus adansoni Lamarck

Conus amadis Gmelin

**Conus andamanensis* Smith

Conus araneosus Solander (Syn : *Conus arachnoides* Gmelin)

- Conus arenatus* Hwass in Bruguiere
- **Conus aulicus* Linnaeus
- Conus bandanus* Hwass in Bruguiere
- Conus canonicus* Hwass in Bruguiere
- Conus chaldaeus* (Roeding)
- **Conus capitaneus* Linnaeus
- Conus characteristicus* Fischer
- Conus catus* Hwass in Bruguiere
- **Conus ceylanensis* Hwass in Bruguiere
- Conus coronatus* Gmelin
- Conus distans* Hwass in Bruguiere
- **Conus ebraeus* Linnaeus
- Conus eburneus* Hwass in Bruguiere
- **Conus edwardi* Preston
- Conus emaciatus* Reeve
- Conus episcopus* Hwass in Bruguiere
- Conus figulinus* Linnaeus
- Conus flavidus* Lamarck
- Conus generaiis* Linnaeus
- Conus geographus* Linnaeus
- Conus insculptus* Kiener
- Conus janus* Hwass in Bruguiere
- Conus litteratus* Linnaeus
- Conus lividus* Hwass in Bruguiere
- **Conus masoni* G. & H. Nevill
- Conus miles* Linnaeus
- Conus miliaris* Hwass in Bruguiere
- Conus millepunctatus* Lamarck
- Conus mitratus* Hwass in Bruguiere
- Conus monile* Hwass in Bruguiere
- Conus mutabilis* Reeve
- Conus nicobaricus* Hwass in Bruguiere (= *Conus araneosus* Solamder)

- **Conus nobilis* Linnaeus
- Conus nussatella* Linnaeus
- Conus pennaceus* Born
- Conus piperatus* Dillwyn
- Conus pretiosus* G. & H. Nevill
- **Conus scabriusculus* Chemnitz
- Conus straturatus* Sowerby
- Conus striatus* Linnaeus
- Conus terebra* Born
- Conus tessulatus* Born
- Conus textile* Linnaeus
- Conus tulipa* Linnaeus
- Conus virgo* Linnaeus
- **Conus zonatus* Hwass in Bruguiere
- * Previous records

Some Common Species and Their Identity

Although, 51 species of *Conus* have been listed above majority are known by dead shells. Kohn (1960) listed a total of 70 species as occurring in Sri Lanka, and Kohn and Robertson (1966) listed 64 species from Maldives and Chagos Islands. When compared to these lists, Andaman and Nicobar Islands therefore present a poor picture. A further search may bring out more species to light. The cones of these Islands are imperfectly known hence the characters of identification of some common species only are given below. It is hoped that this paper will provide the incentive for further work on the bioecology of *Conus* of these Islands.

SYSTEMATIC ACCOUNT

1. *Conus araneosus* Solander in (Lightfoot), 1786

Conus araneosus Solander in Lightfoot, 1786, *Portland Catalogue*, p. 76, no. 1714. Type-locality : China. Kohn, 1964, *J. Linn. Soc. Lond.*, Zoology, **45** : 160, fig. 14.

Conus araneosus Hwass, Reeve, 1843 *Conch. Icon.*, I, *Conus*, sp. no. 44. pl. VIII fig. 44. Tryon, 1884, *Man. Conch.*, 6 : 8, pl. I, figs. 8-10.

Conus arachnoideus Gmelin, 1791, *Syst. Nat.*, ed. 13 : 3388. no. 34. Type-locality : Not mentioned.

Conus nicobaricus Hwass in Bruguiere, *Encyclopede Methodique*, Vers, 1 (2) : 612. Reeve, 1843. *Conch. Icon. 1*, *Conus*, sp. no. 41, pl. viii, figs. 41a, b.

Remarks.—Shell is reticulated with yellowish white and light chocolate brown. The body whorl is encircled with three interrupted or irregular bands of chocolate brown, which are usually well defined.

Kohn (1966) considered *Conus arachnoideus* Gmelin as a junior synonym of *C. araneosus* Solander.

Reeve (1843) maintained *Conus nicobaricus* Hwass and *Conus araneosus* as two distinct species while Tryon (1884) treated the former as a variety of the latter species. But the distinguishing characters between these two species is hardly recognizable and can be treated as conspecific. The collection studied shows characters of both the species. There are specimens with three bands and the upper one is broader than the rest. In some the upper two bands have coalesced together forming a broader one. In general the bands are well defined.

Distribution.—It is a common species in the Andaman and Nicobar Islands.

It occurs in Indo Malayan region and eastern Indian Ocean.

2. *Conus arenatus* Hwass in Bruguiere, 1792

Conus arenatus Hwass in Bruguiere, 1792, *Encyclopede Methodique*, Vers., 6 (2) : 621. Reeve, 1843, *Conch. Icon. 1*, *Conus* sp. no. 92, pl. xvii, fig. 92: Tryon, 1884, *Man. Conch.*, 6 : 18, pl. 4, fig. 66, pl. 27, fig. 2.

Remarks.—The shell may be stoutly turbinated or cylindrical, covered with numerous small reddish brown dots. These dots are sometimes arranged into bands. The spire may be convexely flat or slightly elevated. The body whorl is strongly coronated at the shoulders.

It exhibits variation in the general shape of the shell and in spire.

3. *Conus capitaneus* Linnaeus

Conus capitaneus Linnaeus, 1758, *Syst. Nat. ed. 10* : 713, No. 254, Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 54, pl. xi, fig. 54, Tryon, 1884, *Man. Conch.*, 6 : 40, pl. 12, figs. 21-24, pl. 11, figs. 17-18.

Remarks.—Body whorl is encircled with two reddish brown spotted bands. Spire is low and striate. Aperture is bluish purple

within. According to Reeve (1843) it offers innumerable varieties, differing in size, colour and chest-nut painting. But in the present collection the species exhibits uniform colouration.

Kohn (1963) discussed the nomenclature of this species.

Distribution.—Tropical Indo-West Pacific, Mauritius to Polynesia.

4. *Conus distans* Hwass in Bruguiere, 1792

Conus distans Hwass in Bruguiere, 1792, *Encyclopede Methodique*, Vers., 1 (2) : 634. Reeve, 1843, *Conch Iocn.* 1, *Conus*, sp. no. 174, pl. xxxi, fig. 174. Tryon, 1884, *Man. Conch.*, 6 : 40.

Remarks.—Shell is elongately turbinated, and in the middle narrow. In the majority of specimens the shell is brownish yellow and encircled by distant, somewhat obsolete, impressed lines. The base of the body whorl is stained blackish violet. The spire is convexly exerted and apex is characteristically and flatly truncated. The shoulder is coronated with obtuse white knobs with yellowish brown interstices.

Distribution.—Tropical Indo-West Pacific.

5. *Conus ebraeus* Linnaeus, 1758

Conus ebraeus Linnaeus, 1758, *Syst. Nat.* ed. 10 : 715, no. 268. Type-locality: India. Kohn, 1963, *J. Linn. Soc. Lond.*, 44 : 748.

Conus hebraeus Linnaeus, Reeve, 1843, *Conch. Icon.* 1 : sp. no, 104, pl. xix, figs. 104a, b, Tryon, 1884, *Man. Conch.*, 6 : 20, pl. 5, figs. 75-77, pl. 27, fig. 13.

Remarks.—The shell can be very easily distinguished by its characteristic colour pattern. Shell brownish white with bands of irregular longitudinal or rhomboidal dark chocolate or black markings. The surface more or less striated through out but the striations are more prominent towards the dark stained base.

In the collection of 100 specimens, there are two specimens where the black markings are more continuous so as to cover the entire length of the shell. The specimens with this colour pattern were treated as a variety, namely *vermiculatus* Lamarck by Reeve (1843) and Tryon (1884). This may be a case of colour polymorphism, which occurs sporadically in a population.

It can tolerate exposure to air and half of the individuals were observed above the datum in Maldiva and Chagos Islands where it was common at all intertidal stations and was dominant on smooth limestone pavement and beach rock (Kohn, 1968). In Andaman and

Nicobar Islands also it is a common species on the flats of beach rock exposed during low tide. They generally abound in places, where there is an abundance of polychaetes. Majority of the specimens were collected out of water.

Distribution.—Indo-Pacific.

6. *Conus geographus* Linnaeus, 1758

Conus geographus Linnaeus, 1758, *Syst. Nat.* ed. 10 : 718, no. 283. Type-locality : Indies. Reye, 1843, *Conch. Icon.*, 1, *Conus*, sp. no. 130, pl. xxiii, fig. 130. Tryon, 1884, *Man. Conch.*, 6 : 88, pl. xxviii, fig. 84, pl. xxix, pl. 85.

Remarks.—This cone is not very common in the Islands. However, it is included in this category, because it is known as a dangerous species.

The species can be distinguished by its oblong, thin and inflated shell. It is stained with flesh colour. The spire is concave and slightly canaliculated. It is spirally striated and coronated with rather prominent tubercles. The apex is rose tinted.

Distribution.—It occurs throughout tropical Indo-Pacific.

7. *Conus litteratus* Linnaeus

Conus litteratus Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 712, no. 252. Type-locality : Asiatic Ocean. Kohn, 1963, *J. Linn. Lond.*, Zoology, 44 : 751.

Conus litteratus Linnaeus, Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 183. pl. xxxiii, fig. 183 ; Tryon, 1884, *Man. Conch.*, 6 : 10, pl. 2, figs. 17-19.

Remarks.—Shell is usually encircled with two to three broad indistinct light yellow or orange-brown bands, and a number of rows of large and small dark chocolate or black, round, square or triangular spots. The spots are sometimes elongated longitudinally. The spire is flat and a little depressed.

It bears close resemblance to *Conus millepunctatus* Lamarck, which Tryon (1884) treated as a variety of this species. *C. millepunctatus* differs from this species in the absence of yellow bands and the presence of more numerous spots.

It is the largest among cones occurring in the Islands. A specimen collected from Neil Island measured 141.50 mm. in height, 92.6 mm. maximum width and 18.8 mm. minimum width. In the older specimens the colouration is completely covered by brownish periostracum.

Specimens were found partly buried in sand, in knee-deep water, near Chiriatapu. Shells were always coated with sand and in a few specimens algae was found growing on them.

Distribution.—Tropical Indo Pacific from Zanzibar to Viti Island.

8. *Conus lividus* Hwass in Bruguiere, 1292

Conus lividus Hwass in Bruguiere, *Encyclopede Methodique*, Vers., 1 (2) : 630, pl. 321, fig. 5 Reeve, 1843, *Conch. Icon.*, 1 : sp ; no. 211, pl. Tryon, 1885, *Man. Conch.*, 6 : 45, pl. 13, figs. 54-57. Cernohorsky, 1967, Marine shells of the Pacific, p. 222, pl. 57. fig. 422.

Remarks.—Shell is transversely striated, lower striae are often granulose. It is generally livid green encircled round the middle with a pale indistinct narrow belt. Spire is depressed and conical ; shoulder and spire are coronated with tubercles and apex tinged with pale rose colour. Interior of aperture is deeply stained at the upper and lower parts with purple violet.

It exhibits variation in shell morphology. Some of the specimens are without any tubercles, and the granulations on the body whorl are not prominent or some times even absent. This phenomenon of occurrence of smooth and granulated shells in the same species in Conidae has been discussed by Coomans (1973).

It may be conspecific with *C. flavidus* ; Reeve (1843) and Tryon (1884) expressed doubts about the distinction between the two species.

Distribution.—Indo-Pacific, Red Sea to Polynesia. It is a common species in Andaman and Nicobar Islands. It is the commonest species in Maldives and Chagos Islands, where it occurs on a greater diversity of substrates (Kohn, 1962).

9. *Conus miles* Linnaeus, 1758

Conus miles Linnaeus, 1758. *Syst. Nat.*, ed. 10 : 713, no. 255. Type-locality : India.

Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 9, pl. II. fig. 9. Tryon, 1884, *Man. Conch.*, 6 : 40, pl. 11, fig. 16, pl. 27, fig. 11.

Remarks.—Shell is pale yellowish with two dark transverse ferruginous bands on the body whorl, one slightly above the middle region and another above the basal region, longitudinally with undulating threadlike lines of light brown colour. Basal region of body whorl blackish-brown. Spire is flatly obtuse and yellow.

In some of the specimens the shell is encircled with hairy and distantly placed transverse striae.

It occurs in sandy patches of coral reefs and generally in water.

Distribution.—East Africa to Central Polynesia.

10. *Conus miliaris* Hwass in Bruguiere, 1792

Conus miliaris Hwass in Brugüiere, 1792, *Encyclopede Methodique* Vers., 1 (2) : 629. Reeve, 1843, *Conch. Icon.*, 1, *Conus* sp. no. 198, pl. xxxvi, fig. 198. Tryon, 1884, *Man. Conch*, 6 : 21, pl. figs. 84-90, pl. 27, fig. 12

Remarks.—Shell is shortly turbinated. The body whorl is ornamented with two irregular bands of white colour above and below the middle region. It is encirbled throughout with a very fine dot-interrupted reddish brown lines of striae. The striae towards the base are usually granular and sometimes throughout.

The shells are generally small in size and shows considerable variation in the height and coronation of the spire, as well as in the colour and pattern of markings.

Distribution.—Red Sea to Sandwich and Galapagos Islands.

11. *Conus striatus* Linnaeus, 1752

Conus striatus Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 716, no. 277. Type-locality : Hitoe, Amboina. Reeve, 1843, *Conch. Icon.* 1, *Conus*, sp. no. 179, pl. xxxii, fig. 179a.

Remarks.—Shell is cylindrically turbinate with deep and prominent striae. Colour is usually yellowish being more or less variegated and spotted with brownish black. The spire is obtusely convex and canaliculated with a rose tinted apex.

The species is not very common, but is important being a poisonous one. In fresh condition the coloration is brownish-black. but in older and worn out shells the colour becomes more blackish. The specimens in the Reserve Collections show variations in shell colour and height of the spire.

Distribution.—Occurs throughout tropical Indo-Pacific.

12. *Conus textile* Linnaeus, 1752

Conus textile Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 717, no. 278. Type-locality :

Banda. Reeve, 1843, *Conus. Icon.*, 1, *Conus*. sp. no. 209, pl. xxxviii, fig. 209.
Tryon, 188, *Wan. Conch.*, 6 : 89, pl. xxix, figs. 92-99.

Remarks.—Shell is cylindrically ovate, smooth or striated towards the base. The colour is generally yellow, encircled with two rows of large irregular orange blotches, and with orange brown triangular reticulations in other places. The spire is acuminate, the body whorl strongly shouldered towards the spire.

The species is known for its beautiful colouration. Although different colour variants were recorded in this species, the present collection is of uniform colouration.

Only dead shells washed ashore were collected during all the surveys. It is also known to be a poisonous one.

Distribution.—Indo-Pacific.

SUMMARY

All the species listed above are reported from the Indian Ocean previously, and are widely distributed throughout tropical Indo-West Pacific. There are however four exceptions to this general rule. The species *C. andamanensis* Smith, *C. masoni* G. & H. Nevill, *C. pretiosus* G. & H. Nevill and *C. edwardi* Preston are known from their type-localities only. The latter mentioned two species are however, not recorded subsequently from the Islands.

Conus arenatus, *Conus lividus* and *Conus miliaris* show intra-specific diversity. But the small sample size precludes the possibility of commenting on the variations within populations, Coomans (1973) reported the occurrence of smooth and granulated shells in certain species in Conidae. In the present study, diversity was in the shape of spire and shell (*C. arenatus*), in the height and coronation of the spire (*C. miliaris*). The occurrence of smooth and granulated shells were noticed in *C. lividus* only. Colour morphs were seen in *C. ebraeus* and *C. miliaris*.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Calcutta for the necessary facilities and encouragement. I am thankful to Dr. K. C. Jayaram, Deputy Director for his interest in the work and encouragement. My thanks are also due to Dr. B. K. Tikader, Joint Director, and Dr. K. Reddiah, Deputy Director, for giving me an opportunity to participate in the field trips

to the Andaman and Nicobar Islands and for various facilities on the field.

REFERENCES

- COOMANS, H. E. 1973. Conidae with smooth and granulated shells. *Malacologia*, **14** : 321-325.
- KOHN, A. J. 1959. Ecological notes on *Conus* (Mollusca : Gastropoda) in the Trincomalee region of Ceylon *Ann. Mag. nat. Hist. London*, (13) **2** : 309-320.
- KOHN, A. J. 1966. Type specimens and identity of the described species of *Conus* III. The species described by Gmelin and Blumenbach in 1791. *J. Linn. Soc. Lond., Zoology*, **46** : 73-102.
- KOHN, A. J. 1968. Microhabitats, abundance and food of *Conus* on Atoll reefs in the Maldiva and Chagos Islands. *Ecology*, **49** (6) : 1046-1062.
- KOHN, A. J. and ROBERTSON, R. 1966. The Conidae of Maldiva and Chagos Archipelagoes *J. mar. biol. Assn. India*, **8** (2) : 273-277.
- MELVILL, J. C. and SYKES, E. R. 1898. "Notes on a second collection of marine shells from the Andaman Islands, with the descriptions of new forms of *Terebra*. *Proc. Malac. Soc. Lond.*, **3** : 35-48.
- NEVILL, G. and H. 1874. Descriptions of new marine mollusca from the Indian Ocean. *J. asiat. Soc. Beng.*, **43** (2) : 21-29 (*Conus pretiosus*, *Conus masoni*).
- RAJAGOPAL, A. S. and SUBBA RAO, N. V. 1964. On Chitons from the Andaman and Nicobar Islands. *J. mar. biol. Assn. India.*, **16** (2) : 398-411.
- REDDIAH, K. 1977. The coral reefs of Andaman and Nicobar Islands. *Rec. zool. Surv. India.*, **72** : 315-324.
- PRESTON, H. B. 1908. Descriptions of new species of land, marine and freshwater shells from the Andaman Islands. *Rec. Indian Mus.*, **2** (1) : 187-210.
- SMITH, E. A. 1878. On a collection of marine shells from the Andaman Islands. *Proc. zool. Soc. Lond.*, 1878 : 804-821.

ADDENDUM

The paper [Kohn, A. J. 1978. The Conidae (Mollusca : Conidae) of India, *J. nat. Hist.*, **12** : 295-335] received recently provides a complete list of *Conus* of India, especially of the mainland, their characters for identification and notes on ecology. The paper recorded two species, *Conus lorosii* Keiner and *C. malacanus*. Huress in Brugniere from Nicobar Islands, which are not included in the present paper. The occurrence of *C. miles* L. was treated as unverified, but the presence of about thirty specimens in the Zoological Survey of India, establishes its record beyond doubt. Author's thanks are due to Prof. A. J. Kohn, University of Washington U.S.A., for the reprint.

**HAEMOPROTEUS MEGAPODIUS SP. NOV. IN
MEGAPODIUS FREYCINET ABBOTTI OBERHOLSER
(MEGAPODIIDAE) FROM THE SOUTH NICOBAR**

By

N. C. NANDI AND A. K. MANDAL
Zoological Survey of India, Calcutta

(With one plate)

Members of the family Megapodiidae (Order Galliformes) are curious fowl-like birds, remarkable for their reptile-like nesting habits. They have long been attracted the attention of the ornithologists. However, no report is, so far, available on the blood parasites from these birds. Recently, the authors received some blood smears through the kind courtesy of Sri S. S. Saha of this department, from a South Nicobar Megapode, *Megapodius freycinet abbotti* Oberholser of Campbell Bay, Great Nicobar Island, India for study. Interestingly, one new haemoproteid species was encountered from this bird which forms the basis of this paper.

DESCRIPTION

Type host : *Megapodius freycinet abbotti* Oberholser

Type locality : 24 km Post on North-South Road, Southwest of Campbell Bay, Great Nicobar Island, India.

Macrogametocyte : (Pl.I, Figs. 1 & 2) N=15. Mature parasites straight to slightly haltaridial with conspicuous median constriction, usually lateral to erythrocyte nucleus, occasionally subterminal in position, and sometimes twist the host cell nucleus to 90°. Parasites average 14.3 μm (1.5) by 1.9 μm (0.4) and 36.9 μm^2 (1.7) in area, occupying about 43% of the host cell-parasite complex. Cytoplasm matrix vacuolated, moderately coarse, unevenly stained blue, centrally patchy and peripherally denser. Parasite nucleus submedian, roundoval, averaging 1.5 μm (0.01) by 1.0 μm (0.01) and 1.5 μm^2 (0.2) in area, staining rose. Pigments average 21 (2.2) per parasite in the form of discrete and scattered granules, black to yellow-brown in tinge; volutin granules absent. Erythrocyte nucleus displaced slightly laterally (NDR=0.7) or tilted to 90° (fig. 3.). Host cell hypertrophied in length (3.7%) and in area (5.4%) but relatively unchanged in width. Host cell nucleus atrophied in length (14.2%) and in area (14.7%) however, the width remaining unchanged. Macro-gametocytes are common, the ratio to microgametocytes being 66 : 34.

Microgametocyte : (Pl. I, Figs. 4 & 5) N=10. Parasites, smaller than macrogametocytes, average $10.5\ \mu\text{m}$ (0.3) by $3.3\ \mu\text{m}$ (0.7) and $30.2\ \mu\text{m}^2$ (3.2) in area, with slight or no median constriction. Cytoplasm stains faint blue peripherally, central region unstained. Parasite nucleus diffuse, not exactly distinguishable from the cytoplasm. Pigment granules 20 (1.6) per parasite, localised at the poles. NDR=0.6 (0.1). Host cell atrophied in length (9.0%), in width (2.8%) and in area (12.0%). Host cell nucleus atrophied in length (19%), in width (4.1%) in area (29.5%). Remaining characteristics as for macrogametocytes.

Immature gametocyte (Pl. I, Figs. 4 & 6) : N=10. Small sausage-shaped parasites measuring $5.5\ \mu\text{m}$ (9.6) by $2.0\ \mu\text{m}$ (0.2) and $7.6\ \mu\text{m}^2$ (0.8) in area ; initiate development lateral to erythrocyte nucleus ; cytoplasm granular, vacuolated staining light blue ; pigments 10 (1.4) per parasite ; host cell slightly hypertrophied in width in some cases ; host cell nucleus remaining unchanged. Double infection (Fig. 6) of immature gametocytes is not uncommon.

Uninfected erythrocyte : N=15. Cell $13.3\ \mu\text{m}$ (0.8) by $7.7\ \mu\text{m}$ (0.5) and $78.8\ \mu\text{m}^2$ (5.1) in area. Cell nucleus $6.3\ \mu\text{m}$ (0.5) by $2.3\ \mu\text{m}$ (0.1) and $12.2\ \mu\text{m}^2$ (1.6) in area.

Type material : Holotype (Z. S. I. Reg. No. Pt.1924) is designated to a blood smear taken from *Megapodius freycinet abbotti* from Campbell Bay, Great Nicobar Island, India, 9. iv. 1977, coll. S. S. Saha. *Paratypes* (2 slides Z. S. I. Reg. No. Pt. 1925, 1926) collection data same as for holotype.

DISCUSSION

The available experimental data on the genus *Haemoproteus*, summarised by Bennett and Campbell (1972) and Bennett *et al.* (1975), indicate that haemoproteids are quite specific at the family level and sometimes at the species level (Baker, 1966, 1966b). The principle has widely been used as the basis for taxonomic distinction of the bird-inhabiting haemoproteids. The other primary taxonomic characteristics such as gametocyte-shape and its quantitative measurements lend support to the specific determination of the parasite.

Haemoproteus megapodius differs from all the five haemoproteid species viz., *Haemoproteus chapini*, *H. chucari*, *H. lophortyx*, *H. releyi* and *H. santosdiasii* known from the family Phasianidae (Order-Galliformes) for its characteristic constriction in the macrogametocytes, relatively unstained broad microgametocytes and occasional twisting of the erythrocyte nucleus by the parasite. It also differs from other haemoproteids of the order Galliformes (10 spp. in all excluding those two species from *Centropus* of the Cuculidae. wrongly included in the check list of Levine and Campbell, 1971 under the family Tetraonidae)

in the shape of the macrogametocytes, in the effect of the parasite on the host cell and in its quantitative measurements.

The present species closely resembles *H. fringillae* Labbe, 1894, a parasite of *Fringilla coelebs* (Family Fringillidae) and of other passeri. form species. The mature gametocytes of *H. fringillae* possess marked constriction centrally like the species described in the present paper. However, *H. megapodius* is smaller than *H. fringillae* and is usually sharply constricted centrally.

A perusal of literature indicates that there is no haemoproteid-species reported, so far from the Megapodiidae (Coatney, 1936, Berson, 1964 ; Levine and Campbell, 1971). Thus, considering strong familial specificity among the Haemoproteidae and for the characteristic morphologies presented by the parasite, the name *Haemoproteus megapodius* sp. nov. is proposed, to mark its specific identity.

SUMMARY

Haemoproteus megapodius sp. nov. is described from the South Nicobar Megapode, *Megapodius freycinet abbotti* Oberholser from Campbell Bay, Great Nicobar Island, India. The species is distinguished by its characteristic constriction in the macrogametocytes, broad unstained microgametocytes and occasional twisting of the host cell nucleus by the parasite.

ACKNOWLEDGEMENTS

The authors are thankful to the Director, and Dr. T. D. Soota, Superintending Zoologist, Zoological Survey of India, Calcutta, for facilities provided and for their interests in this study.

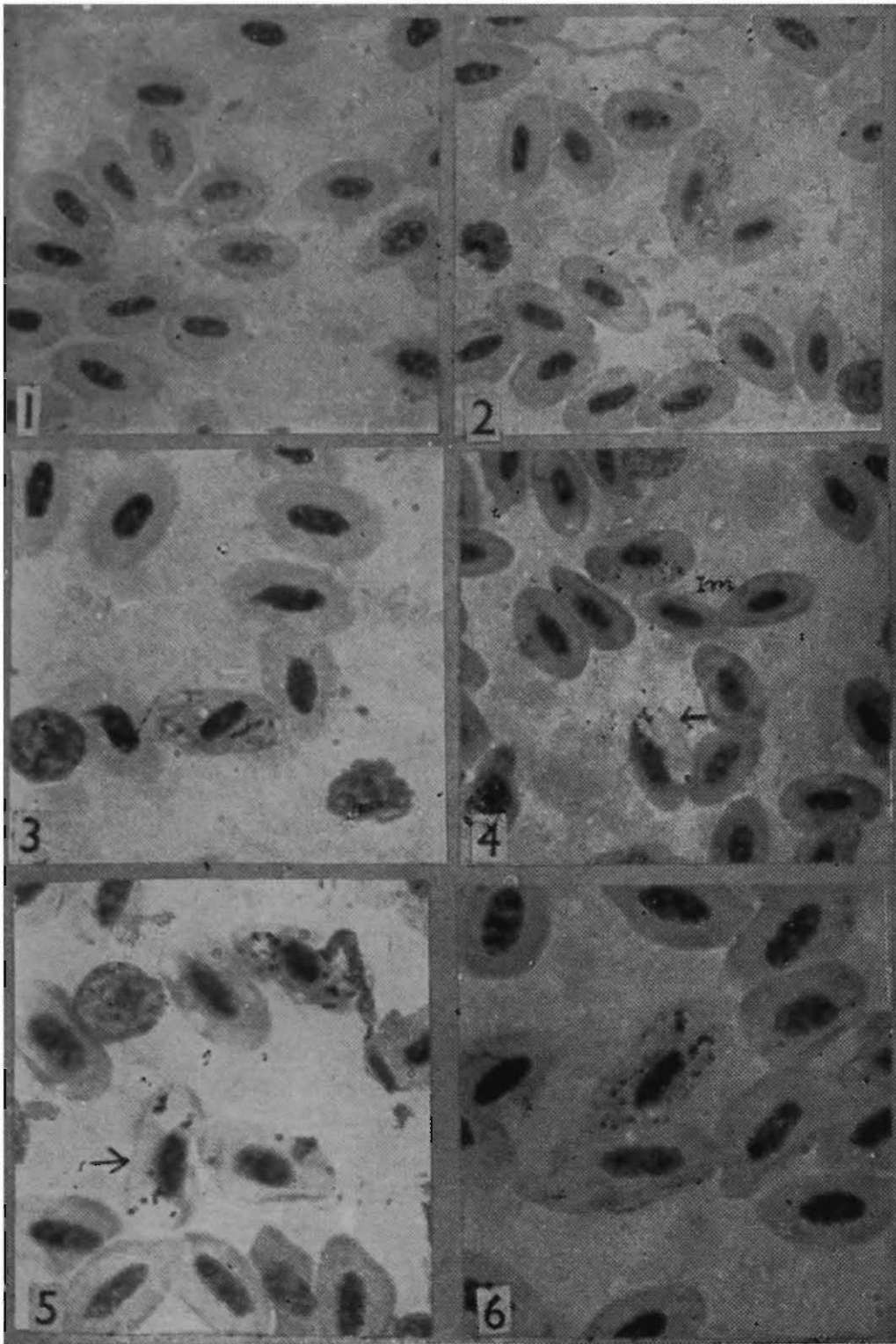
REFERENCES

- BAKER, J. R. 1966a. The host restriction of *Haemproteus* spp. indet. of the wood pigeon, *Columba p. palumbus*. *J. Protozool.*, **13** : 406-408.
- BAKER, J. R. 1966b. *Haemoproteus palumbis* sp. nov. (Sporozoa, Haemosporina) of the English wood pigeon, *Columba p. palumbus.*, *J. Protozool.*, **13** : 515-519.
- BENNETT, G. F. and CAMPBELL, A. G. 1972. Avian Haemoproteidae. I. *Haemoproteus fallisi* n. sp. and a review of the haemoproteids of the family Turdidae. *Can. J. Zool.*, **50** : 1269-1275.

- BENNETT, G. F., FORRESTER, D. J., GREINER, E. C. and CAMPBELL, A. G. 1975. Avian Haemoproteidae. 4. Description of *Haemoproteus telfordi* sp. nov., and a review of the haemoproteids of the families Gruidae and Otidae. *Can. J. Zool.*, **53** : 72-81.
- BERSON, J. P. 1964. Les protozoaires parasites des hematies et du systeme histiocytaire des oiseaux. Essai de nomenclature. *Rev. Elevage Med. Vet. Pays. Trop.* **17** : 43-96.
- COATNEY, G. R. 1936. A check-list and host index of the genus *Haemoproteus*. *J. Parasitol.*, **22** : 88-105.
- LEVINE, N. D. and CAMPBELL, G. R. 1971. A checklist of the species of the genus *Haemoproteus* (Apicomplexa, Plasmodiidae). *J. Protozool.*, **18** (3) : 475-484.

ERRATA

<i>Page</i>	<i>Line (Top)</i>	<i>Inplace of</i>	<i>Read</i>
51	7	with one plate	with 1 text fig.
51	22	pl. I	Text fig. 1
52	1	pl. I	Text fig. 1
52	10	pl. I	Text fig. 1



Text-fig. 1. Photomicrographs of *Haemoproteus megapodius* sp. nov. ; 1 & 2. Mature macrogametocytes ; 3. Host cell nucleus twisted by the macrogametocyte ; 4 & 5. Microgametocytes (arrow), 4 — also shows an early infection with immature gametocyte (Im.) ; 6. Double infection with immature gametocytes.

POLYCHAETE FAUNA OF ANDAMAN AND NICOBAR ISLANDS

By

T D. SOOTA, A. MISRA AND R. K. CHAKRABORTY

Zoological Survey of India, Calcutta

Andaman and Nicobar Islands occupy a unique position as far as their faunal affinities between India and Burma on one side and Malaysia on the other are concerned. The interest of the polychaete representatives of the fauna of these islands is further increased by their being richly varied due to occupying a wide range of eco-niches presented by the practically undisturbed geographic conditions of these islands. Hence, it is desirable to have at hand a comprehensive list of these polychaetes.

The present paper deals with 24 species belonging to 16 genera and 9 families from the unnamed collection of the Zoological Survey of India. Of these, 4 species form new locality records. A complete list, including the present new records, of the polychaetes hitherto known from the area has also been included. Synonymies have been deliberately omitted to avoid repetition as most of these are readily available in the works of Fauvel (1932, 53), Hartman (1959) Tampi and Rangarajan (1964), Day (1967), and Soota and Rao (1977). Rao and Soota (1977).

SYSTEMATIC ACCOUNT

Family APHRODITIDAE

Subfamily POLYNOINAE

***Iphione muricata* (Savigny, 1818)**

Material.—1 ex. ; Z. S. I. Reg. No. An 933/1 ; locality — Malacca beach, Car Nicobar ; 25. i. 74 ; coll. *K. V. Surya Rao*. 3 ex., Z. S. I. Reg. No. An 966/1 ; locality — Aberdeen Bay, Port Blair ; 16. i. 59 ; coll. *K. K. Tiwari*. 1 ex. ; Z. S. I. Reg. No. An 1122/1 ; locality — South point, Port Blair ; habitat — on surface of rock in the intertidal zone ; 20. v. 78 ; coll. *B. P. Haldar*.

Description.—Prostomium bilobed, with very small papilla-like median antennae ; elytra 13 pairs, completely covering the body and with several polygonal areas ; notosetae biserrate capillaries, neurosetae unidentate.

Lepidonotus glaucus (Petters, 1854)

Material.—1 ex. ; Z. S. I. Reg. No. An 968/1 ; locality — Havelock Island, Block No. 4 ; habitat—in dead corals in the intertidal zone ; 9. v. 78 ; coll. *B. P. Haldar*.

Description.—Prostomium narrow with three antennae, median longer ; elytra 12 pairs, with smooth margins ; tubercles in two ridges which extend back from the point of attachment ; notosetae of one kind with serrated margin and denticulate, neurosetae stout and bidentate.

Remarks.—This is the first record of the species from the Andaman waters.

Lepidonotus hedleyi Benham, 1915

Material.—1 ex. ; Z. S. I. Reg. No. An 962/1 ; locality — Atlanta Point, Port Blair ; habitat — on soft rocks arranged in horizontal layers ; 21. v. 78 ; coll. *B. P. Haldar*.

Description.—Elytra oval and smooth ; notosetae of one kind, with spirally serrated body, neurosetae bidentate and pectinate.

Remarks.—This is the first record of the species from the Andaman waters. Earlier reported from Manora Island, Karachi, Pakistan.

Lepidonotus tenuisetosus (Gravier, 1901)

Material.—1 ex. ; Z. S. I. Reg. No. An 967/1 ; locality — Havelock Island, Block No. 5 ; habitat — in crevices of dead coral rocks in the intertidal zone ; 21. v. 78 ; coll. *B. P. Haldar*.

Description.—Prostomium heart - shaped, with three antennae and two pairs of eyes ; elytra fringed and with numerous conical tubercles ; notosetae numerous, spinulose, neurosetae stout, unidentate and with a few fringes.

Lepidonotus (Thormora) jukesi (Baird, 1865)

Material.—1 ex. ; Z. S. I. Reg. No. An 1123/1 ; locality — Neil Island, west of jetty ; habitat — in crevices of dead coral rocks in the intertidal zone ; 3. v. 78 ; coll. *B. P. Haldar*.

Description.—Prosetomius heart - shaped, with three tentacles, and two pairs of eyes, the 1st pair of which prominent, 2nd small and indistinct ; elytra tough, without fringe, and covered with conical

tubercles ; notosetae of two kinds, curved, and with small serrations, inner long, smooth with hastate tips, neurosetae stout, with several rows of small spines and unidentate tips.

Subfamily SIGALIONINAE

Psammolyce zeylanica Willey, 1905

Material.—1 ex. ; Z. S. I. Reg. No. An 969/1 ; locality-Atlanta Point, Port Blair ; habitat—in crevices of coral rocks ; 21. v. 78 ; coll. B. P. Haldar.

Description.—Elytra anteriorly smooth, posteriorly fringed, and on one side with bilobed lateral margin ; notosetae capillary and plumose, and neurosetae compound, with short and long terminal pieces.

Remarks.—This species is reported for the first time from Indian Coasts. Hitherto, reported only from Sri Lanka.

Family AMPHINOMIDAE

Amphinome rostrata (Pallas, 1766)

Material.—1 ex. ; Z. S. I. Reg. No. 1124/1 ; locality-Car Nicobar ; 23. ix. 72 ; coll. K. Reddiah.

Description.—Prostomium small, with a pair of eyes ; bushy gills begin anteriorly ; notosetae of two kinds, simple capillaries and harpoon-setae, the latter with pointed tips and serrated body, neurosetae few, stout, and curved.

Eurythoe complanata (Pallas, 1766)

Material.—1 ex. ; Z. S. I. Reg. No. An 1117/1 ; locality-Havelock Island, Black No. 4 ; habitat—in crevices of soft rocks and dead coral rocks ; 9. v. 78 ; coll. B. P. Halder. 2 ex. ; Z. S. I. Reg. No. An 1125/1 ; locality-Aberdeen Bay, Port Blair ; 18. iii. 59 ; coll. K. K. Tiwari.

Description.—Moderate to large forms ; branchiae beginning on 2nd setiger ; notosetae of three types, spine, harpoon setae, and fine spurred setae ; neurosetae of two kinds, forked with unequal, smooth prongs, and slender spurred,

Notopygos variabilis Patts, 1909

Material.—1 ex. ; Z. S. I. Reg. No. An 970/1 ; locality-off Neil Island ; habitat - in association with living corals at a water depth

about 6 m. ; 5. v. 78 ; coll. *B. P. Haldar*.

Description.—Notosetae and neurosetae bifurcated and non-serrated ; anus on 23rd segment.

Family PHYLLODOCIDAE

Subfamily PHYLLODOCINAE

Phyllodoce quadraticeps Grube, 1878

Material.—1 ex. ; Z. S. I. Reg. No. An 1126/1 ; locality - South Point, Andaman ; 14. ii. 71 ; coll. *A. Daniel*.

Description.—Long and slender forms ; antennae ovoid ; proboscis very long, covered with papillae irregularly arranged ; parapodia uniramus, with 5-6 setae, the latter having swollen, serrated shafts and short dagger-like blades.

Family NEREIDAE

Perinereis brevicirris (Grube, 1869)

Material.—12 exs. ; Z. S. I. Reg. No. An 1127/1 ; locality - Camorta Island ; 4. x. 72 ; coll. *K. Reddiah & Party*.

Description.—Arrangement of paragnaths of the proboscis is given as : Gr. I, with two conicals, Gr. II and III, each with a cluster of several, Gr. IV, arranged in rectangular fashion, Gr. V, with 3 conicals in a row or in a triangle, Gr. VI, with 6 bar-shaped ones in a single row on each side, Gr. VII & VIII, with several conicals and arranged in 2-3 irregular rows.

Family EUNICIDAE

Subfamily EUNICINAE

Eunice afra afra Peters, 1854

Material.—1 ex. ; Z. S. I. Reg. No. An 1128/1 ; locality - Chiriatapu, South Andaman ; habitat - dead coral rocks in the litoral zones ; 21. v. 78 ; coll. *B. P. Haldar*.

Eunice afra paupera Grube, 1878

Material—4 exs. ; Z. S. I. Reg. No. An 1129/1 ; locality - Atlanta Point, Port Blair ; 21. v. 78 ; coll. *B. P. Haldar*. 1 ex. ; Z.S.I. Reg. No. An 1130/1 ; locality - Havelock Island, Block - 5 ; habitat - in crevices of both soft rocks and dead coral rocks.

***Eunice afra punctata* Peters, 1854**

Material.—2 ex. ; Z. S. I. Reg. No. An 1131/1 ; locality - Havelock Islands, Block - 5 ; habitat—in crevices of both soft rocks and dead coral rocks ; 11. v. 78 ; coll. *B. P. Haldar*. 1 ex. ; Z. S. I. Reg. No. An 1158/1 ; locality—Atlanta point, Port Blair ; 3. v. 78 ; coll. *B. P. Haldar*.

***Eunice antennata* (Savigny, 1820)**

Material—3 ex. ; Z. S. I. Reg. No. 1132/1 ; locality—off Neil Island ; habitat—in association with living corals ; 5. v. 78 ; coll. *B. P. Haldar*.

Description.—Gills beginning on 4th to 8th foot ; filaments rapidly increasing from 10th to 16 in number and then decreasing in the middle of the body before again increasing in the posterior part.

***Eunice aphroditois* (Pallas, 1788)**

Material.—2 ex. ; Z. S. I. Reg. No. An 1133/1 ; locality—Neil Island ; habitat—in association with living corals ; 5. v. 78 ; coll. *B. P. Haldar*.

Description.—Body long and with a white bar accross 4th setigerous segment ; gills beginning on 5th to 11th foot, attaining a maximum of 20 filaments and then decreasing gradually towards the posterior part ; acicular setae bidentate.

***Eunice australis* Quatrefages, 1865**

Material.—2 ex. (with posterior parts missing) Z. S. I. Reg. No. An 1134/1 ; locality—Neil Island, off N & NW of jetty ; habitat—beneath a living coral ; 5. v. 78 ; coll. *B. P. Haldar*.

Description.—Tentacles deeply annulated ; gills beginning with three branches from 8th segment onwards, then becoming simple and from 26th segment onwards absent ; acicular setae tridentate ; parapodia with comb setae, simple capillary setae, and compound falciger.

***Eunice norvegica* (Linn., 1767)**

Material.—1 ex. ; Z. S. I. Reg. No. An 1135/1 ; locality—off Peel Island ; habitat—in association with living corals ; 14. v. 78 ; coll. *B. P. Haldar*.

Description.—Body long with a soft membranous tube ; gills beginning from 6th+10th foot, attaining 6 to 8 filaments and continuing up to the end of the body.

***Eunice (Palolo) siciliensis* Grube, 1840**

Material.—3 ex. ; Z. S. I. Reg. No. An 1136/1 locality-South Point, Andaman ; 14. ii. 71 ; coll. *A. Daniel*. 1 ex. ; Z. S. I. Reg. No. An 1137/1 ; locality-Chiriatapu, Andaman ; 22. x. 72 ; coll. *K. Reddiah*. 3 ex. ; Z. S. I. Reg. No. An 1138/1 ; locality-Neil Island, off N & NW of jetty ; habitat—in association with living corals ; 5. v. 78 ; coll. *B. P. Haldar*.

Description.—Body elongated with simple gills beginning very far from the head about 50th—60th segments ; comb setae and acicular setae absent ; lower jaw white.

***Lysidice collaris* Grube, 1870**

Material.—6 ex. ; Z. S. I. Reg. No. An 1139/1 ; locality-Chiriatapu, Andaman ; habitat—in crevices of dead corals ; 21. v. 78 ; coll. *B. P. Haldar*.

Description.—Tentacles three ; tentacular cirri and gills absent ; parapodia with simple acicular, capillary, and comb setae.

Family CIRRATULIDAE

***Cirriformia filigera* (Delle chiaje, 1825)**

Material.—1 ex. ; Z. S. I. Reg. No. An 1140/1 ; locality-Arong beach, Car Nicobar ; 29. i. 74 ; coll. *K. V. Surya Rao*.

Description.—Prostomium conical, without eyes ; tentacular cirri numerous and arising on the anterior part of the body ; gills all along the body.

Family SABELLARIIDAE

***Identhyrsus pennatus* (Peters, 1855)**

Material.—1 ex. ; Z. S. I. Reg. No. An 1141/1 ; locality - Camorta jetty ; 18. iv. 73 ; coll. *G. C. Rao*.

Family TERESELLIDAE
Subfamily TERESELLINAE

Nicolea gracilibranchis (Grube, 1878)

Material.—4 ex. ; Z. S. I. Reg. No. An 945/1 ; locality - Aberdeen Bay ; 24. iii. 52 ; coll. *H. C. Ray*.

Description.—Gills two pairs ; thoracic setigerous segments 17 with capillary notosetae and ventral avicular uncini, the latter with bidentate tips.

Remarks.—This is the first record of the species from the Andaman waters. Earlier reported from Singapore and Madras Coast.

Terebella ehrenbergi Grube, 1870

Material.—1 ex. ; Z. S. I. Reg. No. An 113/1 ; locality - Neil Island ; habitat - associated with living coral at a water depth about 6 m. ; 5. x. 78 ; coll. *B. P. Haldar*.

Description.—Notosetae of only one kind and with serrated tip ; avicular uncini, in single row on the first uncinigerous segment and in double row on the 4th.

Family SABELLIDAE

Subfamily SABELLINAE

Hypsicomus phaeotaenia (Schmarda, 1861)

Material.—1 ex. ; Z. S. I. Reg. No. An 1143/1 ; locality - South Point, Andaman ; 20. v. 78 ; coll. *B. P. Haldar*. 1 ex. ; Z. S. I. Reg. No. An 1144/1 ; locality - Neil Island ; habitat - in tough tubes encrusted with mud and sand granules on sides of rocks where there is sufficient water movement ; 3. v. 78 ; coll. *B. P. Haldar*.

Sabella fusca Grube, 1870

Material.—1 ex. ; Z. S. I. Reg. No. An 1145/1 ; locality - Havelock Island, Block No. 4 ; habitat - in tough tubes encrusted with mud and sand granules formed in rocky crevices ; 9. v. 78 ; coll. *B. P. Haldar*.

*A list of polychaetes hitherto known from the Andaman and
Nicobar Islands*

Family APHRODITIDAE Savigny, 1818

Subfamily APHRODITINAE Savigny, 1818

[= HERMIONINAE Grube, 1875]

1. *Aphrodita talpa* Quatrefages, 1865
2. *Aphrogenia alba* Kinberg, 1857
3. *Hermonia hystrix* (Savigny, 1820)
4. *Pontogenia nuda* Host, 1917

Subfamily POLYNOINAE Malmgren, 1867

5. *Admetella longipedata* McIntosh, 1885
6. *Allmaniella ptycholepis* (Grube, 1878)
7. *Eunoe pallida* (Ehlers, 1980)
8. *Gastrolepidia clavigera* Schmarda, 1861
9. *Halosydna* (*Hyperhalosydna*) *striata* (Kinberg, 1855)
10. *Harmothoe ampullifera* (Grube, 1878)
11. *H. dictyophora* (Grube, 1878)
12. *H. imbricata* (Linn., 1767)
13. *H. minuta* (Potts, 1910)
14. *Iphione muricata* (Savigny, 1818)
15. *Lepidasthenia microlepis* Potts, 1910
16. *Lepidonotus cristatus* (Grube, 1876)
17. *L. glaucus* (Peters, 1854)
18. *L. hedleyi* Benham, 1915
19. *L. jacksoni* Kinberg, 1858
20. *L. melanogrammus* Haswell, 1883
21. *L. tenuisetosus* (Gravier, 1901)
22. *L. (Thormora) jukesi* (Baird, 1865)
23. *Scalisetosus fragilis* (Claparede, 1868)

Subfamily POLYDONTINAE Pflugfelder, 1934

24. *Panthalis oerstedii* Kinberg, 1855
25. *Polyodontes maxillosus* (Ranzani, 1817)
26. *P. melanonotus* (Grube, 1878)

Subfamily SIGALIONINAE Malmgren, 1867

27. *Psammolyce zeylanica* Willey, 1905
28. *Sthenolepis japonica* (McIntosh, 1885)

Family PALMYRIDAE Kinberg, 1858

[= CHRYSOPETALIDAE Ehlers, 1864]

29. *Bhawania goodei* Webster, 1884

Family AMPHINOMIDAE Savigny, 1818

30. *Amphinome rostrata* (Pallas, 1766)
31. *Chloeia amphora* Horst, 1910
32. *C. flava* (Pallas, 1766)
33. *C. flava puchella* Baird, 1870
34. *C. fusca* McIntosh, 1885
35. *C. parva* (Baird, 1870)
36. *Euphrosine foliosa* Audauin & Milne-Edwards, 1833
37. *Eurythoe complanata* (Pallas, 1767)
38. *E. pervecarunculata* Horst, 1912
39. *Notopygos hispidus* Potts, 1909
40. *N. labiatus* Mc Intosh, 1885
41. *N. variabilis* Potts, 1909

Family PHYLLODOCIDAE Williams, 1851

Subfamily PHYLLODOCINAE Williams, 1851

42. *Eulalia albo-picta* Marenzeller, 1879
43. *Phyllodoce fristedti* Bergstrom, 1914
44. *P. malmgreni* Gravier, 1900
45. *P. quadraticeps* Grube, 1878
46. *P. (Anaitides) madeirensis* Langerhans, 1880
47. *P. (Anaitides) tenussima* Grube, 1878

Family PILARCIDAE St. Joseph, 1899

48. *Synelmis albin* (Langerhans, 1881)

Family HESIONIDAE Malmgren, 1867

49. *Hesione intertexta* Grube, 1878

- 50. *H. splendida* Savigny, 1818
- 51. *Leocrates claparedii* (Costa, 1868)
- 52. *L. filamentosus* Ehlers, 1908
- 53. *Ophiodromus angustifrons* (Grube, 1878)

Family SYLLIDAE Grube, 1850

- 54. *Syllis (Syllis) gracilis* Grube, 1840
- 55. *S. (Typosyllis) armillaris* (Muller, 1776)
- 56. *S. (Typosyllis) exilis* Gravier, 1900
- 57. *S. (Typosyllis) okadai* Fauvel, 1934
- 58. *Trypanosyllis gigantea* (McIntosh, 1885)
- 59. *T. zebra* (Grube, 1860)

Family NEREIDAE Johnston, 1865,

- 60. *Ceratonereis anchylochaeta* Horst, 1924
- 61. *C. mirabilis* Kinberg, 1866
- 62. *C. tripartita* Horst, 1918
- 63. *Namalycastis indica* (Southern, 1921)
- 64. *Nereis (Neanthes) cricognatha* (Ehlers, 1905)
- 65. *N. (Nereis) coutierei* Gravier, 1899
- 66. *N. (Nereis) jacksoni* Kinberg, 1866
- 67. *Perinereis aibuhitensis* Grube, 1878
- 68. *P. brevicirris* (Grube, 1869)
- 69. *P. cultrifera* var. *helleri* Grube, 1878
- 70. *P. cultrifera* var. *typica* (Grube, 1840)
- 71. *P. neocaledonia* Pruvot, 1930
- 72. *P. nigropunctata* (Horst, 1889)
- 73. *P. nuntia* var. *typica* (Savigny, 1820)
- 74. *P. singaporiensis* Grube, 1878
- 75. *P. suluana* Horst, 1924
- 76. *P. vancaurica* Ehlers, 1868
- 77. *Platynereis dumerilii* Audouin & Milne-Edwards, 1833
- 78. *P. pulchella* Gravier, 1902

- 79. *P. polyscalma* Chamberlin, 1919
- 80. *Pseudonereis anomala* Gravier, 1901
- 81. *P. rotnestiana* Augnener, 1913
- 82. *P. variegata* (Grube, 1857)
- 83. *Tylonereis bogoyawlenskyi* Fauvel, 1911

Family NEPHTYIDAE Grube, 1850

- 84. *Nephtys (Aqlaophamus) malmgreni* Theel, 1879

Family GLYCERIDAE Grube, 1850

[including GONIADIDAE Kinberg, 1866]

- 85. *Glycera cirrata* Grube, 1869
- 86. *G. prashadi* Fauvel, 1932
- 87. *G. rouxii* Audouin & Milne-Edwards, 1833
- 88. *G. tessellata* Grube, 1863

Family EUNICIDAE Savigny, 1818

Subfamily EUNICINAE Savigny, 1818

- 89. *Eunice afra afra* Peters, 1854
- 90. *E. afra paupera* Grube, 1878
- 91. *E. afra punctata* Peters, 1854
- 92. *E. antennata* (Savigny, 1820)
- 93. *E. aphroditois* (Pallas, 1788)
- 94. *E. australis* Quatrefages, 1865
- 95. *E. grubei* Gravier, 1900
- 96. *E. indica* Kinberg, 1865
- 97. *E. marenzelleri* Gravier, 1900
- 98. *E. norvegica* (Linnaeus, 1767)
- 99. *Eunice tentaculata* Quatrefages, 1865
- 100. *E. (Palolo) siciliensis* Grube, 1840
- 101. *Lysidice collaris* Grube, 1870
- 102. *Marphysa mossambica* Petters, 1854
- 103. *M. sanguinea* (Montagu, 1815)

Subfamily ONUPHINAE Kinberg, 1865

- 104. *Hyalinocia tubicola* (Müller, 1776)

- 105. *Onuphis (Nothria) conchylega* Sars, 1835
- 106. *O. (Nothria) holobranchiata* Marenzeller, 1879
- 107. *O. (Onuphis) aucklandensis* Augener, 1924
- 108. *Rhampphobrachium chuni* Ehlers, 1908

Subfamily LYSARETINAE Kinberg, 1865

- 109. *Oenone fulgida* (Savigny, 1818)

Subfamily LUMBRINERINAE Malmgren, 1867

- 110. *Lumbrinereis sphaerocephale* (Schmarda, 1861)
- 111. *L. tetraura* (Schmarda, 1861)

Subfamily ARABELLINAE Hartman, 1944

[= ARABELLIDAE Hartman, 1944]

- 112. *Arabella iricolor iricolor* (Montagu, 1804)
- 113. *A. mutans* (Chamberlin, 1919)
- 114. *Drilonereis filum* (Claparede, 1868)

Family SPIONIDAE Grube, 1850

- 115. *Nerinides knight-jonesi* de-Silva, 1961

Family MAGELONIDAE Cunningham & Ramage, 1888

- 116. *Magelona japonica* Okuda, 1937

Family CIRRATULIDAE Carus, 1863

- 117. *Cirriformia filigera* (Delle Chiaje, 1825)
- 118. *C. punctata* (Grube, 1859)
- 119. *C. tentaculata* (Montagu, 1808)

Family TROCHOCHAETIDAE Pettibone, 1963

[= DISOMIDAE Mesnil, 1897, including POECILOCHAETIDAE Hennerz, 1956]

- 120. *Poecilochaetus serpens* Allen, 1904

Family CHAETOPTERIDAE Malmgren, 1867

- 121. *Mesochaetopterus minutus* Potts, 1914

Family ORBINIIDAE Hartman, 1942

Subfamily ORBINIINAE Hartman, 1957

- 122. *Nainereis laevigate* (Grube, 1855)
- 123. *Scoloplos marsupialis* Southern, 1921

Family OPHELIIDAE Malmgren, 1867

- 124. *Armandia lanceolata* Willey, 1905
- 125. *A. leptocirris* Grube, 1878
- 126. *Travisia arborifera* Fauvel, 1932

Family CAPITELLIDAE Grube, 1862

- 127. *Capitellethus dispar* Ehlers, 1907
- 128. *Dasybranchus caducus* (Grube, 1846)
- 129. *Notomastus latericeus* Sars, 1851

Family ARENICOLIDAE Johnston, 1835

- 130. *Arenicola brasiliensis* Nonato, 1958

Family MALDANIDAE Malmgren, 1867

- 131. *Asychis gotoi* (Izuka, 1902)
- 132. *Axiothella australis* Augener, 1914
- 133. *Euclymene annandalei* Southern, 1921
- 134. *E. grossa* Baird, 1878
- 135. *Maldane sarsi* Malmgren, 1866

Family STERNASPIDAE Carus, 1836

- 136. *Sternaspis scutata* (Renier, 1807)

Family OWENIIDAE Rioja, 1917

- 137. *Owenia fusiformis* Delle Chiaje, 1894

Family FLABELLIGERIDAE Saint Joseph, 1844

- 138. *Pherusa eruca indica* (Fauvel, 1928)

Family SABELLARIIDAE Johnston, 1865

- 139. *Idanthyrus pennatus* (Peters, 1855)
- 140. *Lygdamis indicus* Kinberg, 1867

Family PECTINARIIDAE Quatrefages, 1865

141. *Pectinaria antipoda* Schmarda, 1861

142. *P. (Amphictene) crassa* Grube, 1870

Family AMPHARETIDAE Malmgren, 1867

Subfamily AMPHARETINAE Chamberlin, 1919 (emend. Day, 1964)

143. *Amphicteis gunneri* (Sars, 1835)

Family TERESELLIDAE Grube, 1851

Subfamily TRICHOBRANCHINAE Malmgren, 1866

[TRICHOBRANCHIDAE, Hesse, 1917, includes CANEPHORIDEA and TRICHOBRANCHIDEA Malmgren]

144. *Terebellides stroemi* Sars, 1835

Subfamily THELEPINAE Malmgren, 1866

145. *Streblosoma persica* (Fauvel, 1908)

146. *Thelepus cincinnatus* (Fabricius, 1780)

Subfamily TERESELLINAE Grube, 1850

[including AMPHITRICACEA and ARTACAMACEA Malmgren, 1865]

147. *Eupolymnia nebulosa* (Montagu, 1818)

148. *Loimia meduse* (Savigny, 1820)

149. *Nicolea gracilibranchis* (Grube, 1878)

150. *Terebella ehrenbergi* Grube, 1870

Family SABELLIDAE Malmgren, 1867

Subfamily SABELLINAE Rioja, 1923

151. *Branciomma nigromaculata* (Baird, 1865)

152. *B. serratibranchis* (Grube, 1878)

153. *Hypsicomus phaeotaenia* (Schmarda, 1861)

154. *Sabella fusca* Grube, 1870

155. *S. melanostigma* Schmarda, 1861

156. *Sabellastrare sanctijosephi* (Gravier, 1906)

Family SERPULIDAE Savigny, 1818

Subfamily SPIROBINAEE Chamberlin, 1919

157. *Spirorbis (Dexiospira) foraminosus* Busch, 1904

Subfamily SERPULINAE MacLeay, 1840

158. *Ditrupa arietina* Muller, 1776
159. *D. arietina* var. *monilifera* Fauvel, 1932
160. *Pomatostegus stellatus* (Abildgaard, 1789)
161. *Spirobranchus giganteus* (Pallas, 1766)

SUMMARY

The paper deals with 24 species of polychaetes from the unnamed collection of the Zoological Survey of India. Four species form new locality records. Also included is a complete list of the polychaetes hitherto known from the area.

ACKNOWLEDGEMENTS

We are much indebted to the Director, Zoological Survey of India, Calcutta, for his kind help and encouragement in the completion of this work.

REFERENCES

- DAY, J. H. 1967. A monograph on the Polychaeta of southern Africa. Pts. I & II. *Br. Mus. (Nat. Hist.)*, publ. 656 : 1-878.
- FAUVEL, P. 1932. Annelida, Polychaeta of the Indian Museum. *Mem. Indian Mus.*, 12 (1) : 1-262.
- FAUVEL, P. 1953. *The Fauna of India*, Annelida, Polychaeta : 1-507.
- HARTMAN, O. 1959. Catalogue of the polychaetous annelids of the world, Pts. I & II. *Allan Hancock Foundation Publications*, Occasional Paper No. 23 : 1-628.
- RAO, C. A. N. and SOOTA, T. D. 1977. On the occurrence of *Poecilochaetus serpens* Allen (Polychaeta : Poecilochaetidae) in the Andaman and Nicobar Islands, *Newsl. zool. Surv. of India*, 3 (6) : 346-347.
- SOOTA, T. D. and ROA, C. A. N. 1977. On some polychaetes from Andaman and Nicobar Islands. *Rec. zool. Surv. India*, 73 (1-4) : 197-210.
- TAMPI, P. R. S. and RANGARAJAN, K. 1964. Some polychaetous annelids from the Andaman waters. *J. mar. biol. Ass. India*, 6 (1) : 98-121.

**NEW RECORD OF *NERITA (THELIOSTYLA) PATULA*
RECLUZ 1841 (MOLLUSCA : GASTROPODA) FROM
ANDAMAN AND NICOBAR ISLANDS WITH A
NOTE ON THE SPECIES**

By

N. V SUBBA RAO

Zoological Survey of India, Calcutta

Recluz (1841) described the species *Nerita patula* without mentioning its Type-locality. At a later date (1850) he figured the species from a collection from the Philippines. The species was hitherto known from Pacific only and there was no report of this species during the present century. The latest report of this species was by Tryon (1888).

During a Survey of Andaman and Nicobar Islands in 1970 and 1972, the present author collected a few examples of this species. This forms the first record of this species from Indian Ocean region. This species was not recorded by any one in the recent years. Hence it is thought worthwhile to give a complete synonymy, description and other notes on this little known neritid, *Nerita patula* Recluz.

Synonymy : *Nerita patula* Recluz, 1841, *Revue Zool. Soc. Cuvier*, p. 148
Type - locality : Not mentioned ; Recluz, 1850, *J. Conch. Paris*, 1 : 285, pl. 11, fig. 7 ; Reeve, 1855, *Conch. Icon.*, 9, *Nerita*, sp. no. 84, pl. XIX, figs. 84 a, b ; Sowerby, 1883, *Thes. Conch.*, 5, pl. 11, fig. 23, pl. fig. 58 ; Von Martens 1887, in Martini & Chemnitz's *Syst. Conch. Cab.*, 2 (11) : 52, pl. 9, figs. 8-13 ; Tryon, 1888, *Man. Conch.*, 10 : 22, pl. 3, figs. 53-56.

Nerita dombeyi Recluz, 1841, *Revue Zool. Soc. Cuvier.*, p. 149, Type—locality : Bombay ; Reeve, 1855, *Conch. Icon.*, 9, *Nerita*, sp. no. 71, pl. XVII, figs. 71 a, b.

Nerita beaniana Recluz, 1843, *Proc. Zool. Soc. Lond.*, p. 201 ; Reeve, 1855, *Conch. Icon.*, 9, *Nerita*, sp. no. 85, pl. XIX, figs. 85a 85d.

Material examined.—(1). 1ex., station I - From the upper surface of rocks at splash zone at Chatham, Port Blair, 10 - ii - 1961, coll. A. Daniel. (2) 10 ex., In front of Naval Garrison, Camorta, 25-iii-1970 ; coll. B. K. Tikader and N. V Subba Rao (2). 12 ex., Bay near Rangchang village, 17 km. south of Port Blair, Andamans, 30-x-1972, coll. K. Reddiah and N. V Subba Rao.

Description.—Shell semioval, more or less dilated, a little triangular, whorls 2, spire minute but impressed, apex distinct but not pointed, sculpture consists of 30 to 40 moderately flat, uneven oblique ribs, interstices very narrow, colour uniformly yellowish brown without any bands or spots.

Aperture largely expanded, columella flatly excavated, columellar

callus moderately large, slightly concave, light black coloured with a mixture of pale yellow in the middle, with an oblique fold like structure on the superior side, inner columellar margin concave and toothless, outer margin of outer lip not very much thickened, white, fringed with yellowishgrey, on the inferior side slightly expanded to from a fold, inner margin of outer lip distinctly yellow ; with 19 to 20 black and longitudinal elongated teeth of equal size, internal palatal hinge tooth absent.

Operculum externally convex, with numerous granules, grey with whitish nucleus, internally pale yellow.

Radula : Central broader, marginals in the middle serrated.

Measurements (in mm.)

	Length	Width	Height of the aperture
Small (Rangachan)	5.35	4.30	2.15
Average (Rangachang)	16.65	12.35	7.45
Large (Chatham)	18.05	12.90	8.05

Habitat.—It was found sticking to small stones in the bay near Rangachang, where a small stream was flowing into it.

Range.—Andamans to Moluccas and the Philippines.

Distribution.—Andamans : Port Blair, Rangachang, Nicobars : Camorta ; INDONESIA : Moluccas, Ternate, Batjan ; PHILIPPINES : Island of Negros, Island of Corrigidor.

Remarks.—*Nerita patula* can be easily distinguished from other species by its distinct columellar callus bearing black granules in the middle and longitudinally elongated black teeth on the inner margin of outer lip. The general shape of the shell is almost triangular. In the young forms, the columellar callus and the margin of outer lip are smooth and uniformly yellowish. The first to appear are the black granules on the columellar callus which are seen on shell with 8.8 mm. height. Indications of teeth first appear in a shell 10.7 mm. height, which become more distinct when it is of 12.7 mm. height.

Basing on general shape, nature and colour of columellar callus von Martens (1883) recognised three forms, namely *typical*, *beaniana* Recluz and *dombeyi* Recluz. The collection studied agrees with the typical form.

Though the collection studied exhibited no bands, Reeve (1855) and von Martens (1883) observed the bands on the shell. The former mentioned the colour as purple rose, encircled with black lines and white dotted bands, while the latter noticed 1-3 broad orange red bands.

Reeve (1855) treated *Nerita dombeyi*, *Nerita patula* and *Nerita beaniana* as three separate species. The characters distinguishing these three species are of trivial nature and it is hardly possible to separate them. The general shape of the shell, the nature of ribs, aperture and columellar callus are identical in the the three species.

Nerita dombeyi was described by Recluz from the specimens collected by Mr. M. de Dombey on the Bombay coast from where no *Nerita patula* was reported. Von Martens (op. cit.) opined that *N. dombeyi* may be an young form of *N. patula* or at most a local variety. He had rightly merged all the three species.

The material from Krusadai Island, Gulf of Mannar, preserved in the Madras Museum was erroneously ascribed to *Nerita dombeyi* Recluz (Satymurti, 1952) ; it belongs to *Nerita insculpta* Recluz.

SUMMARY

Nerita (Theliostyla) patula Recluz is recorded for the first time from Indian Ocean. A detailed description and synonymy are given.

ACKNOWLEDGEMENTS

My thanks are due to the Director, and Dr. S. Khera formerly Joint Director-in-charge, Zoological Survey of India for the encouragement and necessary facilities ; to Dr. S. T. Satyamurti, Director and Shri G. N. Kesav Ram ; Curator (Zoology) Madras Museum, for the facilities to work in their Museum and for the co-operation. My sincere thanks are also due to Dr. K. C. Ghosh, University of Calcutta and to Shri A. S. Rajagopal, Superintending Zoologist for their constant interest and guidance during the course of my studies on Indian neritids ; and to Shri K. Dey, Photographer.

REFERENCES

- MARTENS, E. VON, 1889. Die gattungen *Nerita* und *Neritopsis* in Martini & Chemnitz *Syst. Conch. Cab.*, 2 (11) : 147 pp., pls. A, 1-15.
- RECLUZ, M. C. A. 1841. Description de quelques nouvelles especes de *Nerites* vivantes 1. *Revue zool. Soc. Cuvier.*, : 273-278.
- RECLUZ, M. C. A. 1850. Suite du Memoire sur less genre *Nerita*. *J. Conch.*, Paris 1 : 277-288.

- REEVE, L. 1855. Monograph of the genus *Nerita*. *Conchologia Iconica*, 9, pls. 1-9.
- SATYAMURTI, S. T. 1952. The Mollusca of Krusadai Island (in the Gulf of Mannar) 1. Amphineura and Gastropoda. *Bull. Madras Govt. Mus., N. S. Nat. Hist. Sec. 1* (2), pt. 6 : 1-266, pls. 1-33.
- TRYON, G. W. 1888. Monograph of the family Neritidae. *Man. Conch.*, 10 : 3-11, 18-82, pls. 1-29.

DIGENETIC TREMATODES OF MARINE FISHES OF ANDAMAN

By

M. HAFEEZULLAH AND I. B. DUTTA
Zoological Survey of India, Calcutta

(With 3 Text-figures)

INTRODUCTION

The digenetic trematode fauna of marine fishes of Andaman and Nicobar Islands has been negligibly explored and studied. The same is true with other helminth groups also. Soota *et al.* (1970), and Gupta and Miglani (1974) have described some digenetic trematodes of marine fishes from these groups of islands. The small number of specimens which forms the basis of the present study were collected by Dr. A. K. Mandal and Party in July, 1972. Unfortunately the host fishes were not identified. All the drawings have been made with the aid of a camera lucida. The measurements have been given in microns unless otherwise stated.

SYSTEMATIC ACCOUNT

Family HEMIURIDAE

1. *Hysterolecithoides frontilatus* (Manter, 1969)

(Text-fig. 1)

1969. *Theletrum frontilatum* Manter, *Proc. helminth. Soc. Wash.*, 36 (2) : 194-204.

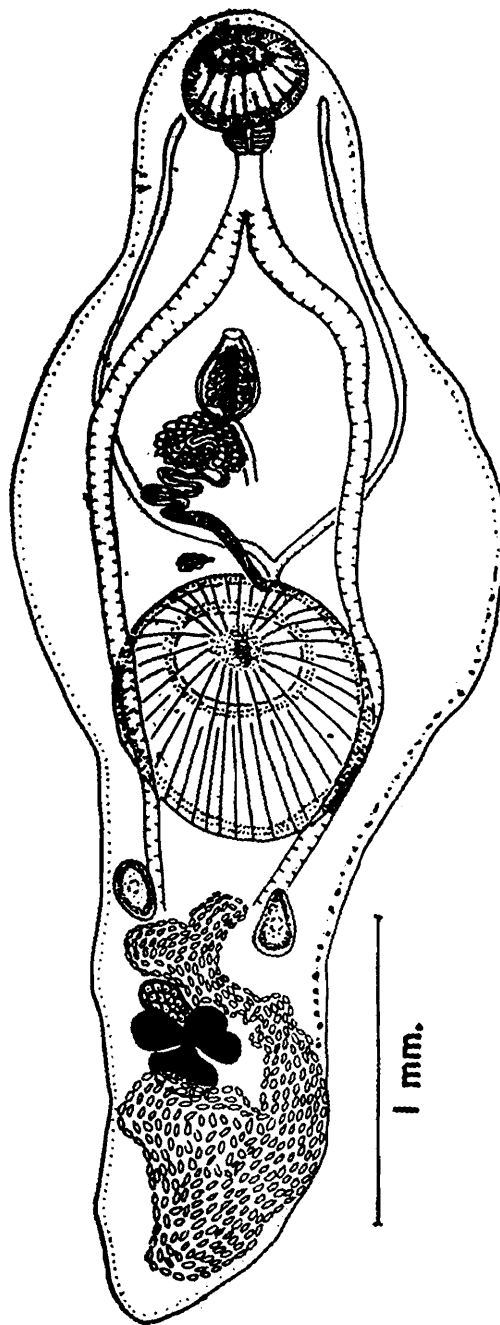
1971. *Hysterolecithoides frontilatus* Yamaguti, *Synog. Dig. Trem. Verteb.*, I. p. 303.

Material.—4 ex., host—unidentified marine fish, location—stomach, locality—Chiria Tapu (Andaman), specimens—Z. S. I. Reg. Nos. W7272/1 to W7274/1.

Description.—Body 4.211-6.077 mm long, 1.278-1.938 mm wide, wider in the preace—tabular region, hindbody tapering posteriorly. Acetabulum 825-1,045 long, 728-866 wide, at 1.444 to 2.15 mm from anterior end of body. Oral sucker 357-440 long, 343-398 wide. Suckers' width ratio 1 : 1.8—2.28 taking width of oral sucker as one. Prepharynx absent pharynx 114-171 in diameter; oesophagus short, followed by cecal bifurcation; ceca simple reaching posterior end of body.

Testes two, ovoid, right testis 192-275 long, 137-165 wide; left

testis 178-247 long, 96-165 wide, symmetrical, immediately behind acetabulum. Seminal vesicle tubular, long, coiled, posteriorly reaching or slightly overlapping acetabulum. Pars prostatica wide, long, winding, surrounded by well developed prostate cells throughout. Sinus sac muscular pear-shaped, enclosing straight tube of genital sinus or hermaphroditic duct, and filled with gland cells between wall of sinus sac and genital sinus. Genital pore median, much behind cecal bifurcation midway between the two suckers. Genital atrium short.



Text-fig. 1. *Hysterolecithoides frontilatus* (Manter, 1969) Yamaguti, 1971. Dorsal View.

Ovary 165-233 long, 137-151 wide, longer than wide, posttesticular, separated from testes by coils of uterus, adjacent to vitelline lobes. Vitelline lobes three, in some specimens left lobe may be slightly indented, situated between posterior end of body and acetabulum. Uterus much coiled, descending upto in front of posterior end of body, largely postacetabular. Eggs minute, 21-28 by 10-14.

Excretory pore terminal. Excretory vesicle I-shaped, dividing into two near anterior border of acetabulum, branches running side ways, not uniting behind oral sucker.

Remarks.—Manter (1969) described his specimens from *Siganus rivulatus* (Forsk.) as *Theletrum frontilatum* whereas Yamaguti (1971) considered Manter's species in the genus *Hysterolecithoides* Yamaguti, 1934. According to Yamaguti (1971 : p. 303) *Theletrum* Linton, 1910 has postacetabular circular ridge, positions of acetabulum and female gonads are different, and the excretory crura unite dorsal to oral sucker or pharynx. In *Hysterolecithoides* Yamaguti, 1934 the postacetabular circular ridge is absent, the acetabulum is more posterior in position, female gonads are removed anteriorly from posterior end of body, and the excretory arms do not unite dorsal to oral sucker or pharynx. This combination of characters indicates that our specimens should belong to *Hysterolecithoides* rather than *Theletrum*. The only difference is that other species of *Hysterolecithoides* have seven vitelline lobes whereas in the present specimens there are three. As a matter of fact the difference in the number of vitelline lobes is of great taxonomic importance but in view of other strong similarities, Yamaguti's placement of Manter's species in the genus *Hysterolecithoides* seems to be correct.

We have collected specimens also from the marine fish *Siganus oramin* from the Gulf of Mannar as well as Coromandel Coast.

Family OPECOELIDAE

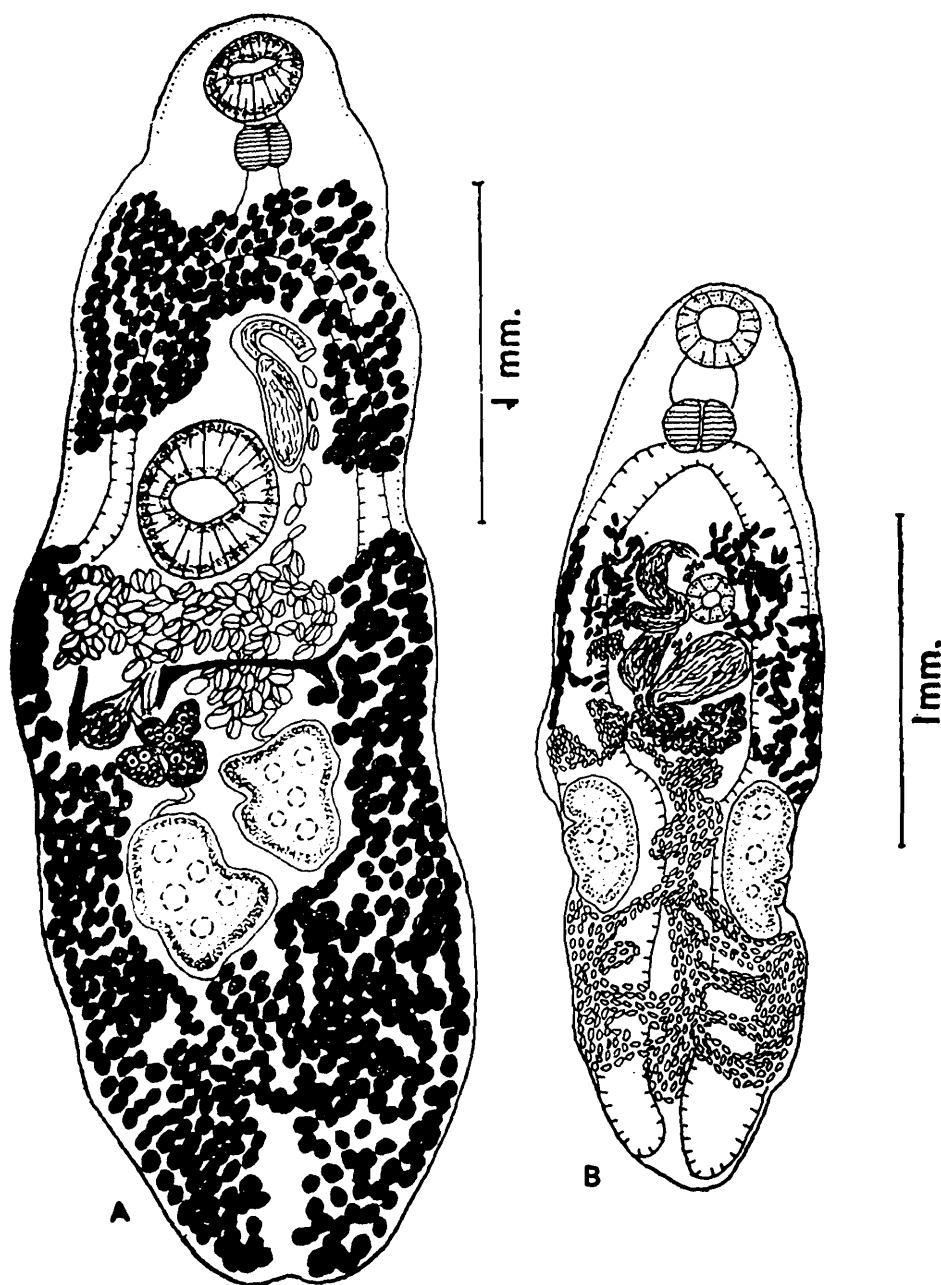
2. *Hamacreadium interruptus* Nagaty, 1941

(Text-fig. 2A)

- 1941. *Hamacreadium interruptus* Nagaty, *J. Roy. Egypt. Med. Assoc.* **24** : 300-310.
- 1952. *Plagioporus (Plagioporus) longivesicula* Yamaguti, *Acta Med. Okayama* **8** : 146-198.
- 1962. *Hamacreadium lethrini* Nagaty and Abdel Aal, *J. Parasit.* **48** : 384-386.
- 1962. *Hamacreadium nagaty* Lamothe, *An. Inst. Biol. Mexico.* **33** : 97-111.
- 1963. *Hamacreadium lenthrium* Manter, *J. Parasit.* **49** : 99-113.

Material.—1 ex., host-unidentified marine fish, location—intestine, locality—Chiria Tapu (Andaman), specimen—Z.S.I. Reg. No. W7275/1.

Description.—Body 3.781 mm long, 1.141 mm. wide. Cuticle unarmed. Non-occulate. Forebody 1.152 mm. Acetabulum cup-shaped, 454 long, 413 wide, preequatorial. Oral sucker 220 long, 261 wide, spherical ventroterminal smaller than acetabulum. Sucker's width ratio 1 : 1.5 taking width of oral sucker as one ; suckers' length ratio 1 : 2.05 taking length of oral sucker as one. Prepharynx short ; pharynx 124 long, 138 wide ; oesophagus present ; ceca reaching posterior end of body.



Text-fig. 2 A—*Hamacreadium interruptus* Nagaty, 1941. Ventral View ;
B—*Mehracola ovocaudatum* Srivastava, 1937. Ventral View.

Testes two, diagonal, margin indented, 447-516 long 327-404 wide, postequa-torial. Cirrus sac club-shaped, lying vertically on left side between acetabulum and left cecum, anterior narrower part recurved,

opening inward of left cecum (probably the original diagonal disposition of cirrus sac from right border of acetabulum to genital pore on left side has been disturbed during processing), enclosing seminal vesicle having one loop, pars prostatica surrounded by prostate cells, and ejaculatory duct.

Ovary 4—lobed, between anterior testis and uterus, submedian or right, Seminal receptacle flask-shaped, dorsodextral to ovary. Vitelline follicles interrupted at acetabular level on both sides. Coils of uterus between acetabulum anteriorly, and anterior testis and ovary posteriorly. Metraterm indiscernible. Eggs 70-74 x 35-49.

Excretory vesicle undetermined. Excretory pore terminal.

Remarks.—*Hamacreadium* Linton, 1910 is sometimes confused with *Plagioporus* Stafford, 1904 and *Podocotyle* (Dujardin, 1845) because of great anatomical similarities among themselves. However, according to Manter (1947), *Hamacreadium* is distinguished from *Plagioporus* "by diagonal testes together with a lobed ovary. In species of *Plagioporus* with a lobed ovary, the testes are tandem. Again, "*Hamacreadium* seems to differ from *Podocotyle* chiefly in that the testes are diagonal rather than tandem".

The present specimens appears to be *Hamacreadium interruptus* Nagaty, 1941 by all probabilities. We concur with Fischthal and Kuntz (1965) for synonymising *Plagioporus* (*Plagioporus*) *longivesicula* Yamaguti, 1952 to *Hamacreadium interruptus*.

The type and paratype specimens of *Maculifer spiralis* Soota, Srivastava, C. B. and Ghosh, 1969 have been examined. Postoral muscular collar, characteristic of the family Opistholebetidae, is not present in these specimens. Apparently its authors mistook the contracted prepharynx as a collar. These specimens definitely belong to the genus *Hamacreadium* of the family Opecoelidae and not to *Maculifer* of the family Opistholebetidae. They seem to be the young adults of *H. mutabile* Linton, 1910.

Family CRYPTOgonimidae

3. *Mehracola ovocaudatum* Srivastava, 1937

(Text-fig. 2B)

1937. *Mehracola ovocaudatum* Srivastava, *Proc. 24th Indian Sci. Cong.*, p. 401.

1939. *Mehrailla ovocaudatum* Srivastava, *Indian J. vet. Sc. & Anim. Husb.* 9 : 209-212.

1971. *Mehracola ovocaudatum* : Yamaguti, *Synop. Dig. Trem. Vereb.*, p. 237.

Material.—3 ex., host—unidentified fish, location—intestine,

locality—Wright Myo (Andaman) specimens—Z.S.I. Reg. Nos. W7276/1 to W7278/1.

Remarks.—*Mehracola* is so far a monotypic genus reported from India only. This is the second record of the genus from the Indian region, of course, this time from the Bay of Bengal rather than the Arabian Sea.

Family BIVESICULIDAE

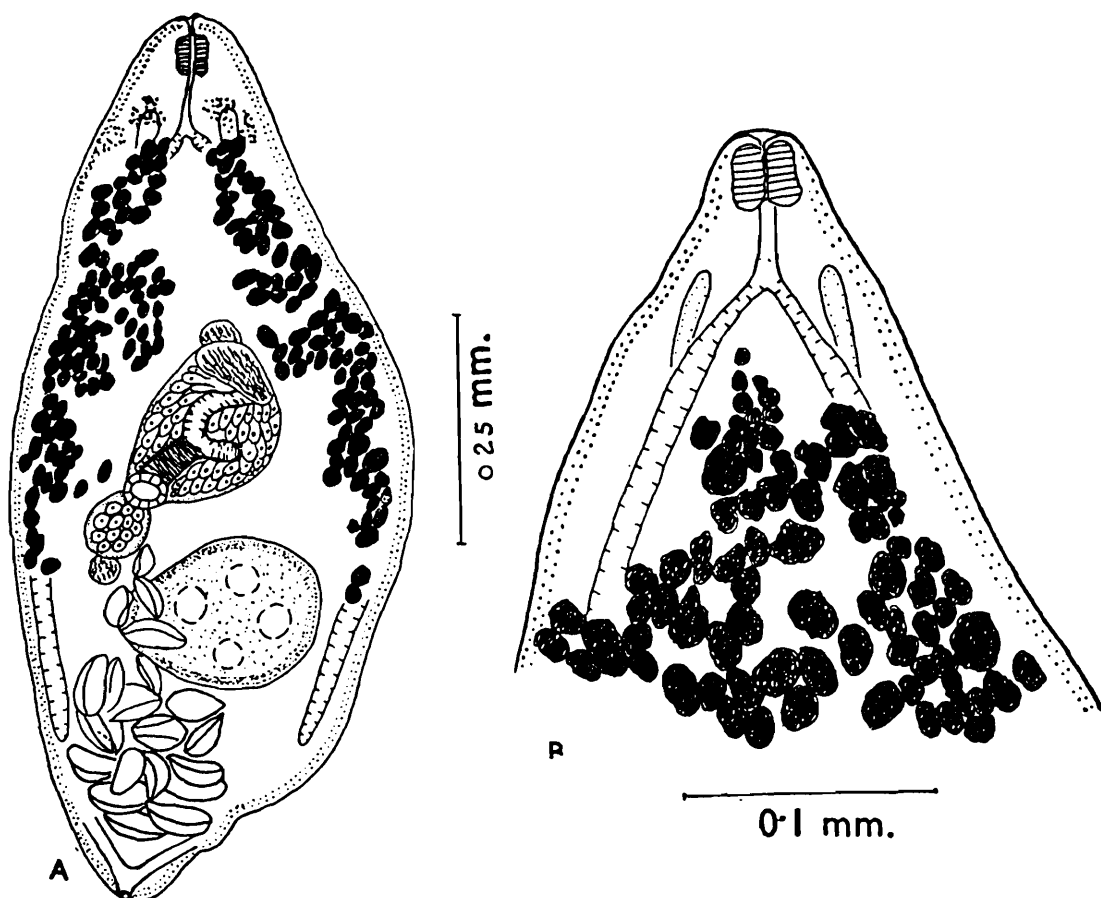
4. *Bivesicula australis* Crowcroft, 1947

(Text-fig. 3)

1947. *Bivesicula australis* Crowcroft, *Pap. Proc. R. Soc. Tasmania*, 5-25, Figs. 13 & 14.

1970. *Bivesicula congeri* Yamaguti, *Dig. Trem. Hawaiian Fishes*, p. 87, fig. 121.

Material.—8 ex. (in addition to the broken ones), host—unidentified marine fish, location—intestine, locality—Chiria Tapu (Andaman), specimens—Z. S. I. Reg. Nos. W7279/1 to W7280/1.



Text-fig. 3. *Bivesicula australis* Crowcroft, 1947; A—Ventral View, B—Anterior part of another specimen.

Description.—(With measurement on 3 specimens): Body 0.99-1.072 mm long, 0.385-0.453 mm wide, fusiform when fully relaxed. Cuticle smooth, probably fine spines lost during processing. Eye-spot pigment present, dissociated. Acetabulum absent. Oral sucker 35-42 in diameter, squarish, width smaller than that of anterior end of body, sometimes withdrawn inside body. Oesophagus of medium length. Muscular oesophageal swelling in front of cecal bifurcation absent. Ceca simple, reaching middle of space between testis and posterior end of body.

Testis single, 165-228 in diameter, postequatorial. External seminal vesicle attached to anterior end of cirrus sac. Cirrus sac 190-210 long, 171-180 wide, enclosing internal seminal vesicle, thick-walled pars prostatica and highly muscular cirrus. Well developed prostate cells completely filling cirrus sac. Genital atrium shallow. Genital pore equatorial or postequatorial.

Ovary 68-82 in diameter, lying near genital pore, submedian. Vitellaria consisting of vitelline follicles extending between oesophageal level to level of anterior margin of testis, tending to coalesce mesially. Uterus descending far beyond posterior to testis, then ascending. Eggs collapsed, 70-87 by 42-45.

Excretory vesicle V-shaped, arms reaching oesophageal level. Excretory pore terminal.

Remarks.—Leaving aside the controversy whether oral sucker is actually the sucker or pharynx, there seem to be two sets of species in the genus *Bivesicula* Yamaguti, 1934—one with muscular oesophageal swelling in front of ceecal bifurcation, and the other without it. The present specimens belong to the latter category. Again, three species so far have been described in the genus *Bivesicula* Yamaguti, 1934 in which the intestinal ceca extend posterior to testis. They are *B. australis* Crowcroft, 1947, *B. tarponis* Sogandares-Bernal and Hutton, 1959, and *B. congeri* Yamaguti, 1970. In the present specimens also intestinal ceca extend posterior to testis. Comparing them with these three species they have obvious important differences with *B. tarponis*. Further, they come very close to *Bivesicula australis* but differ mainly in shape and size of the oral sucker and in the posterior extent of vitelline follicles. In *B. australis* oral sucker has been described to be funnel-shaped and its maximum width at the top is equal to the width at anterior end of body, whereas in the present specimens the oral sucker is squarish and much less in width than that of the anterior end of the body (Text-fig. 3B). Moreover, in Crowcroft's species the vitelline follicles do not reach level of testis, whereas in the present specimens they do reach. Judging from Fig. 13 (Crowcroft, 1947 p. 21) and keeping in view these two characters we are inclined to consider them variations only. Such discrepancies creep in some specimens of a population during processing depending upon the conditions of contraction and relaxation. Yamaguti (1970) did not compare his species, *B. congeri* with *B. australis*, and we consider the slight

difference in the posterior extent of ceca, as taxonomically unimportant. Therefore *B. congeri* becomes a synonym of *B. australis*.

SUMMARY

The present study is a report based on a small collection of the digenetic fauna of marine fishes of Andaman. It consists of four species, *Hysterolecithoides frontilatus* (Manter, 1969), *Hamacreadium interruptus* Nagaty, 1941, *Mehracola ovocaudatum* Srivastava, 1937 and *Bivesicula australis* Crowcroft, 1947. New facts and records about these species have been noted in addition to the important taxonomical observations. *Bivesicula congeri* Yamaguti, 1970 has been considered as synonym of *B. australis* Crowcroft 1947. *Maculifer spiralis* Soota, Srivastava, C. B. and Ghosh, 1969 in the family Opisthoebetidae is nothing but *Hamacreadium mutabile* Linton, 1910 in the family Opecoelidae.

ACKNOWLEDGEMENTS

The authors are thankful to the Director, Zoological Survey of India, Calcutta for providing facilities and to Dr. T. D. Soota, Superintending Zoologist, for taking interest in the study.

REFERENCES

- CROWCROFT, P. W. 1947. Some digenetic trematodes from fishes of shallow Tasmanian waters. *Pap. Proc. R. Soc. Tasmania*, (1946) : 5-25.
- FISCHTHAL, J. H. and KUNTZ, R. E. 1965. Digenetic trematodes of fishes from North Borneo Malaysia. *Proc. helminth. Soc. Wash.*, 32 (1) : 63-71.
- GUPTA, N. K. and MIGLANI, A. 1974. Digenetic trematodes of marine fishes of Port Blair. *Proc. 61st Indian Sci. Congr.*, Abst. No. 124, pp. 107-108.
- MANTER, H. W. 1947. The digenetic trematodes of marine fishes of Tortugas, Florida. *American Midl. Natur.*, 38 (2) : 257-416.
- MANTER, H. W. 1969. Some digenetic trematodes of marine fishes of New Caledonia Part IV. Hemiuridae and Summary. *Proc. helminth. Soc. Wash.*, 36 (2) : 194-204.
- SOOTA, T. D., SRIVASTAVA, C. B. and GHOSH, R. K. 1970. Studies on the helminth fauna of the great Nicobar Island. *Proc. Indian Acad. Sci.*, 70 (6) : 241-250.
- YAMAGUTI, S. 1970. *Digenetic trematodes of Hawaiian fishes*. Keigaku Publ. Co., Japan.
- YAMAGUTI, S. 1971. *Synopsis of digenetic trematodes of Vertebrates*. vols. I & II. Keigaku Publ. Co., Japan.

NEW LOCALITY RECORD OF *PIPISTRELLUS CAMORTAE* MILLER FROM CAR NICOBAR AND ITS SYSTEMATIC STATUS

By

T. D. SOOTA

Zoological Survey of India, Calcutta

AND

Y. CHATURVEDI

Gangetic Plains Regional Station, Zoological Survey of India, Patna

(With one Text-figure)

Our knowledge of the bats of Andaman and Nicobar Islands is mainly based on the works of Dobson (1876, 1878), Blanford (1888, '91), and Miller (1902), especially the last, who gave a comprehensive account of the bats alongwith the other mammals of these islands. Subsequently, Ellerman and Morrison-Scott (1951) listed a number of species of bats from the area, which in recent years have been augmented by Hill (1967) and Chaturvedi (1969).

An abstract of this paper was published (Soota & Chaturvedi, 1971). The detailed observations are given here. A small collection of the bat, *Pipistrellus camortae* Miller, was made in Car Nicobar by the authors in the course of a general faunistic survey of the area in February-April, 1969 and these bats showed some interesting features of baculum having bearing on its systematic position.

***Pipistrellus camortae* Miller**

Material.—1 ♂ and 5 ♀; Tee Top, Car Nicobar, Andaman & Nicobar Islands; 16. iii. 1969. The specimens were collected from a high wooden platform supporting a water cistern in the premises of the Tee Top rest house, Car Nicobar.

Measurements External.—Head body 45-52*, tail 33-36, hind foot 6-8, ear 10-12, forearm 32-34, tibia 11.4-13.8, penis 7.

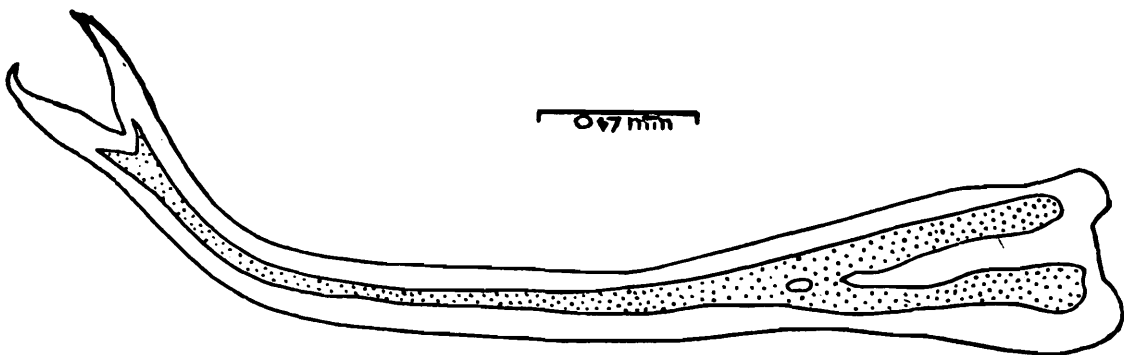
Cranial.—Greatest length 12.7-13.0, condylobasal length 12.3-12.5, cranial width near posterior root of zygomatic arch 6.5-6.8, interorbital width 3.9-4.0, palatal length 6.3-6.7, palatal width 6.0-6.2, postmolar length 7.3-7.9, upper cheek teeth row (C^1-m^3) 4.7-5.0, distance between upper canines 4.2-4.6, zygomatic width 8.4, mandibular length 9.8-10.0, lower cheek teeth row (c_1-m_3) 5.0-5.1, length of rostrum 4.8-5.0, width of rostrum 5.7-6.0.

• All measurements are in millimeters

The specimens are slightly larger than those of Miller (1902), and of Hill (1967), and also appear larger from *P. abramus* and *P. paterculus* as given by Tate (1942).

Colour.—Dorsal pelage dark brown and ventral slightly lighter with paler tinge. The individual hairs on the ventral side have dark brown base with paler tips.

Baculum.—It is 5.5 long and its maximum thickness is 0.66. It is straight except distal end which is raised and forked, with each prong measuring 0.605 in length. and with a maximum gap of 0.385 between them subterminally, the terminal ends of the prong being incurved, shaft gradually narrowing and reaching minimum (0.242) just behind the fork (Text-fig. 1).



Text-fig. 1. *Pipistrellus camortae* Miller, Ventro-lateral view of baculum.

While in general structure the baculum is pipistrellian, in size it comes close to *P. paterculus*, formerly referred to *Pipistrellus* but considered as *Myotis* by Tate (1942).

Distribution.—As the species has so far been reported only from Camorta and Great Nicobar Islands the present record extends its range further northwards.

SYSTEMATIC STATUS

The species *P. camortae* was originally described by Miller (1902) who also pointed out its resemblances with *P. abramus*. Although the resemblance with *P. abramus* was supported by Ellerman and Morrison - Scott (1951), they retained its specific status. Tate (1942) considered it "an unspecialised form of abramus group" on the basis of having much shorter penis. Hill (1967) treated *P. camortae* as a subspecies of *P. javanicus*. In view of these conflicting opinions the status of the species remains confused. It, therefore,

seems desirable to consider the various characters separately for fixing its systematic status.

In the following discussion, the measurements given for *P. abramus* and *P. paterculus* are after Tate (1942), and those for *P. javanicus* after Harrison (1964), and Hill (1967).

Forearm.—In Hill's (1967) specimens of *P. j. camortae* forearm averages 31.8 in length, which, according to him, "is lesser than *P. j. javanicus* (where it is 35-40) and also lesser than *P. abramus* (where it is 33-34 in types), but same as in *P. j. paterculus* (where it is 31 in type)." In our specimens it is 34 in four out of six examined, thus resembling *P. abramus*. It is important to note that Ellerman and Morrison - Scott (1951) treated *P. paterculus* as a subspecies of *P. abramus*, and even Hill (1962) once fully agreed with them in this respect.

Upper cheek teeth row.—In Hill's specimens as recorded by him upper cheek teeth row is shorter than in *P. j. javanicus* (and also in *P. abramus*, where it is 4.7-4.9). Although he distinguished his specimens from those of *P. paterculus* by "larger and more massive teeth" he failed to give any measurement in support of this. However, it is quite obvious that upper cheek teeth row is longer in his specimens (4.6-4.7) than in *P. paterculus* (where it is 4.5 in type). In our specimens it is 4.7-5.0, which is quite close to that of *P. abramus*.

Baculum.—This structure is of special significance especially in *abramus* group. While Thomas (1928) pointed out that in *P. abramus* it is doubly curved and in *P. paterculus* it is straight, a study of the material in the Zoological Survey of India reveals that it is doubly curved also in *P. paterculus* though differing slightly in measurements (Agrwal & Sinha, 1973). In our specimens it has been found that the baculum differs both from that of *P. paterculus* and also of *P. abramus* in being almost straight and smaller, in latter respect coming closer to *P. pequensis* Sinha (1969). Ellerman and Morrison-Scott (1951) treated *P. paterculus* as a subspecies of *P. abramus*. The present authors also hold the same view based now also on the similarities in baculum. Likewise, on the basis of dissimilarities in baculum, *P. camortae* should also be treated as a distinct species from *P. abramus*.

The above discussed facts show that while the forearm and cheek teeth row of *P. camortae* show its affinity with *P. abramus* measurements of its penis and baculum, and the structure of latter shows marked dissimilarity from *P. abramus*. Further, as already pointed out that *P. camortae* lacks the doubly curved baculum which is a very distinguishing character of *P. abramus*. Hence, we feel that *P. camortae* should be treated as a separate species.

SUMMARY

The paper deals with a small collection of *Pipistrellus camortae*

Miller from car Nicobar. Detailed description of its morphology and the study of the baculum are included. The distinct status of the species is considered.

ACKNOWLEDGEMENTS

We are much indebted to the Director, Zoological Survey of India, Calcutta, for his kind help and encouragement in the completion of this work. We are also thankful to Dr. P. D. Gupta, Deputy Director, Gangetic Plains Regional Station, Zoological Survey of India, Patna, for his keen interest in this paper.

REFERENCES

- AGRAWAL, V. C. and SINHA, Y. P. 1973. Studies on the bacula of some oriental bats. *Anat. Anz.*, **133** : 180-192.
- BLANFORD, 1888, 91. *Fauna of British India*, Mammalia, 1 & 2 ; London.
- CHATURVEDI, Y. 1969. Two new records of bats from Assam and Andaman Islands. *Labdev. J. Sci. Tech.*, Kanpur, **7** (B) : 74-75.
- DOBSON, G. E. 1876. *Monograph of the Asiatic Chiroptera and catalogue of the species of bats in the collection of the Indian Museum, Calcutta* ; London.
- DOBSON, G. E. 1878. *Catalogue of the Chiroptera in the British Museum* ; London.
- ELLERMAN, J. R. and MORRISON-SCOTT, T. C. S. 1951. *Check list of Palaearctic and Indian Mammals ; 1758-1946*, British Museum ; London.
- HARRISON, J. L. 1964. *Guide to Mammals of the Malay Peninsula* ; Singapore.
- HILL, J. E. 1962. Notes on some insectivores and bats from Upper Burma. *Proc. zool. Soc. London*, **139** : 119-137.
- HILL, J. E. 1967. The bats of the Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, **64** (1) : 1-9.
- MILLER, G. S. 1902. The mammals of the Andaman and Nicobar Islands. *Proc. U. S. natn. Mus.*, **24** : 751-795.
- SINHA, Y. P. 1969. A new pipistrelle bat from Burma (Mammalia :

Chiroptera : Vespertilionidae). *Proc. zool. Soc. Calcutta*, **22** (1) : 83-86.

SOOTA, T. D. and CHATURVEDI, Y 1971. On the new locality record of a bat, *Pipistrellus camortae* Miller, from Car Nicobar and a note on its systematic status. *Proc. 58th Indian Sci. Congr. Ass.*, (3) : 547-548 (Abstract).

TATE, G. H. H. 1942. Review of the Vespertilionid bats with special attention to genera and species of the Archbold collections. *Bull. Amer. Mus. nat. Hist.*, **80** : 221-297.

THOMAS, O. F. 1928. The Delacour Exploration of French Indochina, Mammal-2. On mammals collected during the winter of 1926-27. *Proc. zool. Soc. London*, (1) : 139-150.

THE MALAYAN SERPENT EAGLE, *SPILORNIS CHEELA MALAYENSIS* (SWANN), IN THE GREAT NICOBAR ISLAND, AN ADDITION TO THE INDIAN AVIFAUNA

By

S. S. SAHA AND J. M. DASGUPTA

Zoological Survey of India, Calcutta

In the Andaman and Nicobar group of islands, the insular forms of the Serpent Eagle, *Spilornis* G. R. Gray, have sometimes been described as separate species by some authors, while some other authors have considered them as conspecific. Baker (1928) recognized *S. elgini* as a distinct species, and maintained *davisini*, *minimus* and *klossi* as subspecies of *S. cheela*. Swann (1931) recognized *S. elgini*, *S. minimus* and *S. klossi* in addition to *S. cheela*, as distinct species, while treating *davisoni* as a subspecies of *S. cheela*. Peters (1931) listed them more or less along the lines of Swann, but treated *klossi* as a subspecies of *S. minimus*. Ripley (1964), and Ali and Ripley (1968), however, recognized only one species, that is *S. cheela*, and accepted *elgini*, *minimus* and *klossi* as its subspecies. They have treated *davisoni* as a synonym of *S. c. elgini*. Abdulali (1965, 1967) recognized *S. elgini* as a distinct species, but kept *minimus* and *klossi* as subspecies of *S. cheela*. Amadon (1968) recognized *S. elgini* and *S. klossi* as distinct species, but treated *davisoni* and *minimus* as subspecies of *S. cheela*. He commented : "Further study, especially in the field, may indicate that some of these races merit recognition as separate species, or alternately that some, now regarded as distinct species, should be merged with *S. cheela*" He also remarked : "Only on the Andaman Islands has there been a 'double invasion' with two species co-existing, and even they are said to be separated ecologically with one inland, the other in the mangroves"

In fact, the dark form *Spilornis elgini* (Blyth) and the light form *Spilornis cheela davisoni* Hume occur in the South Andaman Island, but they were found to be ecologically separated, the former living in the tree-forests and the latter in the coastal mangroves.

We came across another case of 'double invasion' in the Great Nicobar Island where *Spilornis klossi* Richmond and *Spilornis cheela malayensis* (Swann)* are involved, the former living in the closed type of tropical monsoon forest, while the latter in the forest edges and forest clearings near the coast.

* Peters (1931) listed it as *Spilornis cheela bassus* (J. R. Forster), but this could not stand as has been pointed out by Swann (1931, 156).

While working out a bird collection from Great Nicobar Island, we came across a female specimen of the Serpent Eagle, *Spilornis* from Campbell Bay, taken on 22 April 1975 by Shri P. K. Das, measuring 352, tail 227, bill 46 and tarsus 89 mm. This specimen could not be assigned to any other form but *Spilornis cheela malayensis* (Swann) because of its size and characteristic pattern of the tail and wing-bands, as well as spotting on the underparts and wing-coverts. The underparts are rather pale, not dark and with a slight trace of vermiculation. It is, compared to its nearest kins, larger in size than *minimus* (wing 293-304), but is smaller than *davisoni* (wing 393-430). Superficially it is very much like *davisoni*, but differs from it in being much lighter both above and below, dark parts of wing quills and rectrices are more intensely black, spottings on the upper primary coverts are obsolete, but those on the underparts are larger and broader, although there are less number of spots in each feather, and by the difference of patterns of the tail and wing-bands. Its ear-coverts, chin and throat are slate-brown.

SUMMARY

The finding of the Malayan Serpent Eagle in the Great Nicobar Island is an addition to the avifauna of that oceanic island group as well as of the Indian subregion. Its distribution has so far been recorded from the Malayan Peninsula and Sumatra.

REFERENCES

- ABDULALI, H. 1965. The Birds of the Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, **61** (3) : 509-510.
- ABDULALI, H. 1967. The Birds of the Nicobar Islands, with notes on some Andaman Birds. *J. Bombay nat. Hist. Soc.* **64** (2) : 155-156.
- ALI, S. and RIPLEY, S. D. 1968. *Handbook of the birds of India and Pakistan*. **1**, Bombay (Oxford University Press).
- AMADON, D. 1968. *Eagles, Hawks and Falcons of the World*. **1**, Feltham, Middlesex, U. K. (Leslie Brown and the Hamlyn Publishing Group Limited).
- BAKER, E. C. S. 1928. *Fauna of British India, Birds* (2nd Ed.) **5**, London (Taylor & Francis).
- PETERS, J. L. 1931. *Check-list of birds of the world*. **1**, Cambridge (Harvard University Press).

RIPLEY, S. D. 1964. *A synopsis of the birds of India and Pakistan*.
Bombay (Bombay Natural History Society).

SWANN, H. K. 1931. *Monograph of the birds of prey*. 1, London
(Wheldon & Wesley Ltd.).

A FURTHER CONTRIBUTION TO THE STUDY OF TERMITE FAUNA OF ANDAMAN AND NICOBAR ISLANDS

By

GEETA BOSE

Zoological Survey of India, Calcutta

(With 4 Text-figures)

INTRODUCTION

Roonwal and Bose (1970) made an extensive study of the termite fauna of Andaman and Nicobar Islands. They gave a history of the study of the termites of these islands and recorded 17 species and discussed their zoogeography. Since the publication of their work, a fairly good collection got accumulated again through further surveys of these islands, many of which were not surveyed earlier, including Great Nicobar. These recent collections form a further contribution to the study of termite fauna of this part of the Orient. Herein 16 species are recorded, 14 of which are same as reported earlier and two are new records including a species, *Nasutitermes triloki*, which is new to science. As such 19 species are now known from these islands. The soldier of *Neotermes andamanensis* Snyder has been described here for the first time and so also the imago of *Odontotermes latigula* Snyder.

The keys for identification and the synonymies, measurements, etc. of the species are not included in this paper for they have already been given in the previous publication (Roonwal & Bose, 1970). Where required comparisons have been given.

Abbreviations : coll., collected by ; ex., from or out of ; Im., imago ; Pw., pseudoworker ; Reg. No., Z. S. I. registration number ; S., soldier ; W., worker ; Z. S. I., Zoological Survey of India.

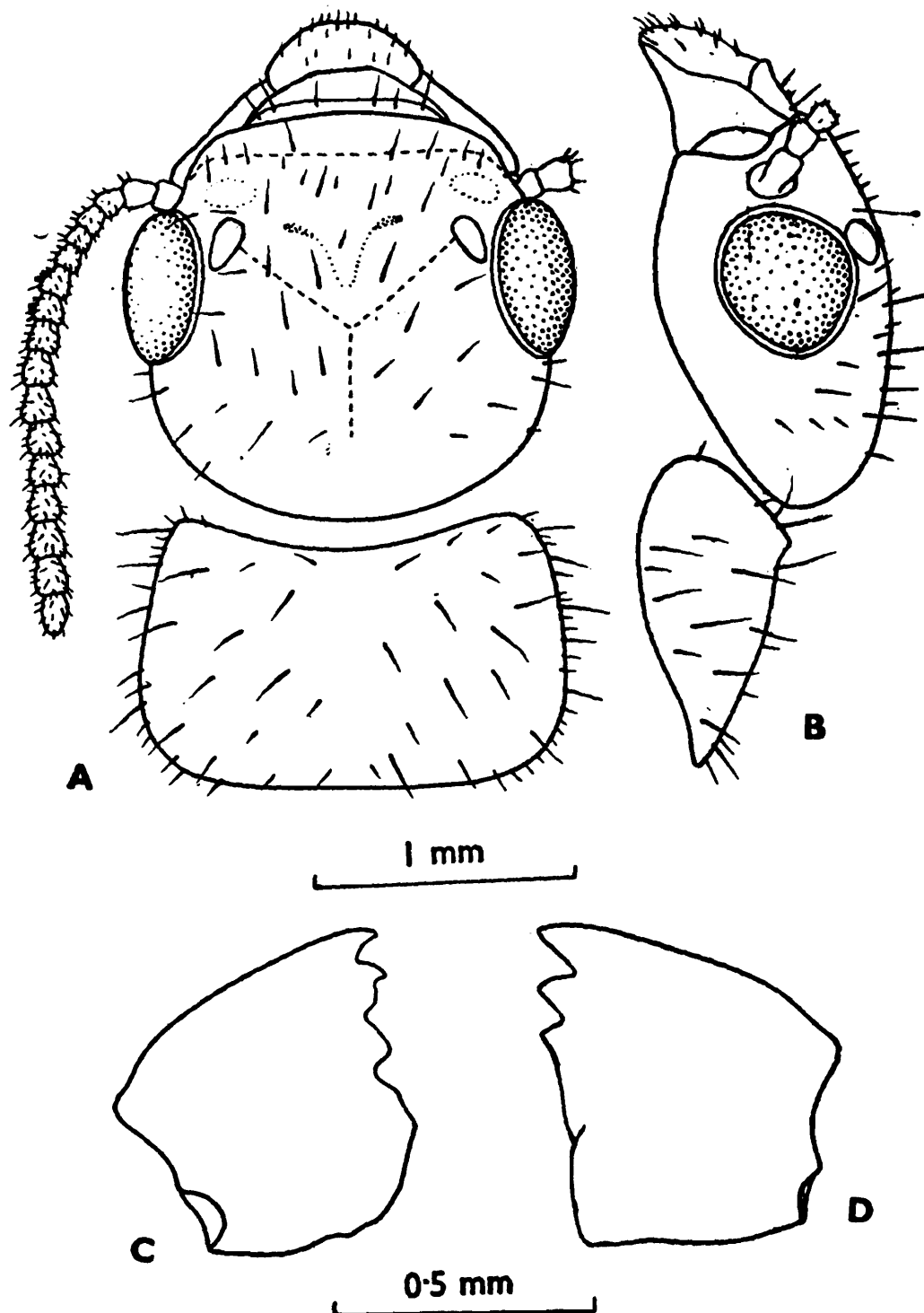
SYSTEMATIC ACCOUNT

Family KALOTERMITIDAE

1. *Neotermes andamanensis* Snyder

Snyder (1933) described the species, *Neotermes andamanensis* from a dealate adult, from North Andamans. His description was rather brief. The holotype (dealate ♀) is deposited in the British Museum Natural History, London and the morphotype (apterous ♀) deposited in the Forest Research Institute, Dehra Dun (India) is not traceable (Roonwal and Bose, 1970). No other material of this

species is available in any other museum. Recently the author came across a fairly good collection (3 vials, one from Maya Bunder, North Andamans and two from Humphrygunj, South Andamans; all coll. G. K. Srivastava, March, 1975) of this species, containing associated imāgos, soldiers and pseudoworkers. The inadequately known imago is redescribed and the hitherto unknown soldier and pseudoworker castes are described here for the first time, from this material.



Text-fig. 1. *Neotermes andamanensis* Snyder : Imago : A, head and pronotum, in dorsal view ; B, head and pronotum, in side view ; C and D, left and right mandibles.

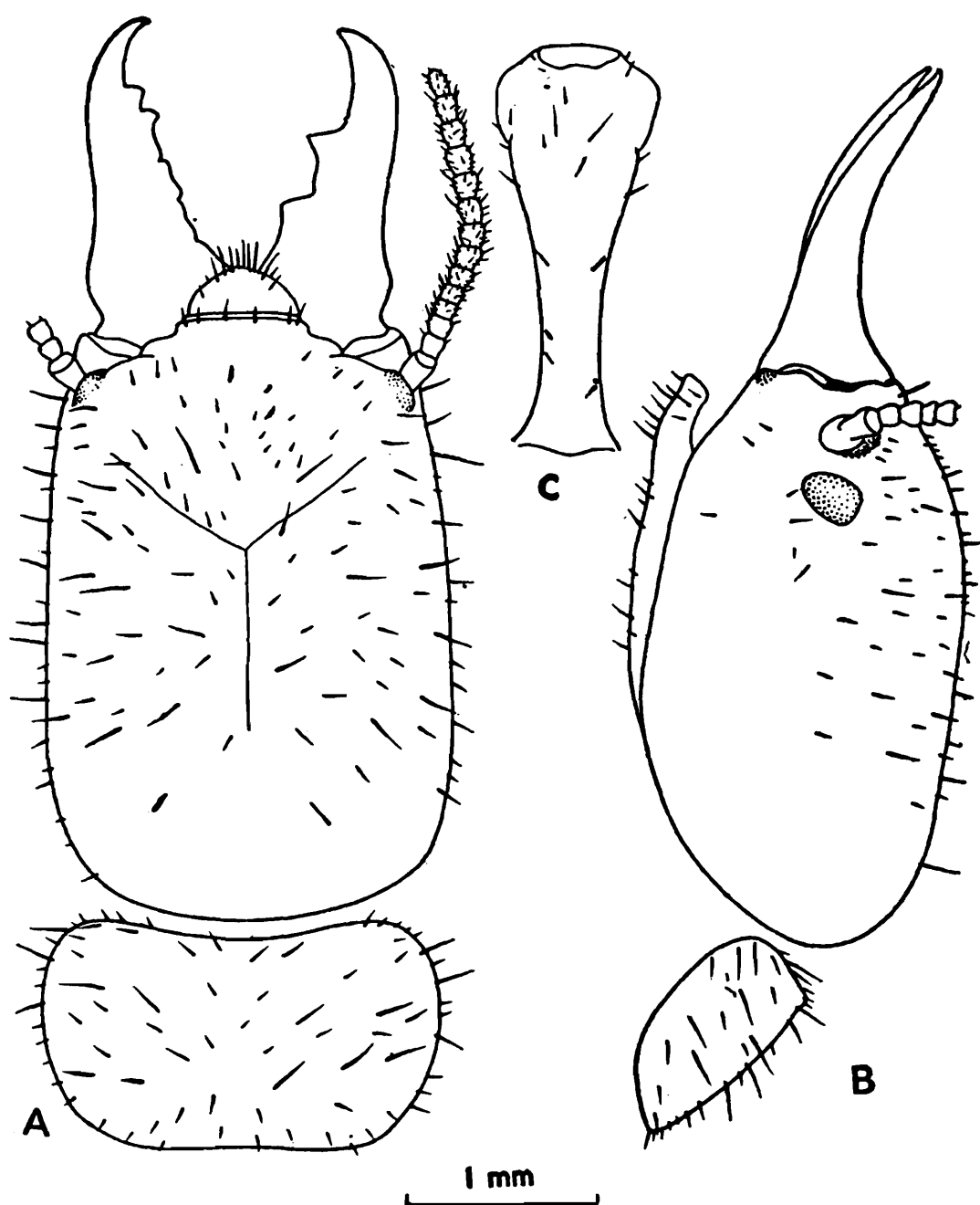
1. *IMAGO* (Text-fig. 1 ; Table 1) : Head capsule reddish brown ; antennae and labrum pale brown ; pronotum yellowish brown, somewhat darker posteriorly ; abdominal tergites paler than head-capsule ; sternites pale yellowish, distal 3-4 pale yellowish brown ; legs golden yellow ; wings pale brown ; all veins except cubitus, brown. Head and body fairly hairy.

TABLE 1.—Measurements (in mm) of imago of *Neotermes andamanensis* Snyder

Body parts	Range (5 exs)
1. Total body-length with wings (excluding antennae), <i>c</i>	14.10-14.60 (3 exs)
2. Total body-length without wings (excluding antennae), <i>c</i>	7.40- 7.90
3. Length of head to tip of labrum	1.93- 2.10
4. Length of head to lateral base of mandibles	1.47- 1.57
5. Maximum width of head (with eyes)	1.70- 1.77 (3 exs)
6. Maximum height of head	0.90- 1.00
7. Maximum length of labrum	0.40- 0.47
8. Maximum width of labrum	0.57- 0.60
9. Maximum diameter of compound eye (with ocular sclerite)	0.53- 0.60
10. Distance of eye from lateral margin	0.17- 0.20
11. Maximum diameter of lateral ocellus	0.23- 0.30
12. Minimum diameter of lateral ocellus	0.13- 0.17
13. Minimum ocellus-antennal distance	0.23- 0.27
14. Maximum length of pronotum	0.90- 1.10
15. Maximum width of pronotum	1.70- 1.73
16. Length of forewing with scale	11.90-12.40 (3 exs)
17. Length of forewing scale	1.40- 1.50
18. Length of hindwing with scale	11.20- 11.40 (3 exs)
19. Length of hindwing scale	0.57- 0.66

Head-capsule flat, subcircular ; width with eyes broader than length to base of mandibles ; Y-shaped epicranial suture present ; a pale, V-shaped mark in between lateral arms of suture and two pale, round spots, one on either side, between the antennae, present ; frons slightly sloping in front ; eyes fairly large, round ; situated very close to antennae and well separated from lateral margins. Ocelli oval, translucent, touching the eyes and almost as far from antennae

as their long diameter. Clypeus faintly divided into ante- and postclypeus; postclypeus pale yellowish, flat and with a few bristles; anteclypeus subtrapezoidal, apilose. Antennae with 17 segments; segment 1 long, cylindrical; 2 about half of 1; 3 slightly shorter than 2, somewhat more strongly chitinized; 4-10 or 11 subequal, broadly pyriform; onwards up to penultimate gradually increasing in length; last ovate, shorter and narrower than penultimate. Labrum broadly dome-shaped; broader than long. Mandibles of typically *Neotermes*-type. Left mandible with an apical and two marginal teeth; posterior margin of 1st marginal equal to anterior margin of second. Right mandible also with an apical and two



Text-fig. 2. *Neotermes andamanensis* Snyder : Soldier : A, head and pronotum, in dorsal view; B, head and pronotum, in side view; C, postmentum, in ventral view.

marginals ; posterior margin of second marginal subequal to molar plate. Pronotum flat ; almost as wide as head with eyes ; anterior margin fairly incurved ; antero-lateral corners narrower than postero-lateral ones ; posterior margin substraight or faintly incurved. Legs short ; tibia somewhat darker than femora, each with 3 apical spurs ; tarsi 4-jointed ; empodium between claws present. Wings transparent, faintly brownish ; anterior veins prominent, thick and brownish ; running close to each other ; cubitus faint and further removed ; membrane between media and cubitus with weak reticulation. Forewing : Costa running along anterior margin ; subcosta uniting with costa at about 1/5th of wing membrane ; radius joining costa at about middle or a little before middle ; radial sector running

TABLE 2.—Measurements (in mm) and indices of soldier of *Neotermes andamanensis* Snyder

Body parts	Range (4 exs)
1. Total body-length	10.00-11.50
2. Length of head to lateral base of mandibles	2.67- 3.03
3. Maximum width of head	2.10- 2.17
4. Maximum height of head	1.60- 1.70
5. Head index I (width/length)	0.69- 0.79
6. Head index II (height/width)	0.76- 0.81
7. Head index III (height/length)	0.56- 0.60
8. Eye diameter (Max.)	0.23- 0.33
9. Eye diameter (Min.)	0.15- 0.23
10. Min. eye-antennal distance	0.13- 0.15
11. Median length of labrum	0.23- 0.40
12. Maximum width of labrum	0.50- 0.57
13. Minimum length of mandibles (from upper base of condyle to tip) :	
Left mandible 	1.53- 1.60
Right mandible 	1.53- 1.60
14. Head-mandibular length index (left mandible-length/head-length)	0.53- 0.57
15. Minimum (median) length of postmentum	1.93- 2.33
16. Maximum width of postementum	0.73- 0.83
17. Minimum width of postmentum	0.25- 0.33
18. Maximum length of pronotum	1.03- 1.17
19. Maximum width of pronotum	2.00- 2.23

parallel with costa all along and giving off 6 oblique branches to latter ; media parallel to radial sector and connected to it by 6-7 evanescent branches ; cubitus with 13-15 branches to posterior margin. Hindwing : Costa and subcosta fused ; radius fusing with costa-subcosta at about middle ; radial sector as in the forewing ; media arising from radial sector a little before 1/3rd of wing-membrane, otherwise as in forewing ; cubitus with about 12 branches to posterior margin. Abdomen oblong ; anterior tergites with a row of long bristles near posterior margin ; distal tergites somewhat more hairy. Cerci 2-jointed ; 0.20 mm long. Styli (in male) single-jointed ; 0.17 mm long.

2. *SOLDIER* (Text-fig. 2 ; Table 2) : Head-capsule yellowish brown, frons, somewhat darker ; labrum and antennae light brownish, antennae paler distally ; mandibles blackish, dark reddish brown basally ; pronotum yellowish, anterior and posterior margins darker ; legs pale yellowish ; abdomen creamy white to pale yellowish. Head-capsule and pronotum fairly hairy, with long and short bristles ; meso- and meta-nota and abdominal tergites with a row of long bristles in middle and several short hairs, visible only in reflected light.

Head-capsule flat, subrectangular ; length about 1.3 to 1.45 times of width ; Y-shaped epicranial suture fairly marked ; frons inclining in front at an angle of about 45° Eyes oval, unpigmented ; 0.23-0.33 mm long and 0.15-0.23 mm wide. Clypeus demarcated from frons by a short line at base of mandibles ; postclypeus slightly darker than frons, pilose near anterior margin ; anteclypeus thin, strip-like, apilose. Labrum broad, sub-rectangular to subsquarish ; anterior margin weakly curved. Antennae with 14 segments ; segment 1 cylindrical, more than half covered by carina ; 2 half of 1 ; 3 longer than 2, pyriform and somewhat more strongly chitinized ; 4 shortest ; 5-7 gradually increasing in length, short and pyriform ; 8-13 gradually decreasing in length ; last oval, shorter and narrower than penultimate. Mandibles strong and robust ; left mandible with 5 and right with 2 marginal teeth, as in fig 2 A. Postmentum long, club-shaped ; anterior wider portion weakly divided into 2 halves and about two and a half times as wide as at waist. Pronotum flat, subrectangular ; almost as wide as head ; anterior margin fairly incurved. Legs short and stout ; each tibia with 3 apical spurs ; tarsi 4-jointed. Abdomen oblong hairy. Cerci 2-jointed ; 0.20 mm long. Styli single jointed, finger-like ; 0.20 mm long.

3. *PSEUDOWORKER* : Head-capsule, antennae and labrum pale yellow ; body and legs creamy white. Head and body moderately hairy. Total body length 6.60-9.30 mm.

Head-capsule subcircular ; broader than or as broad as length to base of mandibles. (length 1.57-1.72, width 1.67-1.80 mm). Eye spots unpigmented ; oval to subcircular, discernible only in strong

light. Antennae with 14 segments ; segment 2 half of 1 ; 3 shorter than 2 ; 4 shortest. Postclypeus flat, subrectangular, with a few hairs on side margins ; anteclypeus, apilose, narrow, strip-like. Mandibles as in imago. Pronotum (length 0.87-1.0, width 1.67-1.90 mm) and legs as in soldier, but paler in colour. Abdomen as in soldier.

Family RHINOTERMITIDAE

Subfamily COPTOTERMITINAE

2. *Coptotermes heimi* (Wasmann)

Material.—Seventeen vials with S. and W., as follows : Eight vials, coll. *B. S. Lamba*, Feb.-April, 1964, Port Blair, Wrafter's Creek, Baratang, Manner Ghat, Mt. Harriet ; Wright Myo ; and Burma Nullah (S. Andamans). Three vials, coll. *B. K. Tikader*, Apr.-July, 1971, Aerial Bay Jetty, Diglipur, (North Andamans) ; and Chiriatapu (S. Andamans). Three vials, coll. *K. S. Pradhan* and *G. S. Arora*, Dec. 1972-Jan. 1973, Hope Town, Port Blair (S. Andamans) ; Lapatty (Car Nicobar) ; and Yerata (Middle Andamans) ; Two vials, coll. *G. K. Srivastava*, March 1975, Humphrygunj and Port Blair (S. Andamans).

Distribution.—Andamans : North Middle and South Andamans and Little Andamans. It is a very widely distributed species in the Indian subcontinent and is also reported from middle Java. Earlier (Roonwal & Bose, 1970) it was reported from Little Andamans only.

3. *Coptotermes travians* Haviland

Material.—Three vials, S. and W., coll. *B. K. Tikader*, Apr.-May, 1971, from Havelock Is. (S. Andamans) and Maya Bunder (North Andamans).

Distribution.—From Andamans, this species was known only from North Andamans and Car Nicobar. Now it is reported from South Andamans. It is, however, a widely distributed species in the Orient.

Subfamily PRORHINOTERMITINAE

4. *Prorhinotermes flavus* (Bugnion & Popoff)

Material.—Six vials, S. and W., coll. *A. Daniel*, *H. K. Bhowmick*, *G. U. Kurup* and party, March to April 1966, Phulobaha, Gala River and Campbell Bay (Great Nicobar).

Distribution.—This species was described from Sri Lanka and later reported from the Little Andamans and Indian mainland. In the present account it has been recorded from the Great Nicobar Island.

Subfamily RHINOTERMITINAE

5. *Schedorhinotermes eleanorae* Roonwal & Bose

1970. *Schedorhinotermes eleanorae* Roonwal and Bose, *Rec. zool. Surv. India*, 62 (3 & 4) : 125-132.

Material.—One vial, S. and W., coll. B. K. Tikader, April 1970, Neil Is. Reserve Forest (South Andamans).

Distribution.—Roonwal & Bose (1970) described it from little Andamans (type-locality) and now it has been collected from South Andamans.

6. *Schedorhinotermes longirostris* (Brauer)

Material.—Six vials, S. and W., A. Daniel, H. K. Bhowmick, G. U. Kurup and party, March to April 1966, Galathea Bay, Gala Bay and Campbell Bay (Great Nicobar).

Distribution.—The species had only once been reported from Kondul Is., Nicobars (type-locality) which lies adjacent to Great Nicobar. In this account it is now reported from Great Nicobar Is. proper.

7. *Schedorhinotermes medioobscurus* Holmgren

Material.—Six vials, S. and W., coll. B. S. Lamba, Mar.-Apr. 1964, Jarva's Creek, Baratang Humphrygunj, Chiriatapu, Manner, Ghat, Mount Harriet Range, and Cowriaghat (South Andamans). Two vials, S. and W., coll. B. K. Tikader, April 1970 and May 1971, Wright Myo and Chiriatapu (South Andamans). Six vials, S. and W., coll. K. S. Pradhan and G. S. Arora, December 1972-Jan. 1973, Wright Myo, Panighat, Ferrargunj (South Andamans) and Bakultala (Middle Andamans). Three vials, S. and W., coll. G. K. Srivastava, Feb.-March 1975, Rangat (Middle Andamans), Kalatang and Ferrargunj (South Andamans).

Distribution.—Middle and south Andamans (Previous and present records). This species is also known from Malaya and Singapore.

8. Schedorhinotermes tiwarii Roonwal & Thakur

Material.—One vial, S. and W., coll. *B. S. Lamba*, March 1964, Wrafter's Creek, Baratang (S. Andamans).

Distribution.—South Andamans and Little Andamans (Previous and present records).

Family TERMITIDAE

Subfamily TERMITINAE

9. Microcerotermes danieli Roonwal & Bose

1970. *Microcerotermes danieli* Roonwal & Bose, *Rec. zool. Surv. India*, 62 (3 & 4) : 141-146.

Material.—Six vials, Im., S., W., coll. *B. S. Lamba*, March-April 1964, from Wrafter's Creek, Rajatgarh, Wright Myo and Cowriaghat (South Andamans). Four vials, S., W., coll. *B. K. Tikader*, April-June 1971, from Smith Island (North Andamans). Three vials, Im., S., W., coll. *G. K. Srivastava*, Mar. 1975, from Port Blair, Humphrygunj and Ferrargunj (South Andamans).

Distribution.—This species was recorded from North, South and Little Andamans. From South Andamans it had been reported from Phoenix Bay, Port Blair only, and presently it is reported from some other localities in South Andamans as given under material above.

10. Microcerotermes nicobarensis Roonwal & Bose

1970. *Micorcerotermes nicobarensis* Roonwal & Bose, *Rec. zool. Surv. India*, 62 (3 & 4) : 146-154.

Material.—Twelve vials with S. and W., as follows : One vial, coll. *B. S. Lamba*, March 1964, Port Blair (South Andamans) Six vials, coll. *B. K. Tikader*, March 1970, from Malacca village, Keating Point and Arong village (Car Nicobar) and Camorta Is. (Nicobars). One vial, coll. *K. S. Pradhan* and *G. S. Arora*, December 1972, from Kakana (Car Nicobar). Four vials, coll. *A. Daniel*, *H. K. Bhowmick* *G. U. Kurup* and party, March-April 1966, from Galathea Bay and Campbell Bay (Great Nicobar).

Distribution.—This species was described from Car Nicobar and Ross Is. (South Andamans). Recently, it has been collected again from South Andamans, Car Nicobar, Camorta Is. (Nicobars) and Great Nicobar Island.

Subfamily MACROTERMITINAE

11. *Odontotermes latigula* Snyder

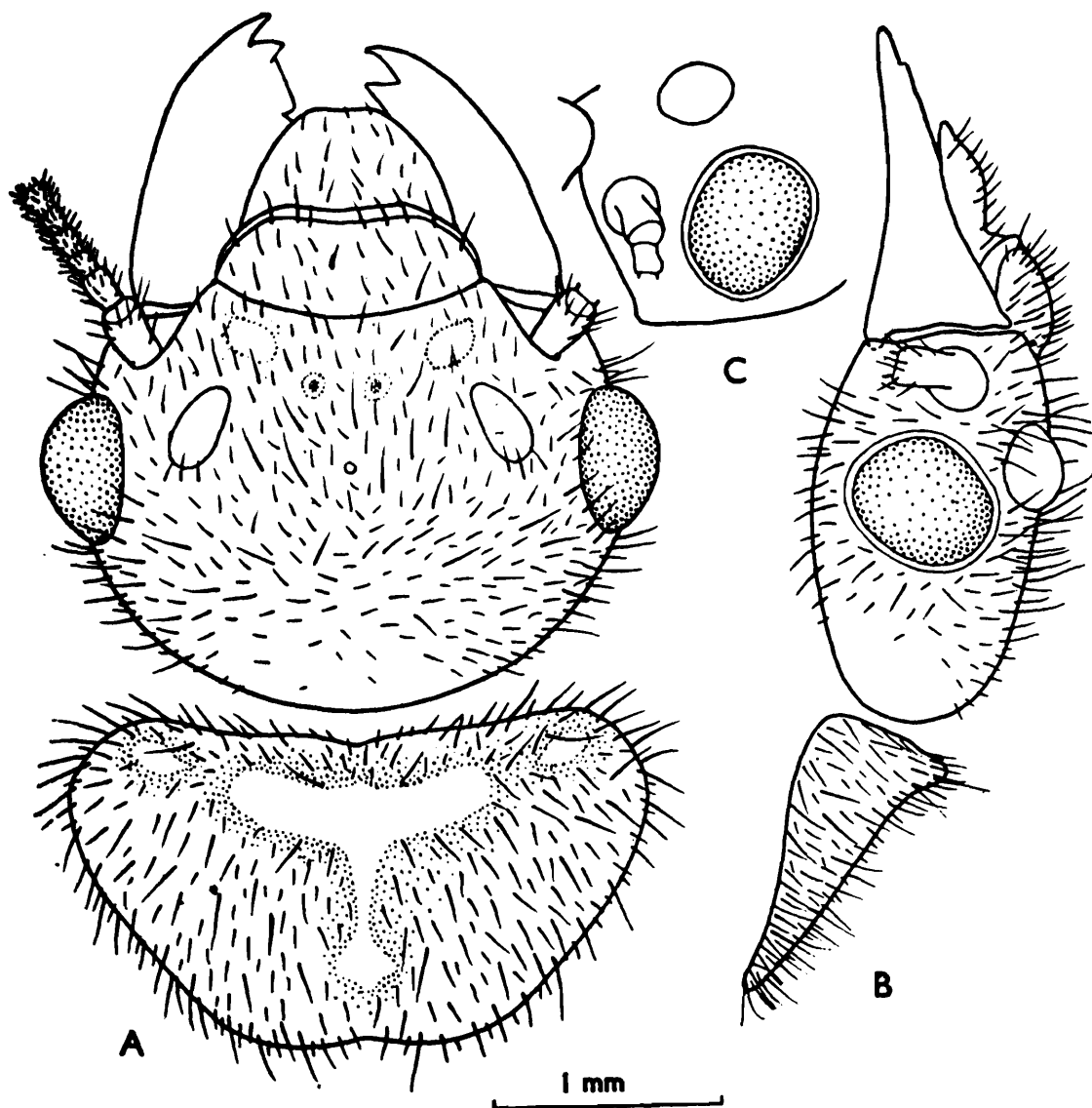
Material.—Sixtyseven vials with S. and W., as follows : Fourteen vials, coll. *B. S. Lamba*, Feb.-April 1964, from Port Blair, Wrafter's Creek, Humphrygunj, Wright Myo, Jarva's Creek, Baratang, Cowriaghat and Burma Nulla (South Andamans). Fifteen vials, coll. *B. K. Tikader*, Feb. 1970 and Apr.-May 1971, from Diglipur, Smith Island and Maya Bunder (North Andamans); Wright Myo, Port Blair, Chiriatapu and Haddo (South Andamans). Two vials, coll. *A. K. Mondal*, from Rangee Chak and Chiriatapu (South Andamans). Twelve vials, coll. *K. S. Pradhan* and *G. S. Arora*, from Maya Bunder (North Andamans); Rangat Bay, Panchwati and Bakultala (Middle Andamans); Aberdeen Bay, Humphrygunj and Ferrargunj (South Andamans). Twentyfour vials, coll. *G. K. Srivastava*, Mar. 1975, from Maya Bunder (North Andamans); Bakultala, Rangat and Webi (Middle Andamans); Humphrygunj, Ferrargunj, Wright Myo, Corbyn's Cove, Port Blair, Monglutan and Chiriatapu (South Andamans).

A vial with Im., S. and W., Smith Island (North Andamans) coll. *B. K. Tikader*, 27. iv. 1971, ex "mound"

Description.—The hitherto unknown imago caste of this species is described below.

IMAGO (Text-fig. 3 ; Table 3) : Head-capsule dark reddish-brown, paler anteriorly; fontanelle plate light brownish yellow; antennae brownish; eyes black; ocelli translucent; postclypeus pale yellowish brown; anteclypeus hyaline; labrum pale yellowish with a brownish chitinized band in middle; mandibles pale brownish, teeth dark brown; pronotum, dark brown, with T-shaped lighter marking on dorsum; wing veins dark brown, membrane paler, legs pale brownish yellow; abdominal tergites dark brown, paler than head and pronotum. Head and body densely hairy. Total length with wings 25.10-25.50, without wings 11.40-12.60 mm.

Head-capsule subcircular, broader than long (head-width with eyes 2.50-2.55, head-length to base of mandibles 1.80-1.82 mm). Fontanelle plate, small, suboval. Eyes subcircular, strongly convexical. Ocelli large, oval, convexical; from eyes situated at a distance of less than their short diameter. Antennae with 19 segments; segment 3 short, subequal to 4 and 5. Labrum broadly tongue-shaped. Mandibles typically *Odontotermes*-type. Pronotum flat, almost as broad as head with eyes, subsemicircular and with a pale, irregular T-shaped mark on dorsum; anterior margin substraight, weakly raised and incised medially; sides converging to a narrower, weakly emarginate posterior margin. Wings long, narrow; scales short. Forewing : Radial streak separating from Radial sector at about half the length of wing membrane; media giving off 3 main and 3 smaller branches to apex of wing; cubitus giving off several branches to



Text-fig. 3. *Odontotermes latigula* Snyder : Imago : A, head and pronotum ; in dorsal view ; B, head and pronotum, in side view ; C, portion of head, showing the position of eye, ocellus and antenna.

lower margin. Hindwing : Radial streak separating at middle of wing-membrane ; media arising from radial sector and giving off a few small branches to upper margin of wing and to wing-apex ; cubitus as in forewing. Legs long, apical tibial spurs 3 : 2 : 2 Abdomen oval ; cerci 2-jointed, 0.15 mm long ; styli single-jointed, 0.05 mm long.

Distribution.—*Odontotermes latigula* was previously known from North, Middle and South Andamans, Little Andamans and Car Nicobar. In the present account it is reported from several more localities in North Middle and South Andamans as given above under "Material" It is also known from Burma.

TABLE 3.—Measurements (in mm) of imago of *Odontotermes latigula* Snyder

Body parts	Range (2 exs)
1. Total body-length without wings <i>c</i>	25.10-25.50
2. Total body-length with wings <i>c</i>	11.40-12.60
3. Length of head to tip of Labrum	2.60- 2.62
4. Length of head to lateral base of mandibles	1.80- 1.82
5. Maximum width of head including eyes	2.51- 2.55
6. Maximum length of labrum	0.50- 0.53
7. Maximum width of labrum	0.83- 0.90
8. Maximum diameter of eye	0.64- 0.68
9. Minimum diameter of eye	0.60- 0.61
10. Eye-antennal distance	0.08- 0.13
11. Maximum diameter of ocellus	0.33- 0.38
12. Minimum diameter of ocellus	0.28- 0.32
13. Eye-ocellus distance	0.15- 0.23
14. Maximum width of postclypeus	0.40- 0.45
15. Maximum width of postclypeus	1.05- 1.15
16. Maximum length of pronotum	1.23- 1.30
17. Maximum width of pronotum	2.25- 2.30
18. Length of forewing with scale	22.00-22.50
19. Length of forewing scale	1.00- 1.10
20. Length of hindwing with scale	20.60-20.65
21. Length of hindwing scale	1.00- 1.05

12. *Odontotermes paralatigula* Chatterjee and Sen-Sarma

1962. *Odontotermes paralatigula* Chatterjee and Sen-Sarma, *J. Bombay nat. Hist. Soc.*, 59 (3) : 822-826.

Material.—Four vials with S. and W., as follows :—One, vial, coll. B. S. Lamba, March 1964, Humphrygunj (S. Andamans). One vial, coll. K. S. Pradhan and G. S. Arora, Jan. 1973, Ferrargunj (S. Andamans). Two vials, coll. G. K. Srivastava, March 1975, Humphrygunj and Monglutan (S. Andamans).

Distribution.—This species was so far known only from Hlegu

Range. Insein Forest Division, (Burma type-locality). It is now reported from South Andamans.

Subfamily NASUTITERMITINAE

13. *Nasutitermes krishna* Roonwal & Bose

1970. *Nasutitermes krishna* Roonwal & Bose, *Rec. zool. Surv. India.*, 62 (3 & 4): 157-161.

Material.—Four vials, with S. and W., from South Andamans, as follows :—One vial, coll. *B. S. Lamba*, March 1964, from Port Blair. Three vials, coll. *G. K. Srivastava*, March 1975, from Chiriatapu and Humphrygunj.

Distribution.—This species was first recorded from the little Andamans (type-locality) and North Andamans. In the present account it is reported from South Andamans.

14. *Nasutitermes matangensis matangensiformis* (Holmgren)

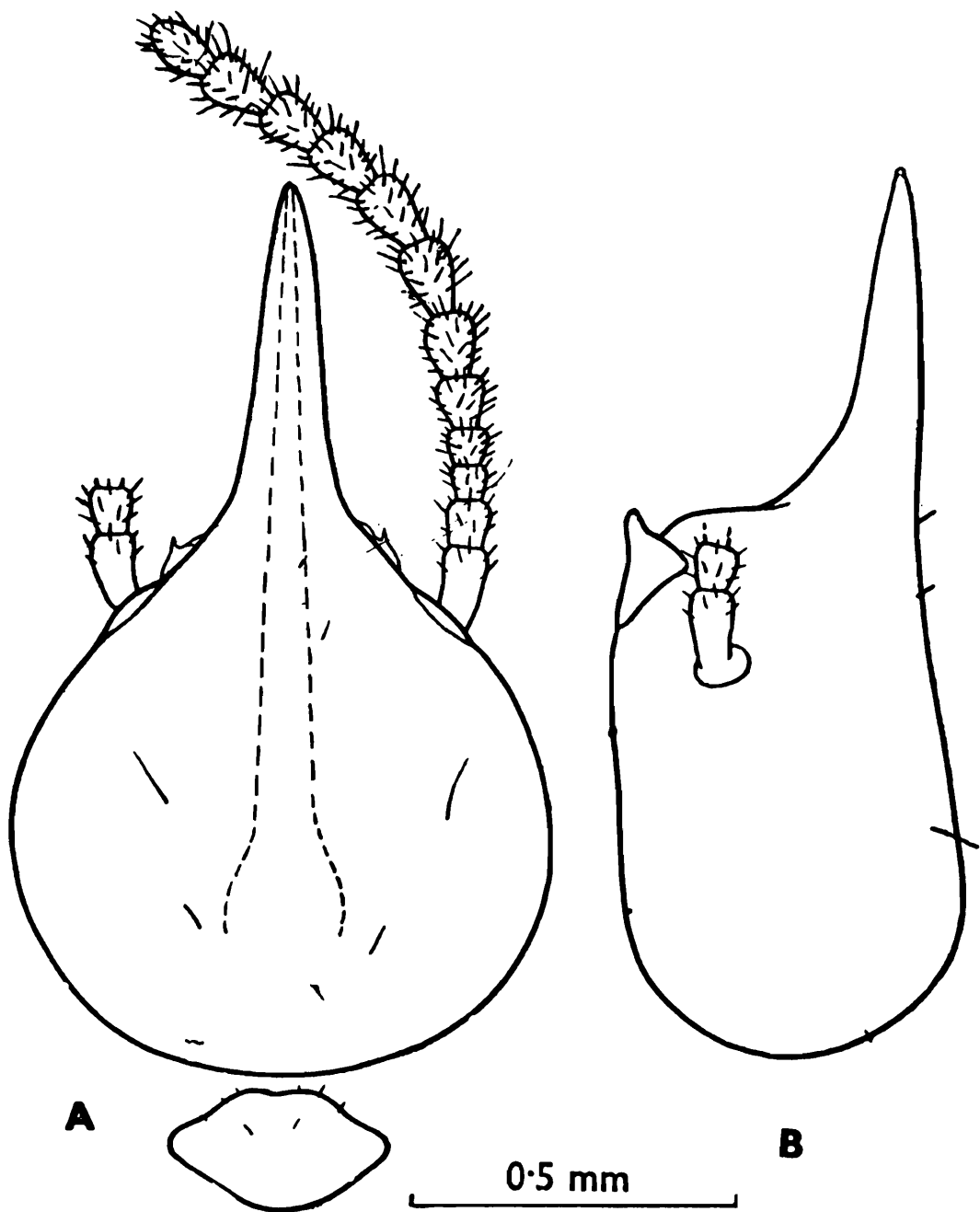
Material.—Thirtyfive vials with S. and W., as follows :—Five vials, coll. *B. S. Lamba*, Feb.-Mar. 1964, from Junglighat, Port Blair, Chabagicha, Mannar Ghat and Mt. Harriet (South Andamans). Nine vials, coll. *B. K. Tikader*, Feb.-Mar. 1970, and Apr.-May 1971, from Wright Myo, Chiriatapu and Neil Is. (South Andamans) and Malacca village, Keating point and Kakana (Car Nicobar) and Camorta Is. (Nicobars). Six vials, coll. *K. S. Pradhan* and *G. S. Arora*, Dec. 1972 from Cadlegunj and Chiriatapu (South Andamans) and Sawai, Arong and Kakana (Car Nicobar). One vial, coll. *S. K. Bhattacharya*, Jan. 1975, from Ramnagar (Nicobar Is.). Fourteen vials, coll. *A. Daniel*, *H. K. Bhowmick*, *G. U. Kurup* and party, Mar.-Apr. 1966, from Campbell Bay (Great Nicobar).

Distribution.—This species was previously recorded from Nicobars (Nankauri Is. and Camorta Is.), Car Nicobar Is. and Little Andaman, and from Malaysia and Indonesia. Presently, from Andaman and Nicobar group of islands, it is reported from Great Nicobar and South Andamans.

15. *Nasutitermes triloki* sp. n.

Material.—One vial with 10 S. and 4 W., coll. *B. K. Tikader*, 19. iv. 1970, Havelock Island, South Andamans.

Description.—1. *IMAGO*. Unknown.



Text-fig. 4. *Nasutitermes triloki* sp. n. Soldier : A, head and pronotum ; in dorsal view ; B, head, in side view.

2. **SOLDIER** (Text-fig. 4 ; Table 4) : Head-capsule pale creamy yellow, a little darker anteriorly ; rostrum pale yellowish brown ; antennae, pronotum, legs and abdomen creamy yellow. Head-capsule with numerous short and 1 or 3 pairs of long, hairs ; rostrum tip with a number of short hairs ; abdominal tergites also with short and a few long, hairs. Total body length 3.30-3.75 mm.

Head-capsule excluding rostrum subcircular, sides converging in front from base of antennae ; in profile head shallowly incurved ; posterior margin rounded. Rostrum slenderly conical ; shorter than head without rostrum (absolute length of rostrum 0.55-0.62, head-

length with rostrum 0.83-0.88 mm). Fontanelle gland not very clear, tube prominently visible. Antennae with 12 segments ; all segments pilose, segment 3 shortest. Mandibles vestigial ; each with a minute, spine-like process, situated at about middle. Pronotum saddle-shaped ; with a few minute hairs ; anterior margin convexical, weakly emarginate ; posterior margin rounded. Mesonotum subsemicircular, narrower than pronotum. Metanotum also subsemicircular, larger than pronotum. Legs moderately long and with long pilosity ; apical tibial spurs 2 : 2 : 2. Abdomen : Oblong, cerci 2 jointed, 0.05 mm long.

TABLE 4.—Measurements (in mm), etc. of soldier of *Nasutitermes triloki* sp. n.

Body parts	Range (5 exs)	Holotype
1. Total body-length (excluding antennae) c	3.30-3.75	3.70
2. Length of head including rostrum	1.43-1.45	1.45
3. Length of head without rostrum	0.83-0.88	0.85
4. Length of rostrum	0.55-0.62	0.60
5. Maximum width of head	0.83-0.95	0.83
6. Height of head	0.55-0.65	0.55
7. Posterior bulge of head	0.20-0.25	0.20
8. Minimum median length of postmentum	0.33-0.40	0.40
9. Maximum width of postmentum	0.25-0.30	0.26
10. Width of postmentum at anterior end	0.15-0.18	0.15
11. Maximum length of pronotum	0.24-0.28	0.24
12. Maximum width of pronotum	0.42-0.48	0.42
13. Maximum width of mesonotum	0.43-0.45	0.45
14. Maximum width of metanotum	0.48-0.55	0.55

3. *WORKER* : Head pale creamy yellow ; antennae, labrum, thorax, legs and abdomen creamy white ; mandibles pale creamy yellow, teeth light reddish brown. Total body length 3.50 mm.

Head subsquarish, broader than long (length of head to base of mandibles 0.83-0.85, head width 0.95-0.98 mm) ; sides diverging a little anteriorly. Antennae with 13 segments, segment 3 shortest. Postclypeus swollen, semicircular. Anteclypeus hyaline, subtrapezoidal. Mandibles of *Nasutitermes*-type. Pronotum saddle-shaped, very small (width 0.53, length 0.25-0.28 mm) ; weakly pilose. Legs fairly long, slender, weakly pilose, apical tibial spurs 2 : 2 : 2. Abdomen oblong, sparsely hairy.

Type specimens : Holotype S., Reg. No. 2263/H11 ; morphotype W., Reg. No. 2264/H11 ; and paratype S. (7) and parmorphotype W. (3), Reg. No. 2265/H11, all vide 'Material' above, in the National Zoological Collections, Z. S. I., Calcutta. A paratype S., each, deposited in Entomological Collection, Forest Research Institute, Dehra Dun (U.P., India) and in American Museum of Natural History, New York (U. S. A.).

Type locality : Havelock Island, South Andamans, India.

Comparisons : The soldier of *Nasutitermes triloki* sp. n. is separable from the other species of *Nasutitermes* of the region by its smaller size and pale colouration. From *N. matangensis matangensis-formis*, it is distinguished by its small size, delicate body, pale colour and extremely minute spines on mandibles. From *N. krishna*, the other species found in the Andamans and to which it is closest, it can be differentiated as follows : (i) Smaller and head pale yellow (vs larger and head dark reddish brown). (ii) Head subcircular, narrower, converging in front (vs nearly pear-shaped and broad). (iii) Rostrum slenderly conical, not very broad at base, (vs conical but thicker and broader at base). (iv) Spine on mandibles very minute (vs somewhat larger in *krishna*).

16. *Hospitalitermes blairi* Roonwal and Sen-Sarma

1956. *Hospitalitermes blairi* Roonwal and Sen-Sarma, *Indian J. agric. Sci.*, 26 (1) : 29-36.

Material.—Eighteen vials with S. and W., as follows : Nine vials coll. B. S. Lamba, Mar.-Apr. 1964, from Port Blair, Wrafter's Creek, Wright Myo, Shoal Bay, Cowriaghat, Rangachang and Burma Nulla (South Andamans). Two vials, coll. B. K. Tikaper, Apr. 1970 and May 1971, from Rangat Bay Jetty (Middle Andamans) and Chriatapu (South Andamans). Two vials coll. A. K. Mondal, July-Aug. 1972, Nimak Pahar and Chriatapu (South Andamans). One vial, coll. K. S. Pradhan, and G. S. Arora, Dec. 1972, from Humphry-gunj (South Andaman). Four vials, coll. A. Daniel, H. K. Bhowmick, G. U. Kurup and party, Mar.-Apr. 1966, from Campbell Bay, and Mangrove Creek Area (Great Nicobar Island).

Distribution.—This species was previously recorded from South Andamans. Recently it has been collected (vide material above) from Middle and South Andamans and the Great Nicobar Is.

SUMMARY

An extensive study of the termite fauna of Andaman and Nicobar Islands was undertaken by Roonwal and Bose (1970).

This present contribution deals with the study of further collections of termites, obtained from the recent surveys of these islands, many which were not previously visited by earlier survey parties of the department. A species new to science is reported and described here, the species *Neotermes andamanensis* which had been rather briefly described from only the imago, and not collected since its original description is redescribed from some recent collections. The soldier of this species, (*N. andamanensis*) and the imago of *Odontotermes latigula* are described here for the first time. *Odontotermes paralatigula* which was not known from the Andamans is newly reported from these islands.

ACKNOWLEDGEMENTS

The author is deeply grateful to the Director, Zoological Survey of India for facilities and encouragements ; to Dr. O. B. Chhotani for assistance in various ways ; to all the scientists whose valuable collections have helped to make this paper possible and to Shri A. K. Ghosh, Artist (Grade 1) for making the drawings for this paper.

REFERENCES

- ROONWAL, M. L. and BOSE, G. 1970. Taxonomy and zoogeography of the termite fauna of Andaman and Nicobar Islands. *Rec. zool. Surv. India*, 62 (3 & 4) : 109-170.
- SNYDER, T. E. 1933. New termites from India. *Proc. U. S. natn. Mus.*, 82 (Art. 16) : 1-15.

SOME SPIDER MITES (ACARINA : TETRANYCHIDAE) FROM ANDAMAN AND NICOBAR ISLANDS WITH DESCRIPTIONS OF THREE NEW SPECIES

By

Y N. GUPTA

Zoological Survey of India, Calcutta

(With 3 Text-figures)

INTRODUCTION

Tetranychid mites, commonly known as spider mites, have considerable economic importance being injurious to the plant epidermis, leaves etc. Heavy infestations may lead to the bloching, stippling and bronzing of the leaves, as a result leaves may fall down and fruits may become scarce.

So far six species have been reported from Andaman and Nicobar Islands (Gupta, 1976). The present communication reports occurrence of another seven species. Of these *Aponychus sarjui*, *Schizotetranychus mansoni* and *Oligonychus manishi* are being described as new to science and the remaining four represent new record to this part of the country. Species recorded are briefly characterised and new species are described in detail. All drawing were prepared by the author from specimens mounted in lactic acid. All type specimens are deposited in the National Collection of the Zoological Survey of India, Calcutta.

1. *Aponychus sarjui* sp. n.

(Text-fig. 1 A-C)

Male : Unknown.

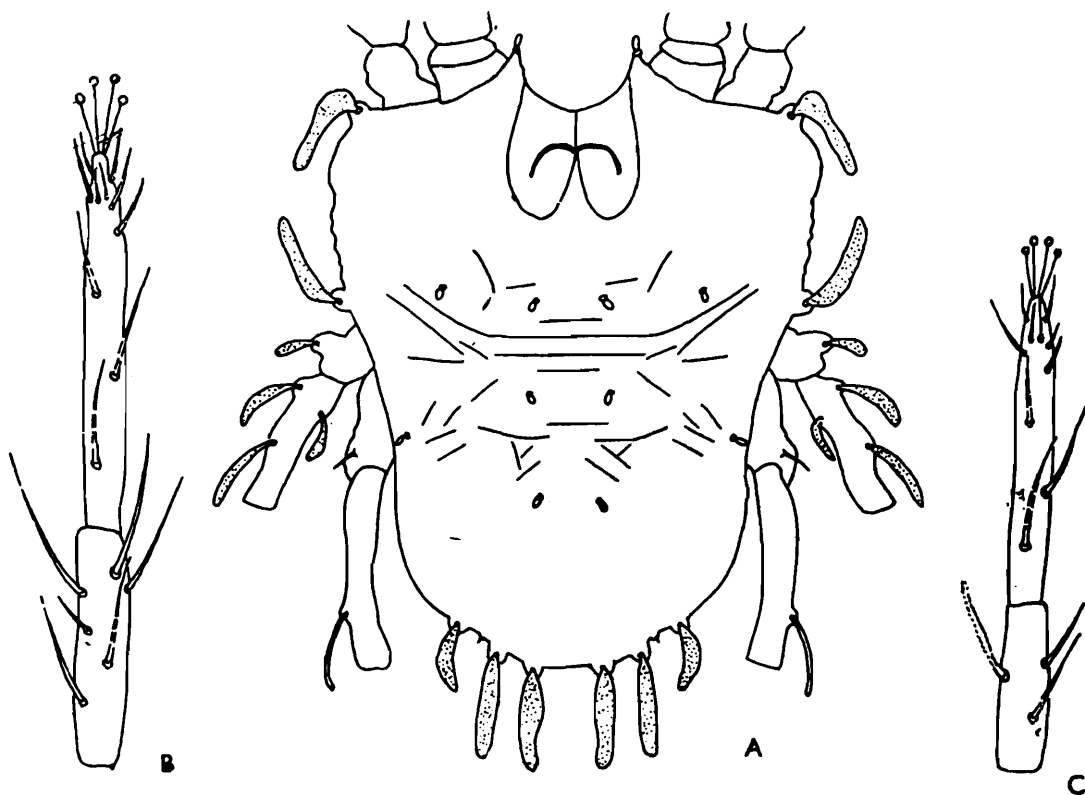
Female : Body including rostrum, 511 μ long, 234 μ wide ; oblong. Idiosoma with dorsal integument wrinkled as figured. Idiosomal setae spatulate, serrate. Dorsocentral, first and second dorsolateral hysterosomal setae are minute. Third propodosomal, humerals, third dorsolaterals same in length, inner sacrals small and outer sacrals and clunals large and same in length. Peritreme U-shaped. Genital flap with transverse striae. Palpus with terminal sensillum slender, dorsal sensillum much smaller. Legs with spatulate setae on proximal dorsum. Tibia I with one sensory and four tactile setae, tarsus I with 10 tactile setae. Tibia II with one sensory and two tactile setae, tarsus II with 10 tactile setae.

Holotype : ♀, South ANDAMAN ISLAND, Chiriatapu, on

bamboo (*Bambusa* sp.), 20. xii. 1972, coll. S. K. Gupta (Reg. No. 3081/17).

Remarks.—This new species resembles to *Aponychus siamensis* Ehara but can be distinguished by the small size of inner sacra and the number of the sensory and tactile setae in tibia and tarsus of legs I and II.

This species is named in honour of my father Sri Sarju Prasad.



Text-fig. 1. *Aponychus sarjui* sp. n., ♀ A—Dorsum, B—tibia and tarsus of leg I, C—tibia and tarsus of leg II.

2. *Panonychus citri* (McGregor)

**Tetranychus citri* McGregor, 1916, *Ann. Ent. Soc. Amer.*, 9 : 284.

**Paratetranychus citri*, McGregor, 1919, *Proc. U. S. Natl. Mus.*, 56 : 672.

Matatetranychus citri, Pritchard and Baker, 1955, *Mem. Pacif. Coast ent. Soc.*, 2 : 133.

Collection data.—4 ♀ ♀, North Andaman Island, Mayabunder, Togapur, on Jack fruit (*Artocarpus* sp.), 10. 1. 1962, coll. S. K. Gupta (Reg. No. 3082/17).

This species has been reported from California, South eastern United States, South Africa, Canton, China and Southern Japan, and India.

Remarks.—*Panonychus citri* is allied to *P. ulsui* (Koch 1836) but differs by having the outer sacral and the clunals all similar in length, about one-third as long as the inner sacral (Pretchard and Baker, 1955).

3. *Eotetranychus fremonti* Tuttle and Baker

Eotetranychus fremonti Tuttle and Baker, 1964, *Univ. Ariz. Tech. Bull.*, 158: 1-41.

Eotetranychus fremonti Tittle and Baker, 1975, *Int. J. Acar.*, 2 (2):

Collection data.—20 ♀ ♀, 2 ♂ ♂, Nicobar Islands, CAR NICOBAR, Agriculture Farm, on fig (*Ficus* sp.), 26. xii. 1972, coll. S. K. Gupta (Reg. No. 3083/17).

This has been reported from Arizona, U.S.A. and this is the first record from India.

Remarks.—The Indian material have been determined by the characters given by Tuttle and Baker 1976.

4. *Schizotetranychus mansonii* sp. n.

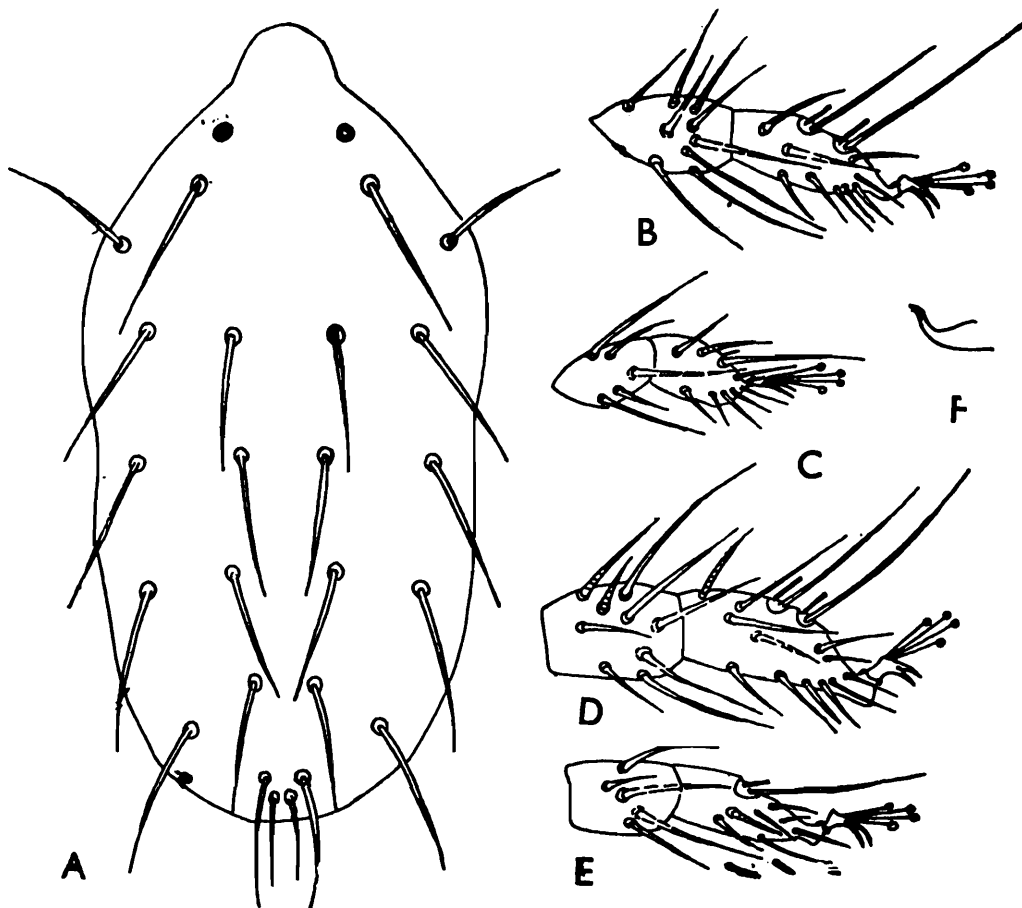
(Text-fig. 2 A-F)

Male : Body 298 μ long, 180 μ wide. Terminal sensillum of palpus 3x as long as wide. Dorsal sensillum slender. Tibia I with two sensory and seven tactile setae, tarsus I with one sensory and four tactile setae proximal to duplex setae. Tibia II with five tactile setae, tarsus II with one sensory setae proximal to duplex setae. Dorsal setae of idiosoma slightly longer than longitudinal interval between their bases. Aedeagus (figs. 2F) the bents upward to form a sigmoid distal end as in *Schizotetranychus elymus* McGregor.

Female : Body 352 μ long, 129.5 μ wide. Terminal sensillum of palpus 2x as long as wide : Tibia I with one sensory and 8 tactile setae, tarsus I with one sensory and three tactile setae proximal to duplex setae. Tibia II with five tactile setae, tarsus II with one tactile and one sensory setae. Dorsal setae of idionoma tapering, minutely with pubescent, reaches beyond the base of next setae. Dorsolateral hysterosomal slightly longer than dorsocentral hysterosomal setae. Outer sacral longer than inner sacral. Post anal setae thin and small. Medioventral setae moderate. Genital flaps with transverse striae.

Holotype : ♂, South Andaman Island, Humphrygunj, on paddy (*Oryza* sp.) 17. xii. 1972, coll. Dr. S. K. Gupta (Reg. No. 3084/17).
Paratype : 25 ♀ ♀ data same as far holotype Reg. No. 3085/17).

Remarks.—The species resembles *Schizotetranychus andropogoni* (Hirst) but differs from it in the shape of aedeagus, in the size of the dorsal setae and the number of tactile and sensory setae and tarsus of both legs I and II.



Text-fig. 2. *Schizotetranychus mansoni* sp. n. (A-C) ♀ A—dorsum, B—tibia and tarsus of leg I, C—tibia and tarsus of leg II. (D-F) ♂ D—tibia and tarsus of leg I, E—tibia and tarsus of leg II, F—aedeagus.

This species is named in honour of Dr. D. C. M. Manson, Horticultural Research Centre, Dept. of Agri., Levin, New Zealand,

5. *Oligonychus biharensis* (Hirst)

Paratetranychus biharensis Hirst, 1925, *Proc. zool. Soc. Lond*, 69.

Oligonychus biharensis, Pritchard and Baker, *Pacif. Coast. ent. Soc. Mem. Ser.* 2 : 364-365.

Collection data.—8 ♀ ♀, 1 ♂, Middle Andaman Island, Rangat, Panchawati, on Cocapant (*Cocos* sp.) 16. 1. 1973, coll. S. K. Gupta (Reg. No. 3086/17).

This species has been reported from Thailand, Philippines, Hawaii, Antigua, Mauritius, Brazil and India.

Remarks.—This species differs from other known species by the distinctive features of Aedeagus.

6. *Oligonychus isilemae* (Hirst)

Paratetranychus isilemae Hirst, 1924, *Ann. Mag. nat. Hist.*, (9) 14 : 524.

Oligonychus isilemae, Pritchard and Baker, 1955, *Pacif. Coast ent. Soc. Mem. Ser.*, 2 : 358.

Collection data.—6 ♀ ♀, 1 ♂, South Andaman, PORT BLAIR, Horticultural-cum-Zoological Garden, on grass, 11. xii. 1972, coll. S. K. Gupta (Reg. No. 3087/17)

This species is known only from the types from Coimbatore, Tamil Nadu, India.

Remarks.—This species is being reported for the first time from the Andaman Islands.

7. *Oligonychus manishi* sp. n.

(Text-fig. 3 A-H)

Male : Body 288 μ long, 144 μ wide. Terminal sensillum of palpus large above twice as long as broad. Tibia I with two sensory and 9 tactile setae, tarsus I with two sensory and four tactile setae proximal to duplex setae. Tibia II with one sensory and 6 tactile setae, tarsus II with one sensory and 3 tactile setae proximal to the duplex setae. Dorsal body setae long and tapering, longer than the longitudinal intervals between them Aedeagus short, stout as figured.

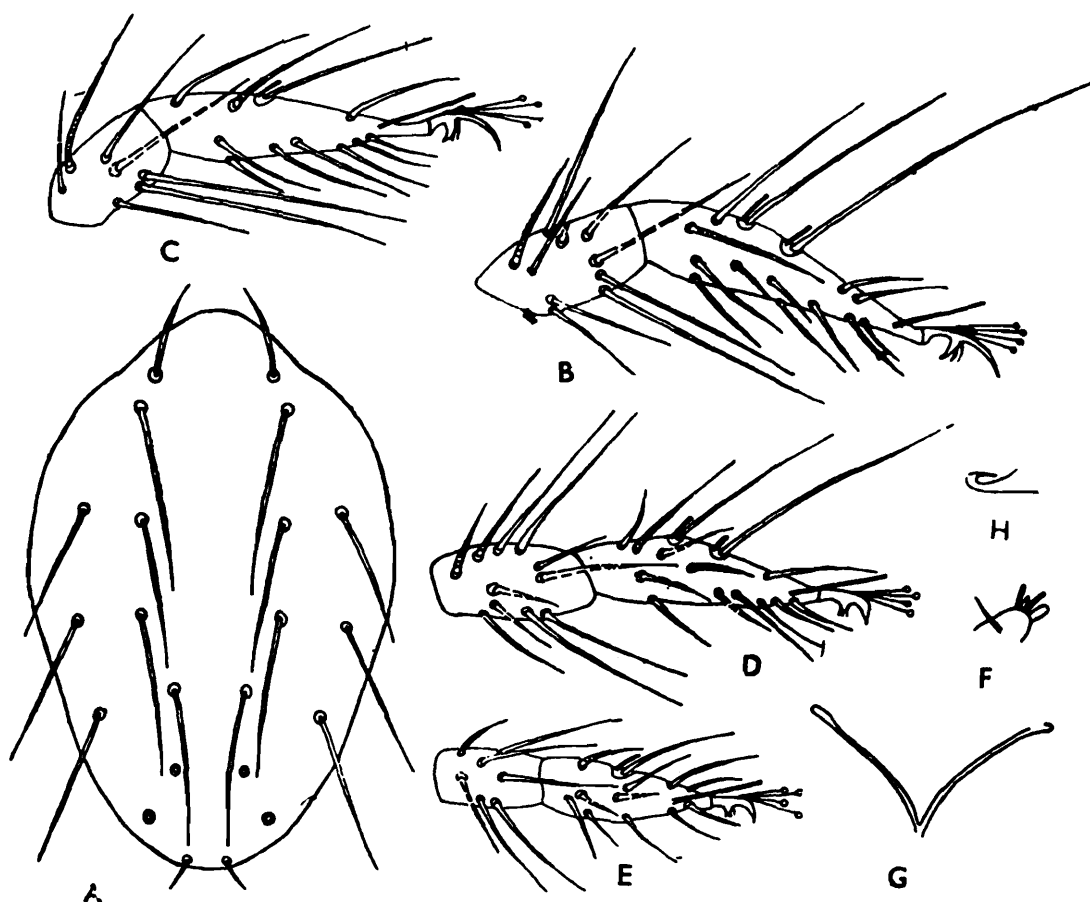
Female : Body 360 μ long, 216 μ wide. Terminal sensillum of palpus 2x as long as wide. Dorsal sensillum longer than terminal sensillum. Tibia I with one sensory and 9 tactile, tarsus I with two sensory and three tactile setae proximal to the duplex setae. Dorsal body setae same in length, with slightly pubescent, acutely tapering, one and half times longer than the longitudinal interval between their basis. Outer sacral and inner sacral setae same in length. Post

anal setae thin and small. Medioventral setae are of moderate length. Genital flap with transverse striae.

Holotype : ♂, Bedna land, on paddy (*Oryza* sp), 21. xii. 1972, coll. S. K. Gupta (Reg. No. 3089/17). *Paratype* : 1 ♂, 25 ♀ ♀, data same as for holotype (Reg. No. 3089/17).

Remarks : This species resemblance to *Oligonychus mcgregori* (Baker and Prichard) but can be distinguished by the shape of aedeagus.

The species is named in the name of my son Sri Manish Kumar Gupta.



Text-fig. 3. (A-C) *Oligonychus manishi* sp. n. ♀ A—dorsum, B—tibia and tarsus of leg I, C—tibia and tarsus of leg II; (D-H) *Oligonychus manishi* sp. n. ♂ D—tibia and tarsus of leg I, E—tibia and tarsus of leg II, F—terminal portion of palp, G—peritreme, H—aedeagus.

SUMMARY

A total of 7 species under 5 genera have been identified in a collection from Andaman and Nicobar Islands. Three species, viz.,

Aponychus sarjui sp. n. *Schizotetranychus mansonii* sp. n. *Oligonychus manishi* sp. n. are being described as new to science and *Eotetranychus fremonti* Tuttle and Baker is first record from india. Besides 3 more species though recorded for the first time from Andaman and Nicobar Islands are known from other parts of the world including India.

ACKNOWLEDGEMENTS

The author is grateful to the Director, Zoological Survey of India, Calcutta for laboratory facilities and to Dr. D. C. M. Manson, Horticultural Research Centre, Department of Agriculture, Levin, New Zealand for confirmation of same specimen referred to him. The author is also grateful to Dr. S. K. Gupta, Superintending Zoologist, Zoological Survey of India, Patna for providing specimens for present study.

REFERENCE

- GUPTA, S. K. 1976. Contribution to our knowledge of tetranychid mites (Acarina) with description of three new species from India. *Orient. Ins....* 10 (3) : 327-351.
- PRITCHARD, A. C. and BAKER, E. W. 1955. A revision of the spiders mite family Tetranychidae. *Pacif. Coast ent. Soc. Mem. Ser.*, 2 : 1-472.
- EHARA, S. and WONGSIRI, T. 1975. The spider mites of Thailand (Acarina : Tetranychidae). *Mushi*, 48 (13) 140-185.

NOTES ON SOME MAMMALS RECENTLY COLLECTED FROM ANDAMAN AND NICOBAR ISLANDS

By

SUBHENDU SEKHAR SAHA

Zoological Survey of India, Calcutta

During March-April 1977, a team including the author, led by Dr. K. K. Tiwari, Joint Director, Zoological Survey of India, obtained 20 specimens of mammals belonging to eight species in the course of its faunistic survey in various islands of the Andaman and Nicobar groups. Most of the specimens were collected in the Great Nicobar Island, except a single bat in the Camorta Island and a rat in the South Andaman Island. The present collection adds additional material of such little-known species as *Taphozous saccolaimus crassus*, *Pipistrellus camortae*, *Rattus flebilis* and *Rattus pulliventer*. Besides, a *Pipistrelle* with anomalous characters which could not be placed under any recognised species.

All the measurements are in millimeters unless otherwise stated. Reference to colour names are after Ridgway (1886). The taxonomy and nomenclature followed here is largely based on Ellerman and Morrison-Scott (1966).

Order INSECTIVORA

Family TUPAIIDAE

Tupaia nicobarica (Zelebor)

Nicobar Tree-Shrew

Cladobates nicobaricus Zelebor, 1869, Reise Novara, *Zool. Theil*, 1 : 17. Great Nicobar.

Material.—4 ♂, 2 ♀ : Campbell Bay, Magar Nullah and Shabnam Nagar, Great Nicobar ; 29-31 Mar and 2 Apr 1977. Dry and wet.

Measurements.—Head & body ♂ ♂ : 183.5, 184, 189.5 and 194 ; ♀ ♀ : 180 and 186.2. Tail ♂ ♂ ; 208, 210.5, 231 and 233.5 ; ♀ ♀ : 225 and 237.5. Hindfoot ♂ ♂ : 45 (2). 45.5 and 46.4 ; ♀ ♀ : 43.5 and 45.5. Ear ♂ ♂ : 17.5 (3) and 18 ; ♀ ♀ : 17.5 and 18. Weight ♂ ♂ : 175, 190 (2) and 195 g ; ♀ ♀ : 180 and 200 g. **Mammae** : one pair, abdominal.

Remarks.—Although the family Tupaiidae is considered to belong to

the order Primates by most of the recent authors since Simpson (1945), it has been kept here under the order Insectivora after Ellerman & Morrison-Scott (1966). Who inturn followed Simpson (1945).

Miller (1902) noticed the variation in the pelage colour of this species, which is also confirmed by the present series. In this series, a female from Shabnam Nagar is a dark specimen, the dark dorsal area is strongly pronounced forward along the sides of the shoulder to join the dark patch of the head, a feature, as stated by Miller (1902) was shown in Zelebor's plate of *Cladobates nicobaricus*. In other specimens, however, the dark patch of the forepart of the dorsum is not so pronounced, some of them agreeing very closely with Miller's description of *Tupaia nicobarica surda* from the Little Nicobar Island. It would, therefore, appear that Miller's *T n. surda* is not tenable.

The following additional points in coloration have been noted : The tail is deep burnt umber with a pencil of drab wood brown underneath. The black of the back is also extended over the tail. In the females the black on the tail is arrested at a place some 4 to 5 cm from the root, but in the males it extends all over the tail, in some as a distinct pencil throughout to the tip and in others in broken patches over it.

The Nicobar Tree-Shrew was found to be very common in forests. It was mostly arboreal but was also found playing and running very fast on sand and very active particularly during the afternoons. Usually it moved in pairs or in small parties of three. A larger party of eight individuals was also once observed at dusk before they went to retire. The call of the Nicobar Tree-Shrew was a long nasal 'cheengayaa' lasting for about three seconds in each spell. It is much vocal in the mornings and afternoons. Occassional call at midday was, however, not uncommon, but the intensity and duration of such calls was decidedly lesser in extent. A slightly modified note 'cheenee' was also heard, repeated four or five times, apparently a call in distress. It occupied various niches from the coastal mangroves to the interior rain forest, from the forest floor to the top of the canopy and also in the forest clearings.

Order CHIROPTERA

Family PTEROPIDAE

Pteropus melanotus Blyth

Nicobar Flying Fox

Pteropus melanotus Blyth, 1863, *Cat. Mamm. Mus. Asiat. Soc. Beng.*, 20. Nicobar Island.

Material.—5 ♂ ♂, 2 ♀ ♀ : Campbell Bay, Shabnam Nagar, Great Nicobar ; 31 Mar. - 2 Apr. 1977. Dry and wet.

Measurements and other characters.—

Age & Sex	Head & Body	Forearm	Ear	Remarks
Subad ♀	219.5	148	24.5	Cusps not worn, Pm ¹ absent. Pelage with much blackish wash, mantle with much red.
ad ♀	237	151.5	28.6	Cusps worn, Pm ¹ lost. Pelage as in subadult, but mantle much richer and darker coloured.
subad ♂	221	149.5	29.8	Cusps not worn, Pm ¹ present. Pelage superficially as in female, mantle with red but not so extensive. Testes abdominal.
subad ♂	242	152	27.5	Cusps slightly worn, Pm ¹ on left maxilla only, right one lost. Pelage dark mantle reddish but paler than above. Testes descending to scrotal sac.
ad ♂	249.3	163.5	28.2	Cusps worn, Pm ¹ lost. Pelage dark, mantle paler than former. Testes entirely in scrotum.
ad ♂	260.5	165	27	Cusps worn, Pm ¹ lost, sockets smooth.
(?old)	271.8	167	27.8	Pelage even paler than ad. male. Scrotum very large. Anogenital region denuded.

Remarks.—Dobson (1873) segregated the sexes on the basis of colouration. He stated that the females from the Andaman and Nicobar Islands were generally of an intensely black colour throughout with the exception of a few individuals, apparently very aged ones, in which the fur on the back of the head and neck had a slightly reddish tinge. The males, on the contrary, had the whole of the head, nape and neck to shoulder coloured bright orange or pale yellow remarkably contrasting with the somber hues of the females. Andersen (1912) contradicted Dobson's statement and said : 'So far as Nicobar individuals [of *P. melanotus*] are concerned, the alleged sexual difference in colour is imaginary. such variation in the bright tinge as does occur is individual, not sexual' Miller (1902) admitted : 'There is considerable individual variation in both colour and size, but taken as a whole the series from the two islands [*i.e.* Andaman and Nicobar] are not distinguishable from each other'

In the present series, the females and a subadult male (forearm 221) have somber hue (cinnamon rufous) on the mantle but powdered with much black, the tips of individual hairs being blackish. Generally, females have a wash of brown on the rump and interfemoral membrane. In addition, females differ from the males by having dark seal brown at the concealed basal part of hairs in the mantle while males have

them cream buff. In younger males a strong reddish tinge is suffused on the mantle, which is faded into much paler and uniform cream buff to light buff in old males.

From the present observations it may be summarized that : (1) mantle is decidedly darker and richer in colouration in females than in males ; (2) hairs in mantle are uniformly coloured in males but dark-based in females ; (3) the exposed parts, namely, mantle and midventral line along chest and abdomen, get paler with ageing ; (4) size of individuals may indicate age, adult female is a trifle smaller than adult male.

Thus, Dobson's (1873) view on sexual difference in colour is established. Miller (1902) and others, in fact, failed to detect the characteristic colour of the base of the hairs in the mantle of females. 'Dull brownish.....on the part of the mantle' as stated by him could not be found there. Again, the faded midventral part of the abdomen and chest was wrongly given by him as 'essentially the same as mantle'

Mason (1908) separated the Andaman population as *Pteropus tytleri*, and Andersen (1912) provided a description of the species. Ellerman & Morrison-Scott (1966) and Hill (1967) treated it as *Pteropus* (?) *melanotus tytleri* Mason. I, however, differ with them and agree with Miller (1902) that the bats from the two groups of islands, viz., Andaman and Nicobar, are not distinguishable from each other.

It has been noted in the field that the larger bats dominated the feeding grounds where bats in small parties were found feeding on some particular trees. Roosting has been reported in swamps as well as in rain forests on hill tops. The presence of healed up lacerated wounds on the tip of ears, particularly in older individuals, suggested fighting and biting among themselves. They were found to be much vocal too.

Family EMBALLONURIDAE

***Taphozous saccolaimus crassus* Blyth**

Blyth's Pouch-bearing Bat

Taphozous crassus Blyth, 1844, *J. Asiat. Soc. Beng.*, **13**: 491. Mirzapur, Uttar Pradesh.

Material.—1 ♀ : Campbell Bay, Great Nicobar. 27 Mar 1977. Dry.

Measurements.—Head and body 91.4. Tail 20.6. Forearm 70.8. Ear 17.6. Tibia 29. Weight 41 g.

Remarks.—Hill (1967) recorded this species for the first time in

the Andaman and Nicobar Islands on a female specimen collected at Campbell Bay, Great Nicobar, on 4 Mar 1967 by Shri Humayun Abdulali.

This specimen had a mature foetus (without hair) in the left uterus. Though very little is known about the biology of this species, according to Phillips (as stated by Brosset, 1962), the breeding season is presumed to be in the autumn in Sri Lanka. This bat was shot at dusk when it came out to feed on termites on wing, swarming of which was observed to be a regular feature in this island. The stomach of specimen was full of termites, even at that early hour of dusk (18.00 hrs).

Family RHINOLOPHIDAE

Subfamily HIPPOSIDERINAE

***Hipposideros bicolor nicobarulae* Miller**

Miller's Nose-leaf Bat

Hipposideros nicobarulae Miller, 1902, *Proc. U. S. natn. Mus.*, 24 : 781. Little Nicobar Island.

Material.—1 ♂ : Kamorta Island (from an old gun box). 24 Mar. 1977. Wet,

Measurements.—Head & body 40.6. Tail 26.8. Forearm 39. Tibia 16.2. Weight 5 g.

Remarks.—Hill (1967) reported this species from many islands of the Nicobar group. One of his specimen collected by Shri H. Abdulali 11 years earlier, on 29 Mar. 1966, was from the same spot where the present specimen was taken from.

Very few (only 4 or 5) individuals were found roosting in an old Japanese gun box, the floor of which was submerged under knee-deep water.

Family VESPERTILIONIDAE

***Pipistrellus camortae* Miller**

Camorta Pipistrelle Bat

Pipistrellus camortae Miller, 1902, *Proc. U. S. natn. Mus.*, 24 : 779. Camorta Island, Central Nicobar.

Material.—2 ♀ ♀ : Campbell Bay, Great Nicobar. 2 Apr. 1977. Wet.

Measurements.—Head & body 45.5, 46.5. Tail 32.5, 33.5. Forearm 31, 32. Ear 10, 10.5. Tibia 12.5, 13. Weight 4.5 g (2).

Remarks.—Tate (1942) placed it as a subspecies under *Pipistrellus abramus* group, and Hill (1967) placed it as a subspecies of *Pipistrellus javanicus*. But I prefer to follow Ellerman & Morrison-Scott (1966) in treating it as a separate species.

Pipistrellus sp.

Material.—1 ♀ : Campbell Bay, Great Nicobar. 25 Mar. 1977, Wet (lower jaw missing).

Measurements.—Head & body 46. Tail 37.5. Forearm 35.5. Ear 12.5. Tibia 15.8. Weight 5.5 g.

Remarks.—For the anomalous characters of this moderate sized Pipistrelle which has a rather broad wing and well marked pads on feet and thumb base, and has a short, broad outline of the skull, rather low but broad muzzle and a strong zygoma, both i^1 & i^2 bicuspid and almost equal in basal area, i^2 slightly anteriorly placed, p^3 greatly reduced and accommodated inbetween c and p^2 at the inner edge of the toothrow, canine strongly built with a distinct accessory cusp and is in close contact with p^2 , I could not place it under any of the recognized species of Pipistrelle.

Order RODENTIA

Family MURIDAE

***Rattus flebilis* (Miller)**

Andaman "Subanus" Rat

Mus flebilis Miller, 1902, *Proc. U. S. natn. Mus.*, 24: 762. Henry Lawrence Island, Andaman Island.

Material.—1 ♀ : Pahargaon, near Port Blair, South Andaman. 14 Apr. 1977. Wet.

Measurements.—Head & body 228. Tail 240. Ear 21. Hindfoot 39.7. Mammary 5 pairs. Cranial : Occipitonasal 49.5. Condylar-basal 47.6. Nasal 18.8. Palate 24. Palatal foramen 8.4. Tooth row (alveolar) 7.4. Tooth row (crown) 5.5. Zygomatic breadth 24.8. Diastema 14.4.

Remarks.—Ellerman & Morrison-Scott (1966) retained this species as *Rattus* (?) *rattus flebilis*. Many other authors also considered it as a subspecies of *Rattus rattus*. But in view of its sympatry with the other indigenous *Rattus rattus*, particularly *R. r. andamanensis* in South Andaman Island, it is treated here as a distinct species.

Rattus pulliventer (Miller)

Nicobar Spine-backed Rat

Mus pulliventer Miller, 1902, *Proc. U. S. natn. Mus.*, 24 : 762. Great Nicobar Island.

Material.—1 ♂, Campbell Bay, Great Nicobar. 6 Apr 1977. Dry.

Measurements.—Head & body 195. Tail 165.5. Ear 20.5. Hind-foot 37.2. Weight 170 g. Cranial : Occipitonasal 44.4. Condyllo-basal 42.5. Nasal 16.5. Palate 21.9. Palatal foramen 7.5. Tooth row (alveolar) 7.4. Tooth row (crown) 6. Zygomatic breadth 21.5. Diastema 11.6. Bulla 7.2.

Remarks.—The characteristic flat dorsal profile of the cranium distinguishes this species from other rats of the Andaman and Nicobar Islands. In this specimen, however, the palatal foramina, supra orbital ridge and the angular process of the mandible have some resemblance with the illustration of *Mus flebilis* given by Miller (1902).

This rat was found to be very common in the forests. It is chiefly arboreal and nocturnal. At dusk it came down the trees and invaded the forest floor as well as the agricultural fields in the forest clearings.

ACKNOWLEDGEMENTS

I acknowledge my gratitude to Dr. B. Biswas, Zoological Survey of India, for kindly going through the manuscript and for valuable suggestions to improve it. My sincere thanks are due to Dr. K. K. Tiwari, leader of the expedition and Shri Humayun Abdulali, whose enthusiasm made it a pleasure while working in those wonderlands in Andaman and Nicobar Islands. I also thank Shri P. K. Das and Shri J. P. Lal for valuable criticism.

REFERENCES

- ANDERSEN, K. 1912. *Catalogue of the Chiroptera in the collection of the British Museum*. 2nd ed. Vol 1. London. pp 224-227.
- BROSSET, A. 1962. The bats of Central and Western India, Pt. 1. *J. Bombay nat. Hist. Soc.* 59 (1) : 1-57.
- DOBSON, G. E. 1873. On secondary sexual character in the Chiroptera. *Proc. zool. Soc.* 1873 : 241-251.
- ELLERMAN, J. R. & MORRISON-SCOTT, T. C. S. 1966. *The checklist of Palaearctic and Indian Mammals*. 2nd ed. London.

- HILL, J. E. 1967. The bats of the Andaman and Nicobar Island. *J. Bombay nat. Hist. Soc.* **64** (1) : 1-9.
- MASON, G. E. 1908. On the Fruit Bats of the genus *Pteropus* inhabiting the Andaman and Nicobar Archipelagos, with the description of a new species. *Rec. Indian Mus.* **2** : 159-166.
- MILLER, G. S. 1902. The mammals of the Andaman and Nicobar Islands. *Proc. U. S. natn. Mus.* **24** : 751-795.
- RIDGWAY, R. 1886. *Nomenclature of colors*. Little Brown, Boston.
- SIMPSON, G. G. 1945. The principles of classification and a classification of mammals. *Bull. Amer. Mus. nat. Hist.* **85**.
- TATE, G. H. H. 1942. Results of the Archbold Expedition No. 47. Review of the Vespertilionine bats, with special attention to genera and species of the Archbold Collection. *Bull. Amer. Mus. nat. Hist.* **80** : 221-297.

MAMMALS OF THE ANDAMANS AND NICOBARS : THEIR ZOOGEOGRAPHY AND FAUNAL AFFINITY

By

Y CHATURVEDI

Zoological Survey of India,

Gangetic Plains Regional Station, Patna

(With three Tables)

The islands of Andaman and Nicobar groups lie in the Bay of Bengal separated by a sea-space of 1190 km from the Coromandal coast of India, 515 km from the Tenasserim coast of Burma and 1255 km from Calcutta. The Andaman group of islands are situated between 13°41' and 10°30' N. latitudes and 92°11' and 93°07' E. longitudes while those of Nicobars lie between 6°40' and 9°30' N. latitudes and 92°30' and 94°10' E. longitudes. There are more than 200 large and small islands in Andaman group which stretch out in a North-South direction. The Nicobars comprise about 22 smaller islands lying in North to South-east direction. The ten degree channel separates the Andamans from Nicobars by a sea-space of 296 km. The land area of the Andamans is approximately 6332 sq. km. and that of the Nicobars 16.5 sq. km. The length of the Andamans is about 352 km and width at maximum 52 km. The Andamans form a compact chain of islands, whereas the Nicobars lie far separated from one another.

Geology

The Andaman islands form a part of lofty range of submarine mountains, 1125.6 km long, running from cape Negrais in the Arakan Yomah range of Burma, through Sumatra and Java to the lesser Sunda island and the Moluccas and contain much that is geologically characteristic of the Arakan Yomah. The older rocks are early Tertiary or late Cretaceous, but there are no fossils to indicate exact age. There is coral formation along the coast of the islands. There has been of late a comparative rising in parts of Andamans especially in the Ritchie's Archipelago, and sinking in others chiefly along the east coast. Narcondam and Barren islands are of volcanic origin. The Nicobar islands form a part of submarine chain known for its volcanic activity. The hilly islands consist partly of stratified deposits which occupied the bottom level of the sea before their appearance and partly of plutonic rocks which pierced the former and came to the surface through the old upheaval.

Climate

The climate in Andamans is just like those of tropical islands on

the same latitudes. It is warm, the mean temperature varying from 21°-30°C. The rainfall is irregular and amounts to an annual average of 34.8 cm. The islands are subjected to both the south-west and north-east monsoons. Cyclones occur at changes of monsoon and are rare. The Nicobars also are exposed to both the monsoons. Rain falls throughout the year, generally in sharp, heavy showers. The annual rainfall varies from 228.6 to 342.9 cm and the temperature from 17.8. to 33.3°C.

History of study of mammalian fauna

Alexander (1827) published an account of the landing of a party at Little Andaman in search of water. In this report mention was made of the skulls of Andaman pig and a drawing of the same was also given. Blyth (1846) gave a brief note on the fauna of the Nicobars ; besides other species, he mentioned a monkey and a large squirrel observed by Mr. Barbe and Capt. Lewis, but these could not be captured. Again, Blyth (1858, 1859, 1860) reported some mammals from the south Andamans. Bartlet (1860, in Miller, 1902) described a new monkey, *Macacus andamanensis* (= *Macacus leoninus* Blyth), Fitzinger (1861, in Miller, 1902) gave a list of eight mammals collected during the voyage of "Novara" In 1863, Blyth gave a complete account of the known mammals of the Andaman and Nicobars. Tytler (1864) gave the description of a new civet cat. Sclater (1869) reported the macaque described earlier by Bartlet. Dobson (1871, 1872, 1873) gave short accounts of bats occurring in Andaman and Nicobars, and more detailed ones lateron (1876, 1878). Hume (1874, in Miller, 1902) observed *Pteropus nicobaricus* on Little Jolly Boy Island. Anderson (1881) listed thirteen species of bats. Blanford (1888, 1891) recorded eighteen mammals, from these islands. Miller (1902) listed 39 mammals four of them doubtful. Mason (1908) reported flying foxes and described a new species, *Pteropus tytleri*. After a long gap, the Zoological Survey of India took initiative to study the fauna of these islands. As the result, Chaturvedi (1966a) described a new house rat and also recorded (1966b, 1969) the Northern Palm Squirrel, *Funambulus pennanti* Wroughton and a fruit bat, *Cynopterus sphinx* (Vahl). Soota & Chaturvedi (1971) reported *Pipistrellus camortae* from Car Nicobar. Nath & Chaturvedi (1975) published an account of 12 species of mammals and added much new information, including the first authentic record of cats from these islands. Bhattacharya (1976) recorded *Pipistrellus coromandra* (Gray) from the Car Nicobar. Hill (1967), based on a collection of Bombay Natural History Society published a paper on bats of these islands and listed 24 species and subspecies. Abdulali (1976) and Chana (1976) also dealt with wild life and its preservation.

MAMMALIAN FAUNA

A total of 46 species and subspecies of mammals are now known

from these islands. The reported occurrence of a few other needs confirmation. Two rats, *Rattus rattus alexandrianus* and *R. norvegicus*, are cosmopolitan and found on all sea-ports. *Rattus bowersi* was recorded by Blanford (1891) but Miller (1902) regarded it as *R. taciturnus*. The sea-cow, *Dugong dugon* (Miller) being a marine form has been kept out of consideration. Occurrence of the Jungle cat, *Felis chaus*, is very doubtful since there is no authentic record of the species from Andamans (no specimen available). The pig-tailed monkey, *Macaca nemestrina leonina*, considered indigenous by Bartlet (*loc. cit.*) proved to be an introduced one, and lack of a subsequent record arouses suspicion that the description of Bartlet was either based on pet specimens or introduced ones which failed to establish themselves in the Andamans. The barking deer, *Muntiacus muntjak* was seen by a party of the Zoological Survey of India in Middle Andaman (personal communication) but in absence of any specimen of this deer as well as sambhar in any collection, these are not included here. Two flying foxes, *Pteropus vampyrus* and *P. giganteus* have also been reported from Andamans but Mason (*loc. cit.*) considered the former as a seasonal migrant and the latter as an occasional and rare straggler. Seasonal migration of *P. vampyrus* (from Malaya) seems to be doubtful since no Worker has collected or seen these bats for decades in these islands. *Scotophilus kuhli* (= *S. temmincki*) was reported by Blyth (1863) but we do not find any subsequent record hence left out of consideration.

The goats introduced in Barren island have grown in large number, Surprisingly these goats can subsist upon sea water as there is no freshwater. Buffaloes left back on Kamorta by some early settlers have multiplied to good number. The elephants once brought to Andamans by some lumbering contractors are still used for the same purpose although on a smaller scale. Two types of feral cats also have been recorded (Nath, & Chaturvedi, 1975). During a visit in the year 1969 to Ross Island, author observed a few rhesus monkeys, a cheetal and some goats brought by some naval staff. Of course, horses and dogs go with human being and these islands are not exception to this. Including all above discussed forms total number of mammals becomes sixtyfour. Out of these the well recognised species (46) are dealt here in brief. Classification followed here is after Ellerman & Morrison-Scott (1951). Distribution of the species on islands is given within parentheses.

INSECTIVORA

Five species, all indigenous have been reported. Two tree shrews, *Tupaia nicobarica nicobarica* (Great Nicobar) and *T. n. surda* (Little Nicobar) and a terrestrial one, *Crocidura nicobarica* (Great Nicobar) are found in Nicobar group of islands. Tree shrews are absent in Andamans but two terrestrial forms, *Crocidura andamanensis* (South Andaman) and *C. hispida* (Middle Andaman) are found there.

CHIROPTERA

Twenty three species of bats are known, out of these, six species are endemic to Andamans and six to Nicobars. Among the remaining eleven species a few are common to Andaman and Nicobars while others are found also in adjacent countries. *Pteropus hypomelanus satyrus* (Narcondam), *Cynopterus brachyotis brachysoma* (South Andaman), *Rhinolophus andamanensis* (Port Cornwallis, South Andaman), *R. cognatus cognatus* (Port Blair), *R. c. famulus* (Narcondam & North central) and *Myotis adversus dryas* (Port Blair) are endemic forms of Andamans. Besides these, *Hesperoptenus tickelli* (Long Isl. & South Andaman), *Tylonycteris pachypus fulvida* (south Andaman), *Cynopterus sphinx* (Port Blair), *Taphozous melanopogan* (Landtall, Ross, Port Blair), *Megaderma spasma* (South Andaman), *Pteropus melanotus* (syn. *P. tytleri*) (South Andaman & Nicobars) and *Eonycteris spelaea* (South Andaman) are also found in Andamans.

The endemic bats of Nicobar group are : *Pteropus Faunulus* (Car Nicobar), *Cynopterus brachyotis scherzeri* (Car Nicobar & Nancowry), *Hipposideros diadema nicobarensis* (Trinkat & Little Nicobar), *H. ater nicobarulae* (Car Nicobar, Camorta, Nancowry & Little Nicobar), *Pipistrellus camortae* (Car Nicobar & Camorta) and *Miniopterus pusillus* (Nicobars). The other species which are also distributed in adjacent countries include *Hipposideros fulvus fulvus* (Nicobars), *Pipistrellus coromandra* (Car Nicobar), *Pipistrellus tenuis* (Nicobars), *Taphozous sacolaimus crassus*, (Great Nicobar), *Pteropus melanotus* (Nicobars & South Andaman).

PRIMATES

Only one species, the crab eating monkey, *Macaca fascicularis umbrosa* Miller is found, that too is confined to Nicobars only.

ARTIODACTYLA

Only three species of artiodactyles are known from these islands. A pig, *Sus scrofa andamanensis* (South Andaman, Baratang, Little Andaman) and a deer, *Axis axis* (Port Cornwallis, North Andaman, Middle Andaman, S. Andaman, Baratang) are found in Andamans. *Sus scrofa nicobaricus* (Great Nicobar) is found only in Nicobars.

CARNIVORA

Carnivores are completely absent from Nicobars while only one species of civet cat, *Paguma larvata tytleri* (South Andaman, Baratang)

is found in Andamans. Two kinds of feral cats are also known from Andamans (Nath & Chaturvedi, 1975).

RODENTIA

Five rats, *Rattus r. andamanensis* (Middle Andaman, South Andaman, Barren, Narcondam), *R. rattus flebilis* (Henry-lawrence), *R. r. atridorsum* (Barren), *R. stoicus* (Henrylawrence) and *R. taciturnus* (South Andaman) are endemic species of Andamans. Two rats *R. rattus holchu* (Interview, Long, Baratang, Port Blair, Car Nicobar) and *R. palmarum* (Great Nicobar, Trinkat, Henrylawrence, South Andaman) have distribution in Andamans as well as Nicobars. A house mouse, *Mus musculus castaneus* (Middle Andaman & Port Blair) widely distributed in India, Burma, Thailand, Malaya etc. is also found in Andamans. The Northern Palm Squirrel, *F. pennanti* (Port Blair & Middle Andaman) although a recent introduction is well established in Andamans. As regards Nicobars, four species *Rattus pulliventer* (Great Nicobar), *R. burrus* (Trinkat), *R. burrulus* (Car Nicobar) and *R. burrescens* (Great Nicobar) are endemic. *R. rattus holchu* and *R. palmarum* are found in Nicobar as well as Andamans.

Fauna Composition.—The results of faunistic analysis have been summarised in table 1. Of the fourteen orders of living mammals only six are represented in Andamans and Nicobars (Cetaceans excluded). Among these 10.8% are insectivores, 50% bats, 2.2% primates, 6.6% artiodactyles, 2.2% carnivores and 28.2% rodents. It is obvious that bats are predominant followed by rats. The primates and carnivores are represented very poorly. It is rather surprising to note that both bats and rats are represented by almost equal number of species/

Table—1. Composition of mammal fauna of Andaman and Nicobars.

Order	Number of Genera	Number of species & subspecies	%. of fauna
Insectivora	2	5	10.8
Chiroptera	12	23	50
Primates	1	1	2.2
Artiodactyla	2	3	6.6
Rodentia	3	13	28.2

subspecies (bats-12, rats-11). Distribution of endemic species in two island group *i. e.* Andamans and Nicobars is exactly equal (15 species in each). Even if we make groupwise consideration, they are found to be in almost equal numbers of species/subspecies in two groups of islands *e. g.* bats six species in each island group, rats five in Andamans

and four species in Nicobars, insectivores two in former and three in latter. The mammal fauna comprises 69.6% (32 species) endemic elements and only 30.4% (14 species) exotic.

ZOOGEOGRAPHY

(Tables 2 & 3)

Andamans.—Of the 27 species and subspecies found here, 15 (55.5%) are native of Andamans. Among insectivores both the shrews are confined to Andamans. Besides six endemic bats there are at least seven species of bats which are also distributed in adjacent countries. *Hesperoptenus tickelli*, *Tylonycteris pachypus fulvida* known from Andamans have got distribution in India, Thailand, Burma and Malaya. *Cynopterus sphinx*, *Taphozous melanopogon* and *Megaderma spasma* are found in India, Burma, Thailand, Malaya and Java-Sumatra. *Pteropus melanotus* in addition to Andamans is found in Nicobars and Java-Sumatra. Another bat, *Eonycteris spelaea* has got very wide distributional range including Andamans, India, Burma, Malaya, Java-Sumatra etc.

A subspecies of civet cat occurring in Andamans is endemic. Among ungulates, Andaman pig is endemic but the cheetal, *Axis axis* is found in India and Sri Lanka. Among rodents *Mus musculus castaneus* is widely distributed in South east Asia while *F. pennanti* is found in India.

Nicobars.—Besides six species of endemic bats mentioned above there are five exotic forms also. *Hipposideros fulvus fulvus* and *Pipistrellus coromandra* are found in Nicobars as well as India. *Taphozous saccolaimus crassus* is also found in India and Java-Sumatra. *Pteropus melanotus* occurs in Andamans and Java-Sumatra besides Nicobars. Another species, *Pipistrellus tenuis* is found in Java-Sumatra also.

Faunal affinity (Table 3).—As discussed above 69.6% of the mammal fauna of Andamans and Nicobars is composed of endemic elements and only 30.4% (less than one third) is exotic. Among the exotic species most of them belong to order Chiroptera and a few to other orders. It is difficult to trace back the arrival of mammals to these islands. However, it can be presumed that most of the terrestrial mammals reached these islands or were already present there long before separation of these islands from the main continental mass. Under changed ecological conditions they evolved as separate distinct species/subspecies. These lately evolved species constitute endemic fauna. The same phenomenon can be applied to bats also. However, higher number of alien species of bats indicate that either they reached these island much later and they have not undergone complete change in the course of speciation. Another possibility, which cannot be ruled

Table—2 Distribution of Andamans and Nicobars mammals in relation to adjacent countries.

Sl. No.	Name	Andamans	Nicobars	Indian Mainland	Malaya	Thailand	Burma	Java	Sumatra	Sri Lanka
INSECTIVORA										
1.	<i>Tupaia nicobarica nicobarica</i> (Zelevor)	+	+							
2.	<i>Tupaia nicobarica surda</i> Miller		+							
3.	<i>Crocidure hispida</i> Thomas	+								
4.	<i>Crocidura nicobarica</i> Miller		+							
5.	<i>Crocidura andamanensis</i> Miller	+								
CHIROPTERA										
6.	<i>Pteropus hypomelanus satyrus</i> Andersen	+								
7.	<i>Pteropus faunulus</i> Miller		+							
8.	<i>Pteropus melanotus</i> Blyth	+	+					+	+	
9.	<i>Cynopterus sphinx</i> (Vahl)	+		+	+	+	+	+	+	+
10.	<i>Cynopterus brachyotis scherzeri</i> Zelevor		+							
11.	<i>Cynopterus brachyotis brachysoma</i> Dobson	+								
12.	<i>Eonycteris spelaea</i> (Dobson)	+		+	+	+	+	+	+	
13.	<i>Taphozous melanopogon</i> Temminck	+		+	+		+	+	+	
14.	<i>Taphozous saccolaimus crassus</i> Blyth		+	+					+	
15.	<i>Megaderma spasma</i> (Linnaeus)	+		+	+	+	+	+	+	+

Table 2 (Contd.)

Sl. No.	Name	Andamans	Nicobars	Indian Mainland	Malaya	Thailand	Burma	Java	Sumatra	Sri Lanka
16.	<i>Rhinolophus andamanensis</i> Dobson	+								
17.	<i>Rhinolophus cognatus cognatus</i> Andersen	+								
18.	<i>Rhinolophus cognatus famulus</i> Andersen	+								
19.	<i>Hipposideros diadema nicobarensis</i> (Dobson)		+							
20.	<i>Hipposideros ater nicobarulae</i> Miller		+							
21.	<i>Hipposideros fulvus fulvus</i> Gray		+	+						
22.	<i>Myotis adversus dryas</i> Andersen	+								
23.	<i>Pipistrellus camortae</i> Miller		+							
24.	<i>Pipistrellus coromandra</i> (Gray)		+	+						+
25.	<i>Pipistrellus tenuis</i> Temminck		+					+		
26.	<i>Hesperoptenus tickelli</i> (Blyth)	+		+			+			+
27.	<i>Tylonycteris pachypus fulvida</i> (Blyth)	+		+					+	
28.	<i>Miniopterus australis pusillus</i> Dobson		+							
PRIMATE										
29.	<i>Macaca fascicularis umbrosa</i> (Miller)		+							
CARNIVORA										
30.	<i>Paguma larvata tytleri</i> Tytler	+								
ARTIODACTYLA										
31.	<i>Sus scrofa andamanensis</i> Blyth	+								

Table—2 (Conted)

Sl. No.	Name	Andamans	Nicobars	Indian Mainland	Malaya	Thailand	Burma	Java	Sumatra	Sri Lanka
32.	<i>Sus scrofa nicobaricus</i> Miller		+							
33.	<i>Axis axis axis</i> (Erxleben)	+		+						+
RODENTIA										
34.	<i>Funumbulus pennanti</i> Wroughton	+		+						
35.	<i>Rattus v. andamanensis</i> (Blyth)	+								
36.	<i>Rattus</i> (?) <i>rattus flebilis</i> (Miller)	+								
37.	<i>Rattus</i> (?) <i>rattus atridorsum</i> (Miller)	+								
38.	<i>Rattus rattus holchu</i> Chaturvedi	+	+							
39.	<i>Rattus palmarum</i> (Zelebor)	+	+							
40.	<i>Rattus stoicus</i> (Miller)	+								
41.	<i>Rattus taciturnus</i> (Miller)	+								
42.	<i>Rattus pulliventer</i> (Miller)		+							
43.	<i>Rattus burrus</i> (Miller)		+							
44.	<i>Rattus burrulus</i> (Miller)		+							
45.	<i>Rattus burrescens</i> (Miller)		+							
46.	<i>Mus musculus castaneus</i> Waterhouse	+		+	+	+	+			+

out, is that bats being good flyers they can easily negotiate the expanse of sea between these islands and adjacent countries and they continue to do so even now as indicated by a good number of exotic species occurring in these islands. However, it is worth to note that even among bats more than 50% are endemic.

Table—3. Faunal affinity of mammals of Andaman & Nicobar Islands with adjacent countries.

Areas	Number of species	%. Fauna
1. Andamans	15	32.6
2. Nicobars	15	32.6
3. Andaman+Nicobars	2	4.3
4. Andaman+India	2	4.3
5. Nicobar+India	2	4.3
6. Nicobar+India+Sumatra	1	2.2
7. Nicobar+Java	1	2.2
8. Andaman+India+Thailand+Burma+Malaya	3	6.6
9. Andaman+India+Thailand+Burma+Malaya+Java & Sumatra	3	6.6
10. Andaman+Nicobar+Java & Sumatra	1	2.2
11. Andaman+Nicobar+India+Thailand+Burma+Malaya+Java & Sumatra	1	2.2

On the basis of geographical distribution of the mammals of these islands the maximum faunal affinity is found with India (Table-3). Among the alien species, nine mammals of Andaman and four of Nicobars are found on Indian main land, of course some of these also occur in Burma, Malaya, Java and Sumatra. There are only two species, *F. pennanti* and *Axis axis* which are found only in India. Likewise, only one species, *Pteropus melanotus* is found only in Java-Sumatra after these islands. We do not find any species of these islands confined to Burma or Malaya only. Out of nine Indian species occurring in Andamans seven are also represented in Burma and Malaya, four of which are known from Java and Sumatra. Among the Nicobar mammals, two species *H. fulvus* and *P. coromandra* are found on Indian main land. Another species, *T. saccolaimus crassus* is found in India as well as Sumatra.

From the facts discussed above it is clear that major part of mammal fauna of Andaman and Nicobar Islands is endemic, each group comprising 32.6% separately and 4.3% sharing with each other.

Likewise 4.3% fauna is distributed between Andaman and India and another 4.3% between Nicobar and India. Presumption that Nicobars are more akin to Malaya or Java and Sumatra is not supported as far mammal fauna is concerned.

SUMMARY

The present paper provides a brief history of work on mammal fauna of Andaman and Nicobar Islands. The doubtful records of several mammals have also been discussed. Forty six species of mammals are recognised as representing the mammal fauna, these are dealt group-wise. The fauna composition, zoogeography and affinity of fauna with those of adjacent countries is also discussed.

ACKNOWLEDGEMENTS

Sincere thanks are due to the Director, Zoological Survey of India, Calcutta for providing facilities for this work. I am grateful to Dr. P. D. Gupta, Deputy Director, Gangetic Plains Regional Station, Patna for his valuable suggestions and providing facilities for the work. I am greatly indebted to Prof. S. Khera, Meerut University, Meerut for some literature and inspiration. The help of Shri T. P. Bhattacharya, Zoological Survey of India, Calcutta is also acknowledged.

REFERENCES

- ABDULALI, H. 1976. Wild life.... *Yojna*, **20** (13-14) : 72-73.
- ALEXENDER, J. E. 1827. Notice regarding Andaman Island, Bay of Bengal. *Edinbrug New philos. Jour.*, Edinburg, **2** : 43-48.
- ANDERSON, J. 1881. *Catalogur of Mammalia in the Indian Museum*, Calcutta. Pt. 1 : 223 pp.
- BHATTACHARYA, T. P. 1976. Occurrence of Indian Pipistrelle, *Pipistrellus coromandra* (Gray) (Mammalia : Chiroptera : Vespertilionidae) in Car Nicobar, Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, Bombay, **73** (3) : 516.
- BLANFORD, W. T. 1888, 1891. *The fauna of British India, including Ceylon and Burma*. Mammalia, vol. 1 & 2, London, 617 pp.
- BLYTH, E. 1846. Notes on the fauna of Nicobar Islands. *J. Asiat. Soc. Beng.*, Calcutta, **15** : 367-379.

- BLYTH, E. 1858. Report of Curator, Zoological department. *J. Asiat. Soc. Beng.*, Calcutta, **27** : 267-298.
- BLYTH, E. 1859. Report of Curator, Zoological department. *J. Asiat. Soc. Beng.*, Calcutta, **28** : 271-290.
- BLYTH, E. 1860. Report of Curator, Zoological department. *J. Asiat. Soc. Beng.*, Calcutta, **29** : 87-115.
- BLYTH, E. 1863. The Zoology of Andaman Islands. Appendix to Mouat's "Adventures and researches among the Andaman Islanders", pp. 345-367.
- CHANA, S. S. 1976. ...and its protection. *Yojna*, **20** (13-14) : 72-73.
- CHATURVEDI, Y. 1966a. A new house rat [Mammalia : Rodentia : Muridae] from the Andaman and Nicobar Islands. *Proc. zool. Soc. Calcutta*, **19** : 141-144.
- CHATURVEDI, Y. 1966b. Occurrence of the Northern Palm Squirrel, *Funambulus pennanti* Wroughton, in the Andamans. *J. Bombay nat. Hist. Soc.*, Bombay, **62** (3) : 545-546.
- CHATURVEDI, Y. 1969. Two new records of bats from Assam and Andaman Islands. *Labdev J. Sci. Tech.*, Kanpur, **7-B** (1) : 74-75.
- DOBSON, G. E. 1871. Description of four new species of Malayan bats from the collection of Dr. Stoliczka. *J. Asiat. Soc. Beng.*, Calcutta, **40** : (2) : 260-266.
- DOBSON, G. E. 1872. Brief description of five new species of Rhinolophine bats. *J. Asiat. Soc. Beng.*, Calcutta, **41** : 336-338.
- DOBSON, G. E. 1873. On the Pteropidae of India with description of new or little known species. *J. Asiat. Soc. Beng.*, Calcutta, **42** (2) : 194-205.
- DOBSON, G. E. 1876. *Monograph of the Asiatic Chiroptera and Catalogue of the species of bats in the collection of Indian Museum, Calcutta*. London, 288 pp.
- DOBSON, G. E. 1878. *Catalogue of the Chiroptera in the collection of the British Museum*. London. 566 pp.
- ELLERMAN, J. R. & MORRION-SCOTT, T. C. S. 1951. *Checklist of Palaearctic and Indian mammals, 1758-1946*. London, 810 pp.
- HILL, J. E. 1967. The bats of the Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, Bombay, **64** (1) : 1-9.

- MASON, J. W. 1908. On the fruit bats of the genus *Pteropus* inhabiting the Andaman and Nicobar Archipelagos with the description of a new species. *Rec. Indian Mus.*, Delhi, **2** : 159-166.
- MILLER, G. S. 1902. The mammals of the Andaman and Nicobar Islands. *Proc. U. S. natn. Mus.*, Washington, **24** : 751-795.
- NATH, B. & CHATURVEDI, Y 1875. On a collection of mammals from Andaman and Nicobar Islands. *Bull. Indian Mus.*, Calcutta, **8** (1) : 44-59 (1973).
- SCLATER, P. L. 1869. Notice of a live monkey from Port Blair, Andamans. *Proc. zool. Soc.*, London, : 467-468.
- SOOTA, T D. & CHATURVEDI, Y 1971 On the new locality record of a bat, *Pipistrellus camortae* Miller from Car Nicobar and a note on its systematic status. *Proc. 58th Indian Sci. Cong.*, : 547-548 (Abst.).
- TYTLER, C. 1864. Description of a new species of *Paradoxurus* from the Andaman Islands. *J. Asiat. Soc. Beng.*, Calcutta, **33** : 188.

ON THE BUTTERFLY FAUNA OF ANDAMAN AND NICOBAR ISLANDS (INDIA). I. PAPILIONIDAE

By

G. S. ARORA AND D. N. NANDI

Zoological Survey of India, Calcutta

INTRODUCTION

The present study is based on the material mainly collected by the various parties of Zoological Survey of India during the period from 1964 to 1976, and the old material in the National Zoological Collections (abbreviated in the text as N. Z. C.). The various parties, which collected the material from the Andaman and Nicobar group of Islands during the months from September to May, were led by the following scientists of the department : Dr. B. S. Lamba (March to April, 1964) ; Drs. A. Daniel & H. K. Bhowmik (March to April, 1966) ; Dr. B. K. Tikader (February to March, 1970 and April to May, 1971) ; Dr. B. Dutta (January to February, 1972) ; Drs. K. Raddiah & P. T. Cherian (September to October, 1972) ; Sri K. S. Pradhan, Dr. G. S. Arora and Sri D. N. Nandi (December 1972 to January, 1973) ; Dr. G. K. Srivastava (February to March, 1975) ; and Dr. P. K. Maiti and S/Shri D. K. Mandal and D. N. Nandi (December 1975 to January, 1976).

The paper deals with 21 species and subspecies, distributed over five genera under three tribes viz, *Troidini* (*Troides*, *Parides* and *Pachliopta*) ; *Papilionini* (*Papilio*) ; and *Leptocircini* (*Graphium*).

It is interesting to observe that the species like *Pachliopta hector* and *Papilio memnon agenor*, common on Indian mainland, are rare in Andaman and Nicobar Islands and have never been collected by any of the recent parties. Besides, as many as four subspecies namely, *Troides helena ferrari* from S. Nicobar, *Papilio fuscus andamanicus*, *Graphium eurypylus macronius* and *G. agamemnon andamana*, from the Andamans, are also very rare and have not been collected recently but all except *ferrari* are represented in N. Z. C. *Parides coon sambilanga*, a very rare species from Great Nicobar Island, is represented by only a single example in N. Z. C., a mention of which has also been made by Ferrar (1951), who has given a fine account of topography of the areas and dealt with the lepidopterous fauna.

Papilio demoleus (L.), a very common species throughout India, Burma and Sri Lanka but hitherto unrecorded from the Andaman and Nicobar group of Islands, is being recorded for the first time from Port Blair, Andaman. Similarly, *Parides rhodifer* known only from Andamans has been recorded from Car Nicobar ; and *Pachliopta aristolochiae kondulana* and *Papilio polytes nikobarus* known from Car

Nicobar, are reported from Gt. Nicobar Island. All these new records are of zoogeographical interest. The distribution of all the different species found on these Islands, is given in details.

The nomenclature has been followed after Talbot (1939), Munroe (1961) and Hemming (1967).

SYSTEMATIC ACCOUNT

1. *Troides helena heliconoides* (Moore)

1877. *Ornithoptera heliconoides* Moore, *Proc. zool. Soc. Lond.* : 592.

Material examined.—S. Andaman : 4 ♂♂, 8 ♀♀, (in N. Z. C. : no further data) ; Burmah Nallah, 4 ♂♂, 18. iv. 1964. N. Andaman : Tugapur Rest House, Mayabunder, 1 ♀, 13.v.1971.

Wing expanse.—Males, 131-135 mm.; females, 154-160 mm.

Distribution and Status.—Andaman Islands. Not rare. Ferrar (1951) observes that roads leading to Ramgachang and Mairmyo and paths to Black rock on Mt. Harriet, are good places for collecting this butterfly.

Remarks.—The subspecies popularly known as the 'Common Birdwing' is one of the largest species, and is characterised by the hindwing being usually golden yellow ; the postdiscal spots larger in female, small or absent in male except in area Cu_{1a} in males where the spot is conjoined with terminal marking.

2. *Troides helena ferrari* Tytler

1926. *Troides ferrari* Tytler, *J. Bombay nat. Hist. Soc.*, 31 : 248-249.

Material examined.—No material of the species was available for study.

Wing expanse.—140-170 mm. (*vide* Talbot, 1939).

Distribution and Status.—South Nicobar Islands. Rare.

Remarks.—Originally recorded from Kondul, the subspecies is reported (*vide* Ferrar, 1951) to be occurring in Gt. and Little Nicobar Islands.

3. *Parides coon sambilanga* (Doherty)

1886. *Papilio doubledayi sambilanga* Doherty, *J. asiat. Soc. Beng.*, (2) 55 (3) : 263.

Material examined.—Gt. Nicobar : 1 ♂ (in N. Z. C. : no further data).

Wing expanse.—Male, 111 mm.

Distribution and Status.—Great Nicobar Island. Very rare.

Remarks.—The subspecies hitherto known from Great Nicobar Island only, has neither been collected by survey parties during the present surveys, nor seems to have been observed by Ferrar (1951) in Southern Nicobars. It is very rare and represented by a single example of male from Great Nicobar in N. Z. C., and is characterised by the tail being black, unlike red in *rhodifer* to which it is closely allied.

4. *Parides rhodifer* (Butler)

1876. *Popilio rhodifer* Butler, *Ent. Mon. Mag.* 13 : 77.

Material examined.—Andamans : 7 ♂♂, 3 ♀♀ (in N. Z. C. : no further data). S. Andaman : Port Blair, Haddo Guest House, 1 ♀, 28. iii. 1964 ; Burmah Nallah, 5 ♂♂, 13, 17. iv. 1964 ; Mt. Harriet range, Mannarghat, 1 ♀, 2. iv. 1964 ; Wright Mayo, 2 ♂♂, 18. iv. 1971, 1 ♂, 1 ♀, 16, 26. xii. 1972 ; Humfraygunj, 2 ♂♂, 17. xii. 1972 ; Chiriatapu, 2 ♂♂, 20. xii. 1972 ; Panighat, 1 ♂, 3. i. 1973 ; South Point, 1 ♀, i. xii. 1975. Mid. Andaman : Panchwati, 2 ♂♂, 6. i. 1973. Car Nicobar : Malacca-Kakana Road, 1 ♂, 25. xii. 1972.

Wing expanse.—Males, 101-133mm.; females, 115-135 mm.

Distribution and Status.—Andaman Islands ; Car Nicobar (New record). Not rare.

Remarks.—Hitherto recorded from Great Andaman Islands, the species is being recorded for the first time from Car Nicobar as well, so that its distribution is extended further southwards.

The species is characterised by the presence of a white patch in the apical half of cell and large white postdiscal patches close to cell below veins R_s - M_1 and Cu_{1b} on hind wing ; spots below M_2 and M_3 and rarely below Cu_{1a} , absent on upperside, obsolescent or weakly developed on underside.

5. *Pachliopta hector* (Linnaeus)

1758. *Papilio hector* Linnaeus, *Syst. Nat.*, 10th ed : 459.

Material examined.—No material of this species was available for study.

Wing expanse.—Males and females, 90-110 mm. (vide Talbot, 1939).

Distribution and Status.—Peninsular India, the Andaman islands and Sri Lanka. Very rare in Andaman Islands.

Remarks.—Referable to the genus *Pachliopta*, the subspecies is very rare in Andamans only and has neither been collected by survey parties nor represented in N. Z. C. by any material from Andamans. The species is characterised by the presence of a postdiscal and a submarginal row of red spots, on hind wing; forewing with an interrupted white band from subcosta, running obliquely to tornus and another similar subapical band from subcosta to vein M_1 , or slightly below M_1 .

6. *Pachliopta aristolochiae goniopeltis* (Rothschild)

1908. *Papilio aristolochiae goniopeltis* Rothschild, *Novit. zool.*, 15 : 167.

Material examined.—S. Andaman : Rajatgarh, Baratang, 1 ♂, 22. iii. 1964; Burmah Nallah, 1 ♂, 14. iv. 1964, 1 ♂, 15. iv. 1964, 7 ♂♂, 17. iv. 1964; Aniket, 1 ♀, 16. i. 1973; Wright Mayo, Kalatang forest, Mt. Harriet, 1 ♀, 28. ii. 1975.

Wing expanse.—Males, 76-84 mm; females 75-94 mm.

Distribution and Status.—Burma; India (Andaman Islands); also found in South China and Thailand (Siam). Common.

Remarks.—It differs from nomino-typical subspecies in the basal area of forewing being black upto the origin of vein Cu_{1b} and the white postdiscal spot in hind wing being long and pointed in the area above vein Cu_{1a} .

7. *Pachliopta aristolochiae sawi* (Evans)

1932. *Tros aristolochiae sawi* Evans, *Identification of Indian Butterflies* : 44.

Material examined.—Car Nicobar : Malacca-Kakana Road, 1 ♂, 2 ♀♀, 25. xii. 1972.

Wing expanse.—Males, 95 mm; females, 88-93 mm.

Distribution and Status.—Car Nicobar Islands. Not rare.

Remarks.—Very common at Car Nicobar, particularly at Sawi, the subspecies is closely allied to *goniopeltis* except for the postdiscal series of spots which are not as large as in same-sized specimens of *goniopeltis*.

8. *Pachliopta aristolochiae camorta* (Moore)

1877. *Papilio camorta* Moore, *Proc. zool. Soc. Lond.* : 592.

Material examined.—Kamorta, 4 ♀ ♀, (in N. Z. C. : no further data)
Car Nicobar : Kamorta Islands. 1 ♂, 1 ♀, 19. iii. 1970 ; 1 ♂, 24. iii. 1970.

Wing expanse.—Males, 94-102 mm ; females, 93-106 mm.

Remarks.—The subspecies is very common in central group of Nicobar Islands, particularly at Kamorta and Nankowri, the subspecies differs in hindwing from both *goniopeltis* and *sawi* in respect of the presence of only two postdiscal spots, i. e., one below Cu_{1b} and another above it on upperside, those in areas above vein Cu_{1a} and M_3 are obsolescent on upperside and weakly developed on underside ; cell also with a spot at its apex on the underside.

9. *Pachliopta aristolochiae kondulana* (Evans)

1932. *Tros aristolochiae kondulana* Evans, *Identification of Indian Butterflies* : 45.

Material examined.—Gt. Nicobar : 1 ♂, 1 ♀, (in N. Z. C. : no further data) ; Campbell Bay, 1 ♂, 27. xii. 1975.

Wing expanse.—Male, 102 mm ; female, 93 mm.

Distribution and Status.—The subspecies is restricted to southern group of Nicobar Islands and is easily recognised from all the preceding subspecies by the shorter postdiscal spots which are not rounded at their apical ends ; the spot in area Cu_{1b} reddish in distal half on upperside, completely reddish on underside, interrupted by black scaling on upper margin. Ferrar (1951) was of the opinion that the species, originally taken at Kondul, probably occurred on the rest of the southern group. A single male from recent collections and a male and female from the old material in N. Z. C., collected from Great Nicobar Islands, confirm his observations.

10. *Papilio clytia flavolimbatus* (Oberthür)

1879. *Papilio dissimilis* var *flavolimbatus*, Oberthür, *Et. d'Ent.*, 4 : 101.

Material examined.—S. Andaman : Cowrighat, 1 ♀, 8. iv. 1964. N. Andaman : Tugapur Rest House, 1 ♂ 12. v. 1971.

Wing expanse.—Male, 93 mm ; female, 105 mm.

Distribution and Status.—Andaman Islands Not rare.

Remarks.—This species is close to the f. *dissimilis* of *clytia clytia* except for its large size, narrow streaks in cell on both wings and large prominent yellow marginal spots on hind wings.

11. *Papilio memnon agenor* Linnaeus

1758. *Papilio agenor* Linn., *Syst. Nat.*, 10th ed : 460.

Material examined.—No material was available for study.

Wing expanse.—Male and female, 120-150 mm. (*vide* Talbot, 1939).

Distribution and Status.—India (Sikkim) to South Burma and the South Nicobar Islands. Talbot reports stragglers on the Andaman and Car Nicobar Islands. Very rare.

Remarks.—Commonly called the 'The Great Mormon', the species is well known for its polymorphic forms in both sexes ; in females particularly, as many as nine forms have been reported to occur in the species, with only f. *agenor* occurring in Andaman and Nicobar Islands. However, no material has been collected by the Z. S. I. parties recently, nor represented in N. Z. C., for these areas.

12. *Papilio mayo* Atkinson

1853. *Papilio mayo* Atkinson, *Proc. zool. soc. Lond.* : 736.

Material examined.—S. Andaman : Humfraygunj, Waterfall, 1 ♂, 7. iii. 1964. Mid. Andaman : Panchwati, 1 ♀, 6. i. 1973.

Wing expanse.—Male, 113 mm.; female, 130 mm.

Distribution and Status.—Gt. and Little Andaman Islands. ♂ common, ♀ rare.

Remarks.—The species is closely allied to the preceding species in the basal area in wings, on underside, being prominent red and in the hindwing in the females being tailed. The two species, However, differ from each other, in the male having a broad pale blue discal band and in the female with the abdomen being black. The species, represented by an example each of male and female, shows sexual dimorphism,

13. *Papilio fuscus andamanicus* Rothschild

1908. *Papilio fuscus andamanicus* Rothschild, *Novit. zool.*, 15 : 171.

Material examined.—No material has been collected recently. However, the N. Z. C. has 7 ♂♂ and 6 ♀♀, all from Andamans, and with 2 exs. showing the date as 'April'

Wing expanse.—Males, 94-106 mm ; females, 94-114 mm.

Distribution and Status.—Andaman Islands. Rare.

Remarks.—Referable to the *Helenus* group, including *polytes*, the species, however, is close to *P. chaon* particularly in the discal band on hind wing extending between veins R_s - M_3 , but differs from it in the submarginal lunules being bluish, unlike yellowish as in *chaon*. The present specimens are slightly smaller in expanse as compared to the minimum recorded expanse as 105 mm. (*vide*, Talbot, 1939).

14. *Papilio polytes stichioides* Evans

1912. *Papilio polytes stichioides* Evans, *J. Bombay nat. Hist. Soc.*, 21 : 972.

Material examined.—S. Andaman : 6 ♂♂, 1 ♀ (in N. Z. C. : no further data) ; Wrafters creak, Baratang, 1 ♂, 12. xii. 1964 ; Port Blair, Dockyard, 1 ♀, (f. *cyrus*), 25. ii. 1970 ; Chiriatapu, 1 ♂, 27. v. 1971, 1 ♂, 1 ♀, (f. *stichius*), 28. v. 1971, 1 ♀, (f. *stichius*), 19. i. 1972, 3 ♂♂, 1 ♀ (f. *cyrus*), 20. xii. 1972. ; Ferargunj, 1 ♂, 17. i. 1973 ; Bambooflat, 1 ♂, 19. xii. 1975. Mid. Andaman : Bakultala, 1 ♀ (f. *cyrus*), 7. i. 1973. N. Andaman : Mayabunder, 1 ♂, 4. v. 1971 ; Tugapur, 1 ♀ (f. *stichius*) i. 1973. Dundas point, 5 ♂♂, 1 ♀ (in N. Z. C. : no further data).

Wing expanse.—Males 85-97 mm ; females, 77-97 mm.

Distribution and Status.—Andaman Islands. Common.

Remarks.—The subspecies is quite common in S. Andaman Islands, and both the forms of female have been collected in recent surveys. Besides, 11 ♂♂ and 2 ♀♀ (f. *cyrus* only), all from S. Andamans, are also present in N. Z. C.

15. *Papilio polytes nikobarus* Felder

1862. *Popilio pammon* var. *nikobarus* C. Felder, *Verh. zool. bot. Ges. Wien.*, 12 : 483.

Material examined.—Car Nicobar : Sawi, 1 ♂, 16. ii. 1972, 1 ♂, 24. ii. 1972 ; Teetop, 2 ♂♂, 21. ii. 1972, 4 ♂♂, (1 ♂ on citrus), 1 ♀, (f. *stichius*), 24. ii. 1962, 2 ♂♂, 26. ii. 1972, 3 ♂♂, 27. ii. 1972 ; near C. P. W. D. office, 1 ♂, 23. ix. 1972 ; Malacca village, 2 ♂♂, 4. iii. 1970 ; Malacca-Kakna, 2 ♂♂, 25. xii. 1972, 1 ♂, 27. xii. 1972 ; Biglapati,

1 ♂, 28. xii. 1972 ; Keating point, 2 ♂♂, 7. iii. 1970. Central Nicobar ; Nankowri, 1 ♀, (f. *cyrus*) (no date collection) ; 1 ♀ (f. *cyrus*), 6. x. 1972 ; Kamorta, 1 ♀, (f. *cyrus*) (both without further data, in N. Z. C.) Kondul 4 ♂♂, 2 ♀♀, (no further data, in N. Z. C.). Gt. Nicobar : 4 ♂♂, 2 ♀♀ (no further data, in N. Z. C.) ; Galathea Bay, 1 ♀, (f. *stichius*), 22. iii. 1966, 2 ♀♀ (f. *cyrus*), 29. iii. 1966, 4. iv. 1967, Lakshman beach, Campbell Bay, 2 ♂♂, 3. iv. 1966, 1 ♂, 28. xii. 1975 ; Rajendra Nagar. 1 ♂, 30. xii. 1975.

Wing expanse.—Males, 81-95 mm. ; females, 90-102 mm.

Distribution and Status.—Car Nicobar, Central Nicobar and Southern group of Nicobar Islands, including Gt. Nicobar. The ♀ f. *stichius* is rare.

Remarks.—Reportedly distributed over Nicobar group of Islands, this constitutes first ever specific record of the subspecies right upto Gt. Nicobar, and is well represented by large number of males compared to number of female forms. Out of nearly 44 exs. examined, only two are *stichius* against 5 of *cyrus*, the remaining are males.

16. *Papilio demoleus demoleus* Linnaeus

1758. *Papilio demoleus* Linnaeus, *Syst. Nat.* 10th ed : 464.

Material examined.—S. Andaman : Port Blair, 1 ex., 1. iii. 1964 (without abdomen).

Wing expanse.—Male and female, 80-100 mm. (Talbot, 1939.)

Distribution and Status.—Sri Lanka, the whole of India to Northern Burma. Also extending to Persia and Arabia. Very Common.

Remarks.—The subspecies is although distributed throughout India, Sri Lanka and Burma, the present record from the Andamans constitutes the first ever from these islands.

17. *Graphium antiphates epaminondas* (Oberthür)

1879. *Papilio epaminondas* Oberthür, *Et. d'Ent.*, 4 : 62.

Material examined.—Andamans : 6 ♂♂, 5 ♀♀, (in N. Z. C. : no further data). N. Andaman : Smith Island, Near Forest department Camp, 1 ♂, 27. iv. 1971.

Wing expanse.—Males, 81-86 mm. ; females, 85-93 mm.

Distribution and status.—Andaman Islands. Not rare.

Remarks.—Restricted to Andamans only, the subspecies is characterised by the presence of broader bands on forewings.

18. *Graphium eurypylus macronius* (Jordan)

1909. *Papilio eurypylus macronius* Jordan, in Seitz, *Macrolepidoptera of the World*, 9 : 98.

Material examined.—Andamans : 4 ♂♂, 3 ♀♀, (in N. Z. C. : no further data).

Wing expanse.—Males, 81-95 mm ; females, 82-90 mm.

Distribution and Status.—Andaman Islands. Rare.

Remarks.—The subspecies is reported to be rare and restricted to Andaman Islands. No material has been collected during recent surveys. However, the old material in N. Z. C. has 4 ♂♂ and 3 ♀♀, from Andaman Islands without further data.

19. *Graphium agamemnon andamana* (Lathy)

1907. *Papilio agamemnon andamana* Lathy, *Trans. ent. Soc. Lond.* : 5.

Material examined.—Andamans 3 ♂♂, 10 ♀♀ (in N. Z. C. : no further data).

Wing expanse.—Males, 86-90 mm. ; females, 85-97 mm.

Distribution and Status.—Andaman Islands. Not rare.

Remarks.—No material has been collected during the recent surveys, but the material already present in the old collections in N. Z. C. from 'Andamans and S. Andamans' only is referable to this subspecies, but differs from the mainland subspecies *menides* in having lighter green-coloured markings on upperside. The series present before us for study, shows that the ground colour is equally darker as in mainland specimens, and the specimens with both shorter and larger tails are present.

20. *Graphium agamemnon decoratus* (Rothschild)

1895. *Papilio agamemnon decaratus* Rothschild, *Novit. zool.*, 2 : 452.

Material examined.—Car Nicobar : 1 ♂, (in N. Z. C. : no further data) ; Horticulture garden, 2 ♂♂, 8-9. iii. 1970 ; Kakana, 1 ♂, 27.

xii. 1972. 1 ♀, 28. xii, 1972 ; Biglapati, 1 ♂, 28. xii. 1972 ; Kamorta, 2 ♀ ♀, (no further data, in *N. Z. C.*).

Wing expanse.—Males, 81-89 mm ; females, 71-79 mm.

Distribution and Status.—Car Nicobar and central group of Nicobar Islands. Not rare.

Remarks.—The material present here and referable to this subspecies, is in general lighter in ground colour on upper and undersides of wings, but is characterised by the presence of five to seven red-coloured spots on underside of hindwings.

21. *Graphium agamemnon pulo* (Evans)

1932. *Zetides agamemnon pulo* Evans, *Identification of Indian Butterflies* : 56.

Material examined.—Gt. Nicobar, 1 ♀, (in *N. Z. C.* : no further data) ; Campbell Bay, 1 ♀, 6. iv. 1966 ; Rest House compound, Campbell Bay, 1 ♀, (*at light*) 29. xii. 1975.

Wing expanse.—Females, 43-71 mm.

Distribution and Status.—South Nicobar Islands (including Gt. Nicobar). Not rare.

Remarks.—Referable to this subspecies, it is close to *decoratus* from Car Nicobar Island, particularly in being lighter and in the presence of red spots on underside of hind wings, except in the tail being smaller. The subspecies extends right up to Great Nicobar Islands. The collection of this species at light is rare and of interest.

SUMMARY

The paper deals with 21 species and subspecies distributed over five genera and three tribes of the family Papilionidae. It brings to light one species as new to these areas ; one species as new to Nicobars ; and two as new to Great Nicobar Islands, besides detailed distributional records of the species.

ACKNOWLEDGEMENTS

The authors are indebted to the Director, Zoological Survey of India, for providing necessary laboratory facilities and encouragement. Thanks are due to Dr. O. B. Chhotani, Superintending Zoologist, Entomological Division for his valuable suggestions.

REFERENCES

- FERRAR, M. L. 1951. The Butterflies of the Andamans and Nicobars.-
J. Bombay nat. Hist. Soc., **47** (3 & 4) : 470-491, Pl, 5.
- HEMMING, F. 1967. The generic names of the butterflies and their
type-species (Lepidoptera : Rhopalocera).—*Bull. Br. Mus. Nat.
Hist. (Ent.)*, Suppl., **9** : 1-509.
- MUNROE, E. 1961. The classification of the Papilionidae (Lepidoptera).-
Canad. Entomol., Suppl., **17** : 1-51.
- TALBOT, G. 1939. *Fauna Brit. India*, Butterflies, **1** : xxix+600.
- WINTER-BLYTH, M. A. 1957. *Butterflies of the Indian Region*, xx+523
pp.

ON THE ZOOGEOGRAPHY OF THE INTERSTITIAL MEIOFAUNA OF THE ANDAMAN AND NICOBAR ISLANDS, INDIAN OCEAN

By

G. CHANDRASEKHARA RAO

Zoological Survey of India, Calcutta

(With 3 Text-figures and 2 Tables)

INTRODUCTION

Our knowledge of the interstitial meiofauna inhabiting the intertidal sands of temperate and tropical coastal waters has been considerably enriched due to the valuable contributions made by many workers since the inception of the studies nearly half a century ago. Extensive researches were carried out on the European coasts and a few other areas, leading to many an interesting discovery on various aspects of the fauna. On the other-hand, nothing is known until quite recently about the interstitial life and the ecological conditions prevailing in other parts of the world. This is particularly true with the Indo-Pacific region, where much exploration and discovery of the fauna still remain to be accomplished in several areas. Thus, any investigation of the Indian ocean, which is known to constitute an important biological link uniting the Atlantic and Pacific waters and bordered by many unexplored regions well isolated by vast stretches of the ocean, will doubtless contribute to a better understanding of the geographical distribution of these animals. Some limited explorations have, however, been carried out in the Indian Ocean on the coasts of Red Sea, South Africa, Mozambique, Madagascar, Maldives, Kerguelen, India, Malaysia and Australia.

Nothing is known of the interstitial meiofauna of the Andaman and Nicobar Islands until the three recent faunistic surveys undertaken by the Zoological Survey of India in the years 1969, 1973 and 1974. During these surveys, the author had an opportunity to make collections of the fauna on some of these islands and study the material. The data presented here includes the author's published and unpublished work. These qualitative collections made at random indicated the presence of a rich variety of fauna of diverse groups that are characteristic of beaches in other parts of the world.

It is premature to attempt a full article on zoogeography when the interstitial meiofauna of the Andaman and Nicobar Islands and other coasts of the Indian Ocean is incompletely known, making a zoogeographical comparison difficult. Yet, a preliminary attempt is made here with the information hitherto available.

TOPOGRAPHY AND COLLECTING LOCALITIES

The Andaman and Nicobar Islands comprise an arcuate chain of 348 islands of various sizes spread in a distance of about 1120 km and located between Lower Burma and Upper Sumatra of Indonesia in the Bay of Bengal. They are summits of the submarine range of hills that connects Arakan Yomas of Burma with Achin head in Sumatra. The Andaman group with 324 islands forms the northern part of the chain, while the Nicobar group with 24 islands the southern. The total land area of these islands is about 8,293 sq kms. The islands have a mass of hills enclosing valleys and a large part of the territory is covered with dense evergreen tropical forests. The vegetation is mostly Burmese and Malay type. The climate is typically tropical, with heavy gales and rainfall. The soil varies from sand to clay. Some of the shores support rich growth of mangrove vegetation and coral reefs of the fringing type.

The collection of fauna was made at the following 24 stations on the archipelago (Text-figs. 1—2). The stations are serially numbered. The major part of the collections were made from the Andaman group of islands.

North Andaman.—(1) Stewart Island, (2) Sound Island, (3) Aves Island, (4) Mayabander.

Middle Andaman.—(5) Rangat Bay, (6) Long Island.

South Andaman.—(7) Peal Island, (8) Havelock Island, (9) Neil Island, (10) Ross Island, (11) Aberdeen Bay, (12) Wandur, (13) Rangachang, (14) Chiriatapu.

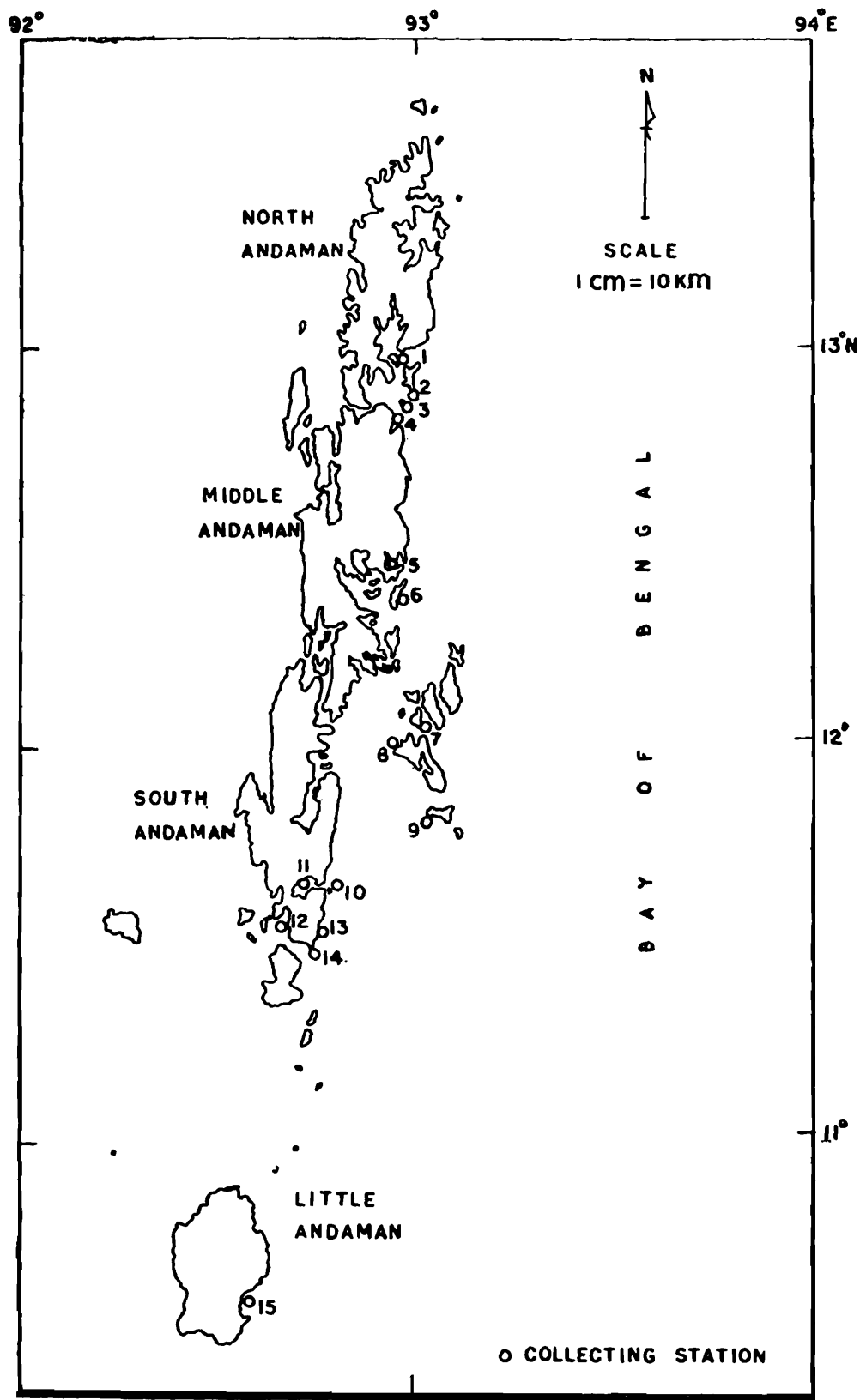
Little Andaman.—(15) Hut Bay.

Car Nicobar.—(16) Sawai Bay, (17) East Point, (18) West Point.

Kamorta.—(19) Nancowry Harbour, (20) Chotina Bay, (21) Champin Island, (22) Katchal Island.

Great Nicobar.—(23) Campbell Bay, (24) Bonnington Bay.

The collection of fauna was generally made at 3 to 5 places depending on the extent of exposure between the low and the high tide levels of the intertidal zone ; but mostly taken near the half-tide level, where bulk of the fauna normally distributed. With the help of a shovel, sand samples were dug out at various depths in the intertidal zone from top to a depth 50 cm below surface and transported to field laboratory in open polythene jars. Each sample of 100 ml was placed in a beaker containing 6% magnesium chloride solution, 10-15 minutes allowed for anaesthetization of fauna and then the



Text—fig. 1. Map of the Andaman Islands, showing collecting stations 1-15.

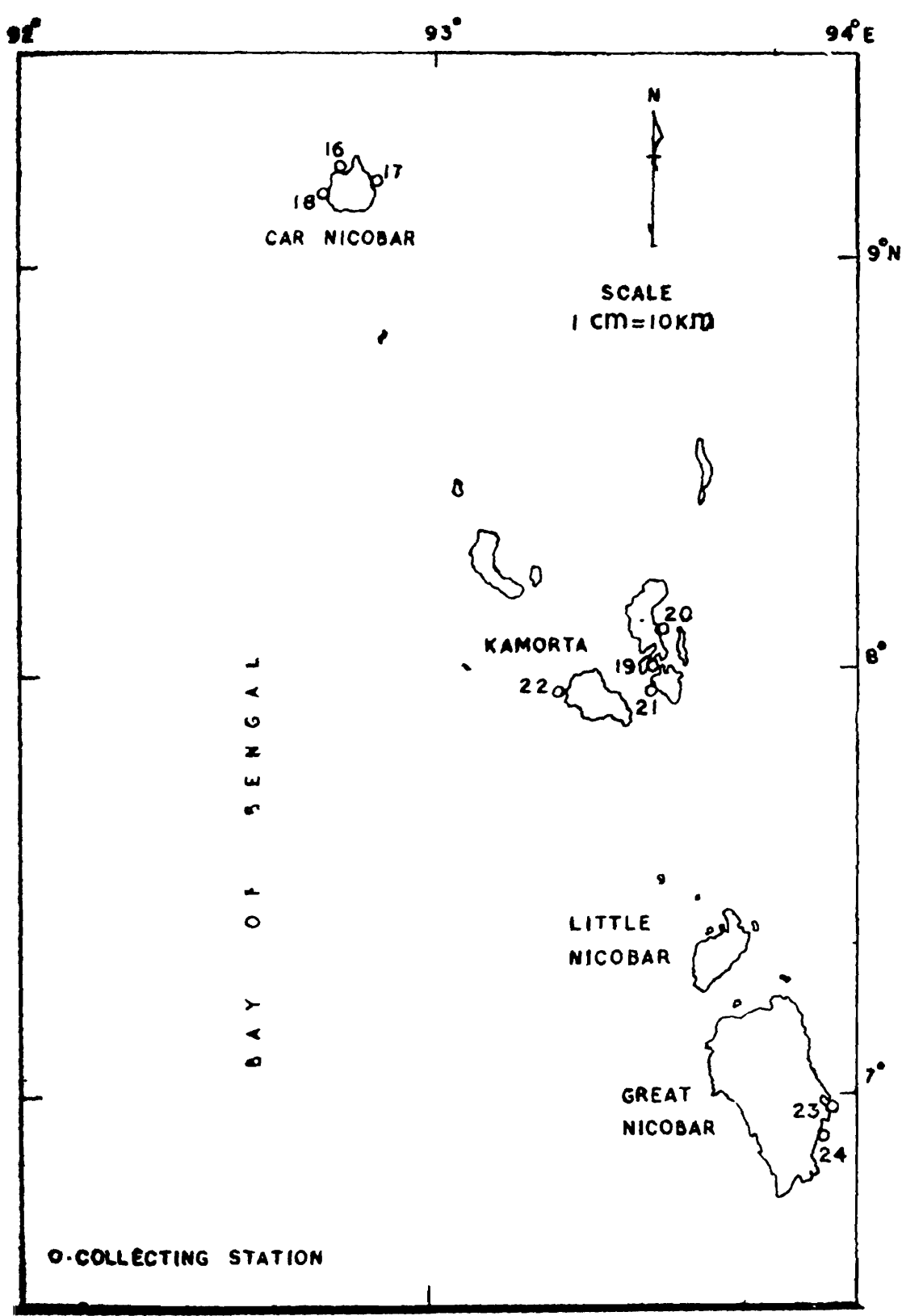
sediment vigorously stirred. After a momentary settling of the coarse sediment, the supernatant water was quickly decanted through a sieve with apertures of 65 μm . The stirring and decanting processes were repeated thrice, when bulk of the fauna got removed from the sediment. Animals thus released on the sieve were washed off into a vial with a jet of filtered sea water. The diverse groups of fauna present in each sample were examined under a binocular microscope, sorted out and counted. The soft fauna was studied in fresh condition or fixed in Bouin's fluid and preserved in 70% alcohol; while the hard fauna was preserved in 5% neutral formalin containing 2% glycerine, for subsequent analysis.

HABITAT AND DISTRIBUTION OF FAUNA

The archipelago offers a rich variety of habitats for the colonization of fauna. Thus, the biogeographic importance of these islands lies mainly in providing isolated biotopes, favouring evolution of a variety of species. In many of the islands investigated, the coast is mostly rocky and sandy or muddy. In some areas the sandy beaches are extensive, while in other places they are restricted to patches between cliffs. Many of the beaches studied are exposed to surf action, while some are sheltered. The sands are mostly fine and medium, silicious or coralline, and grain shape varied from spherical to angular. Temperature and salinity of interstitial water in the habitat varied between 26°C to 30°C and 29‰ to 34‰, respectively. The intertidal sands are sufficiently rich in organic detritus.

The fauna was collected from coarse sandy substrates to soft sediments. The general pattern of distribution of the diverse groups of fauna at different intertidal and vertical levels of these sandy beaches more or less conforms with the conditions reported in other parts of the world. Widely distributed species occurred in different kinds of substratum. Sheltered beaches with adequate coarse particle size generally harboured rich populations of the fauna, probably due to the less disturbed habitat that permits an uninhibited proliferation of the fauna. Beaches with very fine or muddy sand yielded poor collections. Thus, the majority of species showed preferences to habitat selection and are not susceptible to abiotic conditions of the environment. Bulk of the fauna occurred near half-tide level 10-40 cm below surface, depending on the distance from low water level.

The density and diversity of the fauna varied from island to island and locality to locality. Thus, a considerable percentage of the species are stenotopic with restricted distribution, while the others appeared to have a wider distribution on these islands. Quantitatively, the density of the fauna is comparatively low and a maximum of only 600-800 specimens could be collected in 100 cm³ sand (Rao, 1970a). Almost all the typical groups of the interstitial meiofauna, excepting Mystacocarida and Bryozoa, were collected in these sandy beaches.



Text—fig. 2. Map of the Nicobar Islands, showing collecting stations 16-24.

Quantitatively, the copepods formed a dominant element of the total meiofauna (Fig. 3A). Annelids and nematodes were generally second in overall abundance. The Ciliata, Turbellaria, Gnathostmulida, Gastrotricha, Isopoda and Amphipoda, are moderately represented. All the other groups of animals occurred in very small numbers.

LIST OF SPECIES

The list of interstitial meiofauna species of the diverse groups hitherto identified from these islands, together with their known geographical distribution, is given in Table 1. The distribution shown for few of these species is not complete due to non-availability of the concerned literature. The collecting localities, abundance and collection data of these individual species will be given while publishing the detailed reports of the concerned groups. The fauna is largely composed of species of well known genera having more or less a global distribution. Recent investigations on different parts of the world have indicated a wide geographical distribution of many interstitial species and the present study further adds to the ranges of several species. Thus, these zoogeographical ranges will be extended as more and more areas

Table—1. The known geographical distribution of interstitial meiofauna species of the Andaman and Nicobar Islands on other coasts of the world. *Species which are uncertain endemics.+denotes record of the species. Africa includes Madagascar.

Alphabetical list of species	India	Africa	Europe	America	Other parts
CILIATA					
* <i>Aspidisca</i> sp.					
<i>Coleps tessellatus</i> Kahl	+		+	+	
* <i>Coleps</i> spp. (2)					
<i>Condyllostoma patens</i> (O. F. Muller)	+		+	+	
<i>Diophrys appendiculata</i> (Ehrenberg)	+		+	+	Japan
* <i>Diophrys</i> sp.					
<i>Epiclintes ambiguus</i> (O. F. Muller)	+		+	+	Japan
<i>Euplotes vannus</i> O. F. Muller	+		+	+	
* <i>Euplotes</i> sp.					
<i>Geleia fossata</i> Kahl	+		+	+	
<i>Lacrymaria olar</i> O. F. Muller	+		+	+	Japan
<i>Metopus vestitus</i> Kahl	+		+	+	Japan
<i>Oxytricha marina</i> Kahl	+		+		Japan

Alphabetical list of species	India	Africa	Europe	America	Other parts
<i>Pleuronema coronatum</i> Kent	+		+	+	Japan
• <i>Prorodon</i> sp.					
• <i>Remanella</i> sp.					
• <i>Trachelocerca</i> sp.					
<i>Tracheloraphis phoenicopterus</i> (Cohn)	+		+	+	
• <i>Tracheloraphis</i> sp.					
<i>Urotricha globosa</i> Schewiakoff	+				New Zealand
CNIDARIA					
• <i>Anthohydra psammobionta</i> Salvini-Plawen and Rao					
• <i>Halammohydra andamanensis</i> Rao					
• <i>Halammohydra chauhani</i> Rao					
• <i>Halammohydra</i> sp.					
TURBELLARIA					
• <i>Acanthomacrostomum gerlachi</i> Ax	+				Māldives
• <i>Breslauilla</i> sp.					
<i>Cheliplana vestibularis</i> Beauchamp	+		+		
• <i>Cicerina</i> sp.					
• <i>Coelogynopora</i> spp. (3)					
• <i>Convoluta</i> spp. (2)					
• <i>Diascorhynchus</i> sp.					
<i>Gyratrix hermaphroditus</i> Ehrenberg	+	+	+	+	Galapagos, Greenland, Japan.
• <i>Macrostomum</i> spp. (2)					
• <i>Minona</i> sp.					
<i>Monocelis lineata</i> (O. F. Muller)	+		+		
• <i>Nematoplana</i> sp.					
• <i>Otoplana</i> spp. (3)					
• <i>Plagiostomum</i> spp. (2)					
• <i>Polycystis</i> sp.					
• <i>Promesostoma</i> spp. (2)					
• <i>Proxenetes</i> sp.					
• <i>Rogneda</i> sp.					
• <i>Schizochilus</i> sp.					
• <i>Utegla</i> sp.					

Alphabetical list of species	India	Africa	Europe	America	Other parts
<i>Vejdovskya pellucida</i> (M. Schultze)	+		+		
GNATHOSTOMULIDA					
* <i>Austrognathia</i> sp.					
* <i>Gnathostomula</i> spp. (2)					
* <i>Haplognathia</i> sp.					
NEMATODA					
<i>Anticoma acuminata</i> (Eberth)	+		+	+	Red Sea, Maldives
<i>Anticoma arctica</i> Steiner	+		+	+	Red Sea, Maldives
* <i>Araeolaimus</i> sp.					
* <i>Bathyepsilonema</i> sp.					
* <i>Bathylaimus</i> sp.					
<i>Camacolaimus prytherchi</i> Chitwood	+			+	Maldives Bermuda
* <i>Ceramonema</i> sp.					
<i>Chromadora vulgaris</i> Bastian	+		+	+	
<i>Chromaspirina indica</i> Gerlach					Maldives
<i>Desmodora brevicollis</i> (Cobb)		+			Maldives, Jamaica
<i>Desmodora megalosoma</i> Steiner	+	+		+	Maldives
* <i>Desmodora</i> spp. (2)					
<i>Dolicholaimus benepapillosus</i> (Schulz)	+		+	+	
<i>Draconema cephalatum</i> Cobb	+		+	+	Red Sea, Maldives
<i>Enoploides harpax</i> Wieser	+			+	
* <i>Enoploides</i> sp.					
<i>Eubostrichus exilis</i> (Cobb)	+			+	Red Sea, Maldives
* <i>Gammanema</i> sp.					
<i>Halalaimus supercirrhatus</i> Gerlach	+			+	Maldives
* <i>Halalaimus</i> spp. (2)					
<i>Halichoanolaimus robustus</i> (Bastian)	+		+	+	Maldives
* <i>Halipletus</i> sp.					
<i>Latronema orcinum</i> Gerlach	+		+	+	Red Sea, Maldives
* <i>Mesacanthion</i> sp.					
<i>Metachromadora clavata</i> Gerlach	+			+	Red Sea, Maldives

Alphabetical list of species	India	Africa	Europe	America	Other parts
* <i>Microlaimus</i> sp.					
<i>Monhystera parva</i> (Bastian)	+		+	+	Red Sea,
<i>Monoposthia costata</i> (Bastian)	+		+	+	Maldives
* <i>Nannolaimus</i> sp.					
<i>Oncholaimus brachycercus</i> de Man	+		+	+	
<i>Platycoma africanum</i> (Gerlach)	+	+			Red Sea, Maldives
<i>Procamacolaimus tubifer</i> Gerlach	+	+			Red Sea, Maldives
<i>Rhynchonema cinctum</i> Cobb	+			+	Red Sea
<i>Sabatieria jubata</i> (Cobb)	+			+	
* <i>Sabatieria</i> sp.					
* <i>Spaerolaimus</i> sp.					
<i>Steineria pilosa</i> (Cobb)	+		+	+	
* <i>Steineria</i> sp.					
<i>Synonchium obtusum</i> Cobb	+	+	+	+	Red Sea, Maldives
<i>Syringolaimus striaticauda</i> de Man	+		+	+	Red Sea
* <i>Theristus</i> spp. (2)					
* <i>Tricoma</i> sp.					
* <i>Viscosia</i> sp.					
GASTROTRICHA					
<i>Acanthodasys aculeatus</i> Remane	+		+	+	Maldives
<i>Aspidophorus marinus</i> Remane	+		+	+	Maldives
* <i>Cephalodasys</i> sp.					
<i>Chaetonotus atrox</i> Wilke	+		+		
* <i>Chaetonotus</i> spp. (3)					
<i>Dactylopodola indica</i> (Rao and Ganapati)	+				
* <i>Dinodasys</i> sp.					
* <i>Macrodasys</i> spp. (3)					
* <i>Paradasys</i> sp.					
<i>Paraturbanella boadeni</i> Rao and Ganapati	+				
* <i>Paraturbanella</i> spp. (5)					
* <i>Planodasys</i> sp.					
* <i>Pseudostomella malayica</i> Renaud-Mornant					Malaysia

Alphabetical list of species	India	Africa	Europe	America	Other parts
* <i>Pseudostomella</i> spp. (2).					
<i>Tetranchyroderma indica</i> Rao and Ganapati	+				
* <i>Tetranchyroderma</i> spp. (6)					
<i>Thaumastoderma heideri</i> Remane	+		+		Maldives
* <i>Turbanella</i> spp. (2)					
<i>Urodasys viviparus</i> Wilke	+		+	+	Maldives, Bermuda
* <i>Urodasys</i> sp.					
<i>Xenotrichula velox</i> Remane	+		+		
* <i>Xenotrichula</i> spp. (2)					
KINORHYNCHA					
<i>Cateria gerlachi</i> Higgins	+				
* <i>Echinoderes andamanensis</i> Higgins and Rao					
<i>Echinoderes ehlersi</i> Zelinka		+			
* <i>Pycnophyes</i> sp.					
NEMERTINA					
* <i>Cephalothrix</i> sp.					
* <i>Ototyphlonemertes</i> spp. (3)					
* <i>Sacconemertes</i> sp.					
ROTIFERA					
* <i>Encentrum</i> spp. (2)					
* <i>Proales</i> sp.					
ARCHIANNELIDA					
<i>Dinophilus gyrociliatus</i> Schmidt	+		+	+	Japan
* <i>Dinophilus</i> sp.					
<i>Diurodrilus benazzii</i> Gerlach	+		+		
* <i>Diurodrilus</i> sp.					
<i>Nerilla antennata</i> Schmidt	+	+	+	+	
* <i>Nerilla</i> sp.					
* <i>Nerillidium</i> sp.					
<i>Polygordius madrasensis</i> Aiyar and Alikunhi	+	+			
* <i>Polygordius</i> spp. (3)					
<i>Protodrilus indicus</i> Aiyar and Alikunhi	+				Malaysia New Caledonia
<i>Protodrilus pierantonii</i> Aiyar and Alikunhi	+				Galapagos

Alphabetical list of species	India	Africa	Europe	America	Other parts
• <i>Protodrilus</i> spp. (5)					
<i>Saccocirrus krusadensis</i> Alikunhi	+		+		Japan ?
<i>Saccocirrus major</i> Pierantoni			+		Japan
<i>Saccocirrus minor</i> Aiyar and Alikunhi	+				Malaysia
<i>Saccocirrus orientalis</i> Alikunhi	+	+			
• <i>Saccocirrus</i> sp.					
• <i>Trilobodrilus</i> sp.					
POLYCHAETA					
<i>Branchiosyllis exilis</i> (Gravier)	+	+		+	Red Sea, Maldives Galapagos
<i>Brania oculata</i> (Hartmann-Schroder)	+	+	+	+	Red Sea, Galapagos
<i>Brania subterranea</i> (Hartmann-Schroder)	+	+	+	+	Galapagos
• <i>Brania</i> sp.					
• <i>Ceratonereis</i> sp.					
<i>Ehlersia cornuta</i> (Rathke)	+	+	+		Red Sea, Malaysia
• <i>Ehlersia</i> sp.					
<i>Eusyllis homocirrata</i> Hartmann-Schroder	+	+		+	Galapagos
• <i>Exogone</i> spp. (3)					
<i>Goniadides aciculata</i> Hartmann-Schroder	+				Red Sea
• <i>Goniadides</i> spp. (2)					
<i>Hesionides arenaria</i> Friedrich	+	+	+	+	Red Sea, Malaysia, Polynesia, Japan, Galapagos.
<i>Hesionides gohari</i> Hartmann-Schroder	+	+	+	+	Red Sea
<i>Hesionides indooceanica</i> Westheide and Rao	+				
• <i>Hesionides</i> spp. (2)					
<i>Hesionura elongata</i> (Southern)	+		+	+	
<i>Microphthalmus urofimbriatus</i> Alikunhi	+	+			Red Sea
<i>Ophryotrocha labronica</i> Greca and Bacci ?	+		+		Japan, Galapagos ?
<i>Parasphaerosyllis indica</i> Monro	+	+		+	Samoa, Galapagos, Red Sea

Alphabetical list of species	India	Africa	Europe	America	Other parts
<i>Petitia amphophalma</i> Siewing	+	+	+	+	Red Sea
<i>Pisone complexa</i> Alikunhi	+				
<i>Pisone oerstedii</i> Grube	+	+	+	+	Galapagos
* <i>Pisone</i> sp.					
<i>Pisionidens indica</i> (Aiyar and Alikunhi)	+	+		+	Red Sea, Malaysia
<i>Plakosyllis brevipes</i> Hartmann-Schroder	+		+		Red Sea New Caledonia
<i>Sphaerosyllis bengalensis</i> Rao and Ganapati	+				
* <i>Sphaerosyllis</i> spp. (2)					
<i>Syllis gracilis</i> Grube	+	+	+	+	
* <i>Trypanosyllis</i> sp.					
<i>Typosyllis variegata</i> (Grube)	+	+	+	+	Red Sea, Maldives
* <i>Typosyllis</i> spp. (2)					
OLIGOCHAETA					
<i>Aelosoma maritimum</i> Westheide and Bunke ?	+		+		Galapagos
* <i>Enchytraeoides</i> sp.					
<i>Fridericia bulbosa</i> (Rosa)	+		+	+	
* <i>Marionina</i> spp. (2)					
<i>Phallodrilus monospermathecus</i> (Knollner)	+		+	+	
OSTRACODA					
* <i>Cythereis</i> sp.					
<i>Cytheridea papillosa</i> Bosquet	+		+	+	
* <i>Cytheridea</i> sp.					
<i>Microcythere subterranea</i> Hartmann	+		+		
<i>Microloxoconcha compressa</i> Hartmann	+		+		
* <i>Polycope</i> spp. (2)					
* <i>Xestoleberis</i> sp.					
COPEPODA					
<i>Ameira parvula</i> (Claus)	+	+	+	+	
* <i>Ameira</i> spp. (2)					
<i>Amphiascoides neglectus</i> (Normann and T. Scott)			+		
* <i>Amphiascus</i> sp.					

Alphabetical list of species	India	Africa	Europe	America	Other parts
<i>Apodopsyllus camptus</i> Wells	+				
<i>Apodopsyllus depressus</i> (Krishnaswamy)	+				
<i>Arenopontia indica</i> Rao	+				
<i>Arenopontia subterranea</i> Kunz	+	+	+	+	
<i>Arenopontia longiremis</i> Chappuis ?	+	+			Bahamas
<i>Arenosetella germanica</i> Kunz	+	+	+	+	
* <i>Arenosetella</i> spp. (2)					
* <i>Balucopsylla</i> sp.					
* <i>Brianola</i> spp. (2)					
* <i>Canuellina</i> spp. (3)					
<i>Ectinosoma dentatum</i> Steuer	+	+	+	+	Caroline Is. Bermuda
<i>Ectinosoma melaniceps</i> Boeck	+	+	+	+	Red Sea
* <i>Ectinosoma</i> sp.					
* <i>Eoschizopera reducta</i> Wells and Rao					
<i>Harpacticus gracilis</i> Claus	+	+	+	+	Red Sea, Maldives
<i>Hastigerella leptoderma</i> Klie ?			+		
<i>Hastigerella setosus</i> (Rao and Ganapati)	+				
* <i>Hastigerella</i> spp. (2)					
<i>Karllangia arenicala</i> Noodt ?					Red Sea
<i>Klieonychocamptoides remanei</i> Noodt	+	+			Teneriffa
<i>Kliopsyllus holasticus</i> (Klie)			+		
<i>Kliopsyllus psammophilus</i> (Noodt)	+				Red Sea, Malaysia
* <i>Kliospsyllus spiniger</i> Wells, Kunz and Rao					
<i>Kliospsyllus wilsoni</i> (Krishnaswamy)	+				
* <i>Kliospsyllus</i> sp.					
<i>Laophonte cornuta</i> Philippi	+	+		+	Red Sea, Maldives, Bermuda
* <i>Laophontina</i> sp.					
<i>Leptastacus constrictus</i> Lang				+	Malaysia
* <i>Leptopsyllus</i> sp.					
* <i>Longipedia</i> sp.					
<i>Lourinia armata</i> (Claus)			+		
* <i>Melima</i> sp.					

Alphabetical list of species	India	Africa	Europe	America	Orther parts
<i>Nitocra affinis rijekana</i> Petkovski	+	+	+		
<i>Nitocra spinipes</i> Boeck ?	+	+	+	+	Red Sea
* <i>Nitocra</i> sp.					
<i>Noodtiella intermedia</i> Wells	+	+			
* <i>Noodtiella</i> sp.					
<i>Oniscopsis pauliani</i> Chappuis		+			
<i>Paralaophonte spinicauda</i> Vervourt					Caroline Is.
<i>Paraleptomesochra africana</i> (Kunz)		+		+	Bermuda
<i>Paraleptomesochra minima</i> Wells	+	+			
* <i>Paramesochra</i> spp. (2)					
<i>Parastenhelia hornelli</i> Thompson and A. Scott	+	+	+		Red Sea
<i>Phyllopodopsyllus longipalpatus</i> (Chappuis)			+		
* <i>Phyllopodopsyllus</i> spp. (2)					
* <i>Phylleptomesochra</i> sp.					
* <i>Psammameira</i> sp.					
<i>Psammastacus spinicaudatus</i> Rao and Ganapati	+				
<i>Psammopsyllus operculatus</i> Nicholls	+	+		+	Australia
* <i>Sarsameira</i> sp.					
* <i>Schizopera</i> sp.					
<i>Sicameira langi</i> Rao	+				
* <i>Stenocopia</i> sp.					
<i>Sunaristes tranteri</i> Hamond					Australia
* <i>Sunaristes</i> sp.					
* <i>Tetragoniceps</i> sp.					
<i>Tisbe furcata</i> (Baird)	+	+	+	+	Red Sea, Maldives, Bermuda
* <i>Willeyella</i> sp.					
ISOPODA					
* <i>Angeliara cosettae</i> Coineau and Rao					
* <i>Angeliara</i> sp.					
* <i>Microcerberus andamanensis</i> Coineau and Rao					
AMPHIPODA					
* <i>Bogidiella sootai</i> Coineau and Rao					
* <i>Ingolfiella kapuri</i> Coineau and Rao					

Alphabetical list of species	India	Africa	Europe	America	Other parts
• <i>Ingolfiella</i> sp.					
TARDIGRADA					
<i>Batillipes mirus</i> Richters	+		+	+	Malaysia
• <i>Batillipes</i> sp.					
<i>Parastygarctus higginsii</i> Renaud-Debyser		+			Malaysia
<i>Stygarctus bradypus</i> Schulz	+		+	+	Bahamas
ACARINA					
• <i>Actacarus</i> sp.					
• <i>Copidognathus</i> spp. (3)					
<i>Halacarus anomalus</i> Trouessart	+		+	+	
• <i>Halacarus</i> sp.					
COLLEMBOLA					
• <i>Isotoma</i> sp.					
MOLLUSCA					
<i>Caecum glabrum</i> (Montagu)	+		+		
• <i>Microhedyle</i> spp. (2)					
• <i>Pseudovermis soleatus</i> Salvini-Plawen and Rao					
<i>Pseudovermis indicus</i> Salvini-Plawen and Rao	+				
• <i>Pseudovermis</i> sp.					
ECHINODERMATA					
• <i>Trochodota havelockensis</i> Rao					
• <i>Leptosynapta</i> sp.					
TUNICATA					
• <i>Heterostigma</i> (?) sp.					

of the world are investigated. Hitherto, a total of 324 species comprising about 60 per cent of the fauna collected were identified and the actual number of species inhabiting these islands would be much higher. The majority of species listed here are those already reported from other parts of the world, while some new genera and a large number of new species mostly cited here at the generic level, are yet to be described. Thus, the list also excludes large material of unidentified species, particularly of the groups Ciliata, Turbellaria, Gnathostomulida, Nematoda, Nemertina, Polychaeta, Oligochaeta and Copepoda. As several areas of these islands are still virgin fields, any

intensive explorations in the future are likely to reveal the existence of many more known and unknown species. Due to the uneven distribution of meiofauna in the interstitial habitat, unless and until an intensive search is made all along any particular area, no negative report of the occurrence of a meiofauna species can be established with certainty.

ZOOGEOGRAPHY AND EVOLUTION

As already indicated, any attempt to rationalise the zoogeography of the interstitial meiofauna of these islands suffers from lack of adequate information from many parts of the world and particularly from the adjoining countries of the east. A summary of the zoogeographical relationships of the Andaman fauna based on the data shown in Table 1, is given in the Table 2. A perusal of the Table 2 shows that out of the total 324 species listed, 50 (or 15.4 per cent) appear

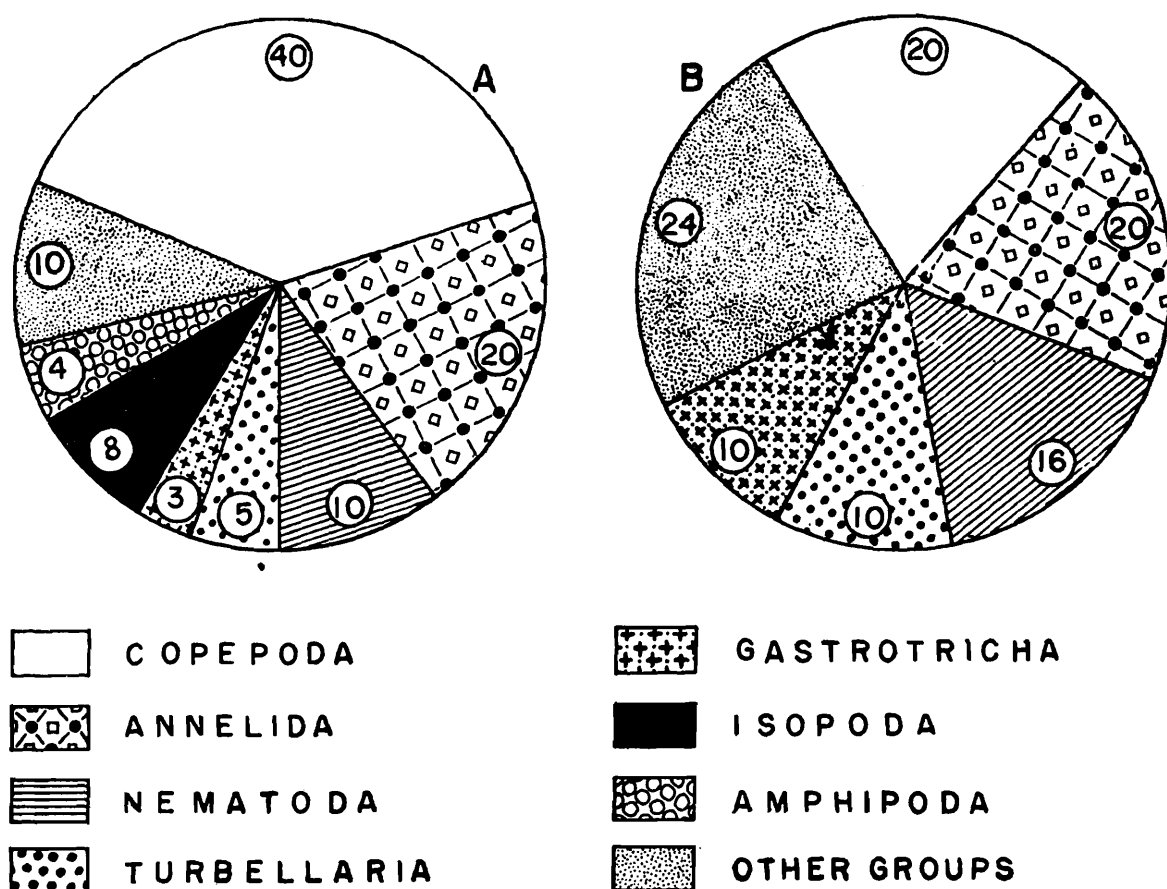
Table—2. A summary of the zoogeographical relationships of the interstitial meiofauna of the Andaman and Nicobar Islands.

Group	Total number of species	Cosmopolitan species	Eurytopic or widely distributed species	Species known from Indian Ocean only	Uncertain endemics
Ciliata	21	8	4	—	9
Cnidaria	4	—	—	—	4
Turbellaria	29	1	3	1	24
Gnathostomulida	4	—	—	—	4
Nematoda	46	13	9	3	21
Gastrotricha	38	4	2	4	28
Kinorhyncha	4	—	—	2	2
Nemertina	5	—	—	—	5
Rotifera	3	—	—	—	3
Archiannelida	24	2	4	4	14
Polychaeta	36	12	3	5	16
Oligochaeta	6	—	3	—	3
Ostracoda	8	—	3	—	5
Copepoda	70	8	15	12	35
Isopoda	3	—	—	—	3
Amphipoda	3	—	—	—	3
Tardigrada	4	2	—	1	1
Collembola	1	—	—	—	1
Acarina	6	—	1	—	5
Mollusca	6	—	1	1	4
Echinodermata	2	—	—	—	2
Tunicata	1	—	—	—	1
Total	324	50	48	33	193

to be cosmopolites, 48 (or 14.1 per cent) eurytopics, 33 (or 10.2 per cent) Indian Ocean forms and 193 (or 59.6 per cent) uncertain endemics. Thus, the cosmopolites and eurytopics are adequately represented on these islands; but in the absence of the evidence of their true interbreeding, it is now difficult to say whether these two categories are sibling species. The species exclusively known from Indian Ocean are not yet many and zoogeographically, the present distributional pattern of the fauna does not indicate any specific grouping of species characteristic for the shores in this region. However, the element of endemic fauna appears to be sufficiently strong in these islands, although the endemic genera are fewer in number than the species. It is possible that further investigation would reveal more endemic genera and species for these islands. It is also possible that a number of species which are now regarded endemic for these islands may reveal their existence in other regions of the Indian Ocean. Thus, these zoogeographical ranges are likely to continue to change as more and more areas in this region are investigated, the now supposed endemics joining the ranks of eurytopics. However, the probable endemism of fauna for these islands appears to be nearly similar to the rates reported for the fauna in other parts of the world, with the exception of some young oceanic archipelagoes, such as the Galapagos Islands in the South Pacific (Ax and Schmidt, 1973).

The composition and abundance of genera and species of these islands are more or less in agreement with the other regions of the world hitherto explored. In all the major groups of the fauna encountered, quantitative abundance of few dominant species is observed. Thus, about 20 per cent of the total species encountered comprised about 75 per cent of the total number of meiofauna individuals, while bulk of the remaining species occurred in small numbers. Some species are so poorly represented that they are rarely encountered in the collections made on these islands. Many interstitial meiofauna groups with a considerable number of genera and species are known to have also a wide geographical distribution. Thus, qualitatively the groups Ciliata, Turbellaria, Gnathostomulida, Nematoda, Gastrotricha, Archiannelida, Polychaeta and Copepoda, are best represented on these islands with many a variety of taxa, while the remaining groups have only moderate to poor representatives (Fig. 3B). Further, many tolerant species of the groups Ciliata, Nematoda, Archiannelida, Polychaeta, Oligochaeta, Copepoda and Tardigrada, appear to have a cosmopolitan or eurytopic distribution, while the other groups have a restricted geographical distribution with limited number of eurytopic species in their cadres (Table 2).

Apart from the endemic element, it is difficult to distinguish between many of these cold temperate and warm tropical species, due to their distribution in almost all these regions. At present, the affinities of the Andaman fauna with the fauna of other regions of the Indian Ocean are not quite clear and with further intensive exploration, many strong faunal links are likely to appear between



Text—fig. 3. Circle diagrams illustrating the percentage composition of the diverse groups of interstitial meiofauna (excepting Ciliata) of the Andaman and Nicobar Islands. A—Quantitative distribution, B—Qualitative distribution.

different land masses of the area. Hitherto, many species described and reported from different areas of the Indian Ocean, such as Red Sea (Nicholls, 1944 ; Gerlach, 1958b, 1959, 1964a, 1967 ; Hartmann-Schroder, 1960 ; Noodt, 1964), South Africa (Zelinka, 1913 ; Day, 1967 ; Barrisford, 1969 ; Hartmann-Schroder, 1974 ; Jouin, 1975), Mozambique (Wells, 1967), Madagascar (Chappuis, 1952, 1954 ; Gerlach, 1953, 1958a ; Renaud-Debvser, 1965), Maldives (Sewell, 1940, Gerlach, 1961, 1962, 1963, 1964b ; Ax, 1971), Ceylon (Fauvel, 1953 ; Noodt, 1971), India (Aiyar and Alikunhi, 1940, 1944 ; Alikunhi, 1946, 1947, 1948a, b ; Fauvel, 1953 ; Krishnaswamy, 1957 ; Timm, 1961 ; Ganapati and Rao, 1967 ; Rao, 1967, 1969, 1970b, 1971, 1972a ; Rao and Ganapati, 1966, 1967, 1968a, b, c, 1969a, b ; Higgins, 1968 ; Wells, 1971 ; Salvini-Plawen and Rao, 1973 ; Hartmann, 1974 ; Westheide and Rao, 1977), Malaysia (Ranaud-Mornant, 1967 ; Renaud-Mornant and Serene, 1967) and Australia (Nicholls, 1945 ; Hamond, 1973), occurred on these islands (Table I). Thus, at present about 15 species (4.6 per cent of the total) are known exclusively common to both

India and Andamans, while the remaining western regions indicate far less commonness. These islands being located in the middle of the Oriental Region, detailed explorations are likely to reveal some clear affinities with the fauna of India, Burma and Indonesia. Due to geographical proximity, it is quite possible that the Andaman fauna is more closely related to the fauna of the countries east of it, which remain unexplored with the exception of Malaysia. It is seen that many (9) of the few (10) species reported from Malaysia (Renaud—Mornant and Serene, *op. cit.*) occurred on these islands. Thus, there is a close degree of similarity between these two regions and any further collecting will doubtless reveal still closer relationship. As many of the coasts in the Indian Ocean are now very incompletely investigated, it is not yet opportune to offer an extended discussion on the zoogeography of the fauna of these islands.

The Andaman and Nicobar Islands first arose from the ocean bed in the Mesozoic period about 110 million years ago and have since then undergone several periods of partial submergence and elevation (Roonwal and Bose, 1964). Thus, the archipelago is sufficiently aged and is now known to support very similar taxa of widespread meiofauna species. The absence of larval dispersion and other bio-ecological peculiarities in the sedentary interstitial meiofauna should in fact lead to a high degree of endemism in isolated areas, but the present evidence of a high degree of similarity of taxa reported from different continents supports the historical role played by the continental drift (Rao, 1972b). The considerable degree of endemism in these islands which are separated from the mainland by a vast stretch of the ocean, probably signifies the considerable period of their isolation following the drift. Thus, the modern distributions of the fauna are probably to be explained from an understanding of the former arrangement of the present land masses before the drift occurred. Sterrer (1973) is also of the opinion that the cosmopolitanism and high degree of faunal similarity over vast geographic range might be due to slow speciation after the geological dispersal by continental drift. Thus, the present pattern of distribution indicates that the consequence of the historical drift is perhaps stronger in interstitial meiofauna than in the fauna of many other marine habitats.

Hitherto, active migration and transport along the margins of the continents were considered to be the means of short range dispersal in this sedentary meiofauna. But in a recent article, Gerlach (1977) favourably considered the various possible means of meiofauna dispersal to distant areas by mechanisms such as by airborne animals, rafting on drifting materials, ballast of sailing vessels, pelagic ways of life, dispersal in suspension or eroded sediments during severe storms etc., and concluded that there is no reason to attribute more importance to the geographical patterns of meiofauna than to the distribution of most other marine animals. But, even during the periods of severe storm or turbulence along a particular coast, it is not known to how much offshore distance the eroded sediment with meiofauna can be carried in suspension. Further evidence is probably necessary to

substantiate this means of dispersal. However, these accidental mechanisms can probably play a role as a matter of chance for certain species at random, but cannot possibly be held responsible for the total dispersal of meiofauna species of all the groups to widely separated oceanic areas, resulting in the present pattern of distribution. If the dispersal to distant areas is to depend on such accidental means of transport, the chances of regular gene flow between populations of widely separated areas would be quite limited and the present similarity of this faunal element on a global scale perhaps does not exist. Further, if the oceans are considered no barrier for dispersal of meiofauna, every endemic species has a chance to migrate anywhere and it will be difficult to explain the present distribution and development of endemics due to isolation. As already indicated, the faunal element considerably differed from island to island in the Andaman Archipelago and certain endemic species appeared quite stenotopic. Thus, when stenotopic endemism is so prominent within a closely knit archipelago, the chances of the accidental means of meiofauna dispersal by drifting to too distant areas seem limited. The high percentage of endemism reported for the Galapagos Archipelago appears to be due to the recent formation of these islands, followed by rapid speciation due to lack of initial competition (Ax, 1977); and thus many of the old taxa characteristic of the historical continental plates are probably missing. The morphological similarity of the Galapagos fauna with the European species might be the result of parallel development due to identical environmental conditions. Has the continental meiofauna really crossed a ocean barrier of about 1000 km and reached the Galapagos Islands? If so, the means of dispersal other than the drifting ways etc., are also probably to be explored.

However, as the composition and external morphology of Andaman meiofauna species almost resemble the known in other parts of the world, any phylogenetic development of the fauna of these islands appears to be limited to the formation of endemic species. Although the region of Indian Ocean is considered as one of great biological interest, unless and until a clear picture of these areas emerges, it is difficult to locate any evolutionary centre for the meiofauna in this region.

SUMMARY

1. A preliminary investigation of the geographical distribution of interstitial meiofauna collected from marine beach sands on Andaman and Nicobar Islands, has been attempted. The zoogeographical significance of the study lies in the fact that the work is the first of its kind in the Indo-Pacific region.

2. The density and distribution of meiofaunal groups in the intertidal sands of these islands is indicated. The density and diversity of fauna is nearly similar to other explored areas of the world. Ubiquitous genera have well represented species on these islands.

3. The list of meiofauna hitherto recorded from these islands has a total of about 324 species in 200 genera. The actual number of species inhabiting the archipelago is much higher and further exploration of these areas will probably prove to have a rich diversity of taxa than now known.

4. The geographical distribution shows that about 50 species in 45 genera represent cosmopolitan taxa, while 48 species in 40 genera are eurytopics. No specific grouping of Indian Ocean element as such is noticed and 33 species in 30 genera are recorded. About 193 species in 132 genera are uncertain endemics. Due to lack of adequate data from different coasts of the Indian Ocean, the exact amount of endemism could not now be estimated.

5. The world wide distribution of many interstitial meiofauna genera and species is now well established. The faunal element is dominated with species and genera showing affinities with the entire warm temperate parts of the world. Detailed explorations are likely to reveal some closer relationships with the fauna of Oriental Region.

6. The means of meiofauna dispersal are discussed in relation to the age of these islands. The presence of a considerable percentage of endemic element indicates that the Andaman fauna has at least a limited phylogenetic development of its own.

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to the Director, Zoological Survey of India, Calcutta, for facilities, encouragement and interest in the work, Dr. K. V Lakshminarayana, for going through the manuscript and Dr. J. B. J. Wells, Zoology Department, Victoria University of Wellington, New Zealand, for identifying some of the copepods listed in the paper.

REFERENCES

- AIYAR, R. G. AND ALIKUNHI, K. H. 1940. On a new pisionid from the sandy beach, Madras. *Rec. Indian Mus., Calcutta*, **42** : 89-107.
- AIYAR, R. G. AND ALIKUNHI, K. H. 1944. On some archiannelids of the Madras coast. *Proc. natn. Inst. Sci. India*, **10** : 113-140.
- ALIKUNHI, K. H. 1946. On a new species of *Saccocirrus* from the Madras beach. *Curr. Sci.*, **15** : 140.
- ALIKUNHI, 1947 On *Pisone complexa* n. sp. from the sandy beach, Madras. *Proc. natn. Inst. Sci. India*, **13** : 105-127.

- ALIKUNHI, K. H. 1948a. On a new hermaphrodite species of *Microphthalmus* (Polychaeta, Hesionidae) from the sandy beach, Madras. *J. Roy. Asiatic Soc. Bengal*, **14** : 17-25.
- ALIKUNHI, K. H. 1948b. On some archiannelids of the Krusadai Island. *Proc. natn. Inst. Sci. India*, **14** : 373-383.
- AX, P. 1971. Neue interstitielle Macrostomida (Turbellaria) der Gattungen *Acanthomacrostomum* and *Haplopharynx*. *Mikrofauna Meeresboden*. **8** : 1-14.
- AX, P. 1977. Problems of speciation in the interstitial fauna of the Galapagos. *Mikrofauna Meeresboden*, **61** : 29-43.
- AX, P. AND SCHMIDT, P. 1973. Interstitielle fauna von Galapagos, I. Einfuhrung. *Mikrofauna Meeresboden*, **20** : 1-38.
- BARRISFORD, C. D. 1969. Two interstitial beach dwelling polychaetes *Mikrophthalmus* and *Hesionides*, representing genera new to South African region. *Trans. roy. Soc. South Africa*, **38** : 133-137.
- CHAPPUIS, P. A. 1952. Copepodes Harpacticoides psammiques de Madagascar. *Mem. Inst. Sci. Madagascar*, **7** : 145-160.
- CHAPPUIS, P. A. 1954. Copepodes Harpacticoides prammiques de Madagascar. *Mem. Inst. Sci. Madagascar*, **9** : 45-73.
- DAY, J. H. 1967. A monograph on the Polychaeta of Southern Africa. *Brit. Mus. (Nat. Hist.)*, London. Publication No. 656, pp. 878.
- FAUVEL, P. 1953. *The fauna of India including Pakistan, Ceylon, Burma and Malaya*. Annelida, Polychaeta. The Indian Press, Allahabad, pp. 507.
- GANAPATI, P. N. AND RAO, G. C. 1967. On some interstitial gastrotrichs from the beach sands of Waltair coast. *Proc. Indian Acad. Sci.*, **66** : 214-225.
- GERLACH, S. A. 1953. Researches sur la faune des eaux interstitielles de Madagascar. *Mem. Inst. Sci. Madagascar*, **8** : 73-86.
- GERLACH, S. A. 1958a. Deuxieme contribution de la faune des Nematodes des eaux interstitielles littorales de Madagascar. *Mem. Inst. Sci. Madagascar*, **12** : 343-365.
- GERLACH, S. A. 1958b. Freilebenden nematoden von den Korallenriffen des Roten Meeres. *Kieler Meeresforsch.*, **14** : 241-246.

- GERLACH, S. A.** 1959. Drei neue nematoden aus dem Kustengrundwasser der Insel Abd el Kuri (Golf von Aden). *Zool. Anz.*, **163** : 360-364.
- GERLACH, S. A.** 1961. Gastrotrichen aus dem meeressand der Malediven. *Zool. Anz* , **167** : 471-475.
- GERLACH, S. A.** 1962. Freilebende meeresnematoden von den Malediven. *Kieler Meeresforsch.*, **18** : 81-108.
- GERLACH, S. A.** 1963. Freilebende meeresnematoden von den Malediven II. *Kieler Meeresforsch.*, **19** : 67-103.
- GERLACH, S. A.** 1964a. Freilebende nematoden aus dem Roten Meer. *Kieler Meeresforsch.*, **20** : 18-34.
- GERLACH, S. A.** 1964b. Neue cyatholaimidae (Nematoda, Chromadorida) von den Malediven. *Ver. Inst. Meeres. Bremerhaven*, **9** : 70-78.
- GERLACH, S. A.** 1967. Freilebende meeresnematoden von den Sarso-Inseln (Rotes Meer). *Meteor-Forschungsergebnisse Reihe D*, **2** : 19-43.
- GERLACH, S. A.** 1977. Means of meiofauna dispersal. *Mikrofauna Meeresboden*, **61** : 89-103.
- HAMOND, R.** 1973. Four new copepodes (Crustacea, Harpacticoidea, Canuellidae). *Proc. Linn. Soc. N. S. W.*, **97** : 165-201.
- HARTMANN, O.** 1974. Polychaetous annelids of the Indian Ocean. *J. mar. biol. Assn. India*, **16** : 191-252, 609-644.
- HARTMANN-SCHRODER, G.** 1960. Polychaeten aus dem Roten Meer. *Kieler Meeresforsch.*, **16** : 69-125.
- HARTMANN-SCHRODER, G.** 1974. Zur polychaeten fauna von Natal (Sudafrica) *J. mar. biol. Assn. India*, **16** : 540-582.
- HIGGINS, R. P.** 1968. Taxonomy and postembryonic development of the Cryptorhagae a new suborder for the mesopsammique kinorhynch genus *Cateria*. *Trans. Amer. Micro. Soc.*, **87** : 21-39.
- JOIN, C.** 1975. Etude de quelques archiannelides des cotes d'Afrique du Sud. *Cah. Biol. Mar.*, **16** : 97-110.
- KRISHNASWAMY, S.** 1957. Studies on the Copepoda of Madras. *Univ. Madras*, pp. 1-168.

- NICHOLLS, A. G. 1944. Littoral Copepoda from the Red Sea. *Ann. Mag. Nat. Hist.*, **11** : 487-503.
- NICHOLLS, A. G. 1945. Marine Copepoda from Western Australia. *J. Proc. Roy. Soc. West. Aust.*, **29** : 17-24.
- NOODT, W. 1964. Copepoda Harpacticoidea aus dem Litoral des Roten Meeres. *Kieler Meeresforsch.*, **20** : 128-154.
- NOODT, W. 1971. Biogeography of interstitial Copepoda Harpacticoidea from Ceylon marine sand beaches. *Abst. Symposium on Indian Ocean and Adjacent Seas, Cochin*.
- RAO, G. C. 1967. On the life-history of a new sand-dwelling harpacticoid copepod. *Crustaceana*, **13** : 129-136.
- RAO, G. C. 1969. The marine interstitial fauna inhabiting the beach sands of Orissa coast. *J. zool. Soc. India*, **20** : 89-104.
- RAO, G. C. 1970a. On the occurrence of interstitial fauna in the intertidal sands of some Andaman and Nicobar group of Islands. *Curr. Sci.*, **39** : 251-252.
- RAO, G. C. 1970b. On some interstitial fauna in the marine sands on Indian coast. *Curr. Sci.*, **39** : 504-507.
- RAO, G. C. 1971. On two species of marine interstitial Tardigrada from the east coast of India. *Proc. Indian Acad. Sci.*, **73** : 53-57.
- RAO, G. C. 1972a. Some new interstitial harpacticoid copepods from Andhra coast, India. *Cah. Biol. Mar.*, **13** : 305-319.
- RAO, G. C. 1972b. On the geographical distribution of interstitial fauna of marine beach sand. *Proc. Indian Nat. Sci. Acad.*, **38** : 164-178.
- RAO, G. C. AND GANAPATI, P. N. 1966. On a new species of *Sphaerosyllis* (Polychaeta) from the beach sands of Waltair coast. *Proc. Indian Acad. Sci.*, **63** : 309-312.
- RAO, G. C. AND GANAPATI, P. N. 1967. On some polychaetes from the beach sands of Waltair coast. *Proc. Indian Acad. Sci.*, **65** : 10-15.
- RAO, G. C. AND GANAPATI, P. N. 1968a. On some archiannelids from the beach sands of Waltair coast. *Proc. Indian Acad. Sci.*, **67** : 24-30.

- ROA, G. C. AND GANAPATI, P. N. 1968b. Some new interstitial gastrotrichs from the beach sands of Waltair coasts. *Proc. Indian Acad. Sci.*, 67 : 35-53.
- RAO, G. C. AND GANAPATI, P. N. 1968c. The interstitial fauna inhabiting the beach sands of Waltair coast. *Proc. natn. Inst. Sci. India*, 34 : 82-125.
- RAO, G. C. AND GANAPATI, P. N. 1969a. Some new interstitial copepods from Waltair coast. *Proc. Indian Acad. Sci.*, 69 : 1-14.
- RAO, G. C. AND GANAPATI, P. N. 1969b. On some interstitial copepods from the beach sands of Waltair coast. *Proc. Indian Acad. Sci.*, 70 : 262-286.
- RENAUD-DEBYSER, J. 1965. Etude sur un Stygarctidae (Tardigrada) nouveau de Madagascar. *Bull. Soc. zool. France*, 90 : 31-38.
- RENAUD-MORNANT, J. 1967. *Pseudostomella malayica* n. sp. gastrotriche nouveau de la cote Orientale de Malaisie. *Bull. Mus. Nat. Hist.*, 39 : 205-208.
- RENAUD-MORNANT, J. AND SERENE, P. 1967. Note sur la microfaune de la cote Orientale de la Malaisie. *Cah. Pacif.*, 11 : 51-73.
- ROONWAL, M. L. AND BOSE, G. 1964. Taxonomy and zoogeography of the termite fauna of Andaman and Nicobar Islands, Indian Ocean. *Rec. zool. Surv. India*, 62 : 109-170.
- SALVINI-PLAWEN, L. V AND RAO, G. C. 1973. On three new mesopsammobiotic representatives from the Bay of Bengal. *Z. Morph. Tiere*, 74 : 231-240.
- SEWELL, R. B. S. 1940. Copepoda Harpacticoida. *Scient. Rep. John Murray Exped.*, 7 : 117-382.
- STERRER, W 1973. Plate tectonics as a mechanism for dispersal and speciation in interstitial sand fauna. *Netherl. J. Sea Res.*, 7 : 200-222.
- TIMM, R. W 1961. The marine nematodes of the Bay of Bengal. *Proc. Pak. Acad. Sci.*, 1 : 1-88.
- WELLS, J. B. J. 1967. The littoral copepoda (Crustacea) of Inhaca Island, Mozambique. *Trans. R. Soc. Edinb.*, 67 : 189-358.
- WELLS, J. B. J. 1971. The Harpacticoida (Crustacea, Copepoda) of two beaches is south-east India. *J. nat. Hist.* 5 : 507-520.

WESTHEIDE, W. AND RAO, G. C. 1977. On some species of the genus *Hesionides* (Polychaeta, Hesionidae) from Indian sandy beaches. *Cah. Biol. Mar.*, **18** : 275-287.

ZELINKA, C. 1913. Die Echinoderen der Deutschen Sudpolar-Expedition 1901-1903. *Deutschen Sudpolar—Expedition 1901-1903*, **14** : 419-436.

ON THE WOOD-BORING MOLLUSCS OF SOUTH ANDAMANS, INDIA

By

A. K. DAS AND M. K. DEV ROY

*Andaman and Nicobar Regional Station,
Zoological Survey of India, Port Blair*

(With 1 Text-figure)

INTRODUCTION

A considerable number of papers have been published on the wood-boring molluscs of Mainland India (see Nair and Saraswathy, 1968 ; Subba Rao, 1968). But there is no published account on this group from Andamans barring a single paper by Kalyansundaram and Granti (1975) who have simply mentioned the occurrence of 4 species of molluscan wood-borers, namely, *Teredo furcifera* von Martens, *Neoteredo* sp, *Bankia bipalmulata* (Lamarck) and *Martesia* (*Martesia*) *striata* (Lamarck) at port Blair, South Andamans. Of course, Rajagopal and Daniel (1972) have reported the occurrence of one species of wood-boring molluscs, *Nausitora dunlopei* Wright, from the mangroves of Great Nicobar.

While studying the mangrove fauna of South Andaman in recent years we have examined a large number of living mangroves and dead stumps in this area for marine wood-borers. Our investigations reveal the presence of 8 species of molluscan borers out of which 7 species belong to the family Teredinidae and one belongs to the family Pholadidae. Incidentally, all these borers under study excepting *Martesia* (*Martesia*) *striata* (Lamarck) constitute the first record from Andaman and Nicobar islands.

LIST OF WOOD-BORING MOLLUSCS RECORDED FROM ANDAMAN AND NICOBAR ISLANDS

Class BIVALVIA

Order EULAMELLIBRANCHIATA

Family TEREDINIDAE

- 1 *Bactronophorus thoracites* (Gould)
- * 2. *Neoteredo* sp.
3. *Dicyathiifer manni* (Wright)

4. *Uperotus rehderi* (Nair)
- * 5. *Teredo furcifera* von Martens
6. *Lyrodus pedicellatus* (Quatrefages)
7. *Nototeredo edax* (Hedley)
- * 8. *Nausitora dunlopei* Wright
9. *Nausitora hedleyi* Schepman
10. *Bankia bipennata* (Turton)
- *11. *Bankia bipalmulata* (Lamarck)

Family PHOLADIDAE

12. *Martesia (Martesia) striata* (Lamarck)

(Species with asterik marks are not studied by us)

SYSTEMATIC ACCOUNT

Family TEREDINIDAE

Turner (1966) has revised the family and reassessed the number of species of ship-worms occurring along the Indian coasts. The system followed by her has been adopted in this paper.

Key to the genera of the family Teredinidae occurring in South Andamans

1. Pallets not segmented	2	
— Pallets segmented	7	
2. Blade composed of a basal cup with an inner element extending like a dagger		<i>Bactronophorus</i>
— Blade composed of a single piece without any inner element	3	
3. Blade composed of a calcareous base and a prominent brown to black periostracal cap in the distal half		<i>Lyrodus</i>
— Blade entirely calcareous, the periostracal covering thin	4	
4. Blade oval to rectangular in outline basal portion of which is nearly smooth and the distal portion with prominent radiating ribs		<i>Uperotus</i>
— Blade variable in shape without any radiating ribs	5	
5. Blade solid, triangular in outline, moderately cupped with partially to almost completely divided medial ridge		<i>Dicyathifer</i>
— Blades variable, not as above	6	

6. Blade large, paddle shaped and cupped in the distal end ; two long fleshy lobes present on the dorsal surface of the posterior end of the animal	...	...	<i>Neoteredo*</i>
— Blade small, broadly oval to elongate in shape, slightly to deeply cupped	...	...	<i>Teredo*</i>
7. Segments separated as distinct cones	...	...	<i>Bankia</i>
Segments closely packed and fused	...	...	8
8. Blade elongate, often with a calcareous incrustation on the distal end ; siphons short, united at least half their length	...	...	<i>Nausitora</i>
— Blade oval, entirely covered by a yellowish periostracum ; calcareous incrustation absent ; siphons short and separate	...	...	<i>Nototeredo</i>

Genus *Bactronophorus* Tapparone-Canefri

1. *Bactronophorus thoracites* (Gould)

(Fig. 1 A)

1856. *Teredo thoracites* Gould, *Proc. Boston Soc. Nat. Hist.*, 6 : 15.

Material examined.—South Andamans : (1) Guptapara 7. vi. 78, 3 ex. ; 4.x.78, 13 ex. ; (2) Wright Myo, 3.viii.78, 9 ex. ; 20. viii. 78, 2 ex. ; (3) Sippighat, 18.ix.78, 2 ex. (4) Wandoor, 11.viii.78, 2 ex. ; (5) Chidyatapu. 17.x.78 ; 3 ex. ; (6) Rangachan, 18.x.78, 16 ex. ; (7) Lohabari, 25.x.78, 2 ex.

Distribution.—INDIA : Sundarbans, Mahanadi Estuary, Visakhapatnam and Bombay. Elsewhere : Indian Ocean islands, BURMA, MALAYASIA, INDONESIA, AUSTRALIA and NEW ZEALAND.

Remarks.—*B. thoracites* is the most common molluscan wood-borer in the entire mangrove area of South Andamans. It is one of the largest species in the family Teredinidae. The specimens collected from South Andamans range from 13.3 to 56 cm in length.

Genus *Dicyathifer* Iredale

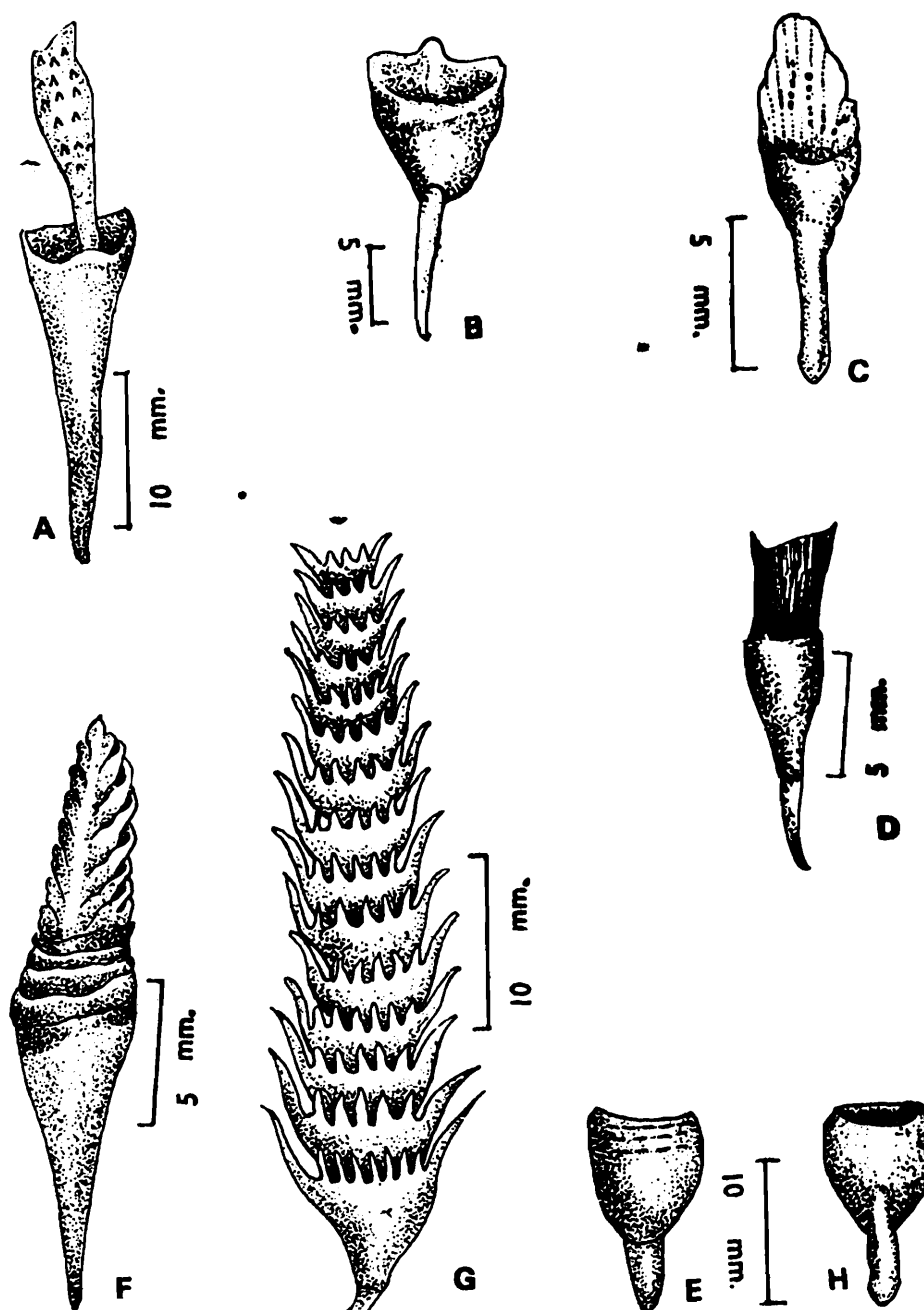
2. *Dicyathifer manni* (Wright)

(Fig. 1 B)

1866. *Kuphus ? mannii* Wright, *Trans. Linn. Soc. London*, 25 : 565, pl. 65, figs. 1-8.

Material examined.—South Andamans : (1) Wright Myo 2.vii.78, 2 ex. ; (2) Sippighat, 18.ix.78 ; 3 ex. ; (3) Guptapara, 4.x.78, 2 ex. ; (4) Lohabari, 25.x.78, 10 ex.

* not studied by us



Text-fig. 1. Pallets of Teredinids (Outer face): A—*Bactronophorus thoracites* B—*Dicyathifer manni*; C—*Uperotus rehderi*; D—*Lyrodus pedicellatus*, E—*Nototerredo edax*; F—*Nausitora hedleyi*; G—*Bankia bipennata*, H—*Nototerredo edax*.

Distribution.—INDIA : Sundarbans, Mahanadi Estuary, Visakhapatnam, Madras Harbour, Pulicat Lake, Cochin and Bombay. Elsewhere : World-wide in tropical and temperate seas.

Remarks.—Specimens collected from South Andamans range from 8.3 to 23.4 cm in length.

Genus *Uperotus* Guettard3. *Uperotus rehderi* (Nair)

(Fig. 1 C)

1954. *Teredo* (*Teredora*) *rehderi* Nair, *Rec. Indian Mus.*, 52 : 408, fig. 9 a-d.

Material examined.—South Andamans : (1) Rangachan, 18.x.78, 1 ex.

Distribution.—Madras Harbour, INDIA.

Remarks.—This species has so far been recorded from the vicinity of Madras, east coast of India. According to Turner (1966) *U. rehderi* is probably an ecologic wood-boring form of *U. clavus*. But she also asserted (*op. cit.*) that it is yet to be shown experimentally that 'the young *clavus* (nut borer) when boring into wood mature to look like *rehderi*.'

Genus *Lyrodus* Gould4. *Lyrodus pedicellatus* (Quatrefages)

(Fig. 1 D)

1849. *Teredo pedicellatus* Quatrefages, *Ann. Sci. Nat. Zool.* (3) 11 : 26, pl. 1, fig. 2.

Material examined.—South Andamans : (1) Chidyatapu, 25.v.78, 1 ex. ; 17.x.78, 12 exs. (2) Rangachan, 18.x.78, 1 ex.

Distribution.—INDIA : Mahanadi Estuary, Visakhapatnam, Madras Harbour, Cochin and Bombay. Elsewhere : World-wide in tropical and temperate seas.

Remarks.—Pallets of this species composed of a calcareous base and a distinct blackish periostracal cap. The specimens examined from South Andamans measured from 10 to 32.01 cm in length.

Genus *Nototeredo* Bartsch5. *Nototeredo edax* (Hedley)

(Fig. 1 E, H)

1895. *Teredo edax* Hedley, *Proc. Linn. Soc.*, New South Wales (2) 9 : 501, pl. 32, figs. 1-5.

Material examined.—South Andamans : (1) Chidyatapu, 17.x.78 ; 3 exs.

Distribution.—INDIA : Visakhapatnam and Madras Harbour.

Elsewhere : Indian ocean islands, BURMA, MALAYASIA, INDONESIA, AUSTRALIA and NEW ZEALAND.

Remarks.—This species has been collected from the dead stumps of the mangrove area of Chidyatapu, South Andamans.

Genus *Nausitora* Wright

6. *Nausitora hedleyi* Schepman

(Fig. 1 F)

1919. *Nausitora hedleyi* Schepman, *Nova Guinea Res. Exped. Scient.*, **13**, Zoologie : 195, pl. 7, fig. 3.

Material examined.—South Andamans : (1) Chidyatapu, 25.v.78, 1 ex. ; 17.x.78, 2 exs. ; (2) Wright Myo, 20.vii.78, 1 ex. ; (3) Sippighat, 18.x.78, 3 exs. ; (4) Rangachan, 18.x.78, 4 exs.

Distribution.—INDIA : Mahanadi Estuary, Madras Harbour and Cochin. Elsewhere : Indian Ocean Islands, BURMA, MALAYASIA and INDONESIA.

Remarks.—This is a tropical estuarine ship-worm whose most suitable salinity range for early development seems to be between 11 and 15‰ as noted by Nair and Saraswathy (1968).

Genus *Bankia* Gray

7. *Bankia bipennata* (Turton)

(Fig. 1 G)

1819. *Teredo bipennata* Turton, *A Conchological Dictionary of the British Islands* : 184, figs. 38-40.

Material examined.—South Andamans : (1) Chidyatapu, 17.x.78, 18 exs. ; (2) Rangachan, 18.x.78, 2 exs.

Distribution.—INDIA : Visakhapatnam and Madras Harbour. Elsewhere : Indian Ocean islands.

Remarks.—The specimens examined from South Andamans contained both the young and mature forms. The maximum length recorded is 19 cm in length.

Family PHOLADIDAE

Genus *Martesia* Sowerby

8. *Martesia (Martesia) striata* (Linnaeus)

1758. *Pholas striata* Linnaeus, *Syst. Nat.* ed. 10 : 669.

Material examined.—South Andamans : (1) Wright Myo, 20.vii.71, 5 ex. ; (2) Kadakachang, 20.vii.78, 12 ex.

Distribution.—India : Throughout entire east and west coast. Elsewhere : Pacific, Indo-Pacific and Western Atlantic.

Remarks.—This species is cosmopolitan in distribution. It can tolerate a wide range of salinity from nearly 35‰ during April and May and 0.5‰ during the rainy months (Balasubramanyan, 1968). The normal abodes of these pholadids are the floating logs and submerged timber structures.

REMARKS ON DISTRIBUTION

Out of 8 species of molluscan borers dealt with in this paper 3 species, namely, *Dicyathifer manni*, *Lyrodus pedicellatus* and *Martesia (Martesia) striata* are cosmopolitan in distribution, 2 species, namely, *Bactronophorus thoracites* and *Nototerredo edax* are distributed in India and Indian Ocean islands, Burma, Malayasia, Indonesia, Australia and New Zealand and the rest 3 species — *Uperotus rehderi*, *Nausitora hedleyi* and *Bankia bipennata*, have so far been recorded from India and Indian Ocean islands.

Our present investigation reveals that there is no host specificity or host preference for any of these borers under discussion. They prefer dead stumps and floating logs than the living mangroves and their species-assemblage in a particular abode seems to be random as shown in Table 1.

TABLE 1. Showing species-assemblage of molluscan wood-borers in a particular abode in South Andamans

Locality	Habitat	Nature of species assemblage in a particular abode
Chidya tapu	Dead stumps of mangroves	1. <i>Lyrodus pedicellatus</i> and <i>Nausitora hedleyi</i>
	—do—	2. <i>Lyrodus pedicellatus</i> and <i>Bankia bipennata</i>
	—do—	3. <i>Lyrodus pedicellatus</i> and <i>Bactronophorus thoracites</i>
	—do—	4. <i>Lyrodus pedicellatus</i> , <i>Bactronophorus thoracites</i> , <i>Nausitora hedleyi</i> and <i>Nototerredo edax</i>

Locality	Habitat	Nature of species assemblage in a particular abode
Rangachan	—do—	1. <i>Nausitora hedleyi</i> and <i>Bactronophorus thoracites</i>
	—do—	2. <i>Nausitora hedleyi</i> , <i>Bankia bipennata</i> and <i>Bactronophorus thoracites</i>
	—do—	3. <i>Nausitora hedleyi</i> , <i>Dicyathifer manni</i> , <i>Bactronophorus thoracites</i> and <i>Lyrodus pedicellatus</i>
Wright Myo	—do—	1. <i>Nausitora hedleyi</i> and <i>Bactronophorus thoracites</i>

SUMMARY

Eight species of molluscan wood-borers under eight genera belonging to two families collected from South Andamans, India are dealt with. Out of these seven species are new records from Andaman and Nicobar islands.

ACKNOWLEDGEMENTS

Our sincere thanks are due to the Director, Zoological Survey of India, Calcutta providing necessary facilities in connection with this work.

REFERENCES

- BALASUBRAMANYAN, R. 1968. Studies on the pholadid marine wood-borer *Martesia seriata* (Linn.). *Proc. Symposium on Mollusca III, Mar. biol. Assoc. India* : 707-711.
- KALYANSUNDARAM, N. AND GRANTI, S. S. 1975. The intensity and distribution of marine wood-borers at various ports of India. *Bull. Dept. mar. Sci. Univ. Cochin*, 7 (3) : 637-644.
- NAIR, B. N. AND SARASWATHY, M. 1968. Some recent studies on ship-worms of India. *Proc. Symposium on Mollusca III, Mar. biol. Assoc. India* : 718-729.
- RAJAGOPAL, A. S. AND DANIEL, A. 1972. Boring organisms of the Great Nicobar island. Mollusca : Teredinidae. *J. Bombay Nat. Hist. Soc.*, 69 (3) : 676-678.

SUBBA RAO, N. V. 1968. Report on a collection of wood-boring molluscs from Mahanadi estuary, Orissa, India. *Proc. Symposium on Mollusca I, Mar. biol. Assoc. India* : 85-93.

TURNER, R. D. 1966. *A Survey and Illustrated Catalogue of the Teredinidae (Mollusca : Bivalvia)* : 1-265, 65 pls. (Museum of the Comperative Zoology, Harvard University), Cambridge, Mass.

SOME PROSTIGMATID MITES (ACARINA) FROM ANDAMAN AND NICOBAR ISLANDS

By

S. K. GUPTA*

Zoological Survey of India, Gangetic Plain Regional Station, Patna

AND

S. K. GHOSH

Zoological Survey of India, Calcutta

(With 7 Text-figures)

Our knowledge of the mite fauna of Andaman and Nicobar Islands is limited. Prasad (1974) in his catalogue of Indian mites listed only two species from these islands. Recently, the senior author recorded 5 species of Tetranychidae (Gupta, 1976) and 18 species of Phytoseiidae (Gupta, 1977) from these islands. Later, two more species of Phytoseiidae were described by Gupta (in press).

The Andaman and Nicobar Islands comprise of 348 Islands of various sizes distributed North-South between 6° and 14°N. latitudes and 92°E. longitude in the South East Bay of Bengal. The Andaman Islands are in three main groups, i. e. North Andamans, Middle Andamans and South Andamans. Of these, the senior author had an opportunity to survey a part of Middle and South Andamans, Little Andamans and Car Nicobar from Nicobar group of islands during December, 1972 to January, 1973. This enabled him to make a fairly representative collection of mites particularly those from plants.

The present study revealed 30 species of prostigmatid mites in 8 families and 20 genera which included 2 new genera and 7 new species. Besides, 7 genera and 9 species are recorded here for the first time from Indian territory. A comprehensive key to the families, genera and species of prostigmatid mites treated here is given.

Studies revealed that due to heavy rainfall and luxuriant growth of vegetation the mite fauna of Andaman and Nicobar Islands is very rich and varied. An intensive survey of these areas therefore may yield many interesting species.

All the mites reported here were collected by the senior author. The measurements given in the text are in microns. The classification of Prostigmata followed here is that of Meyer *et al.* (1973). Types and other material treated here are deposited in the Zoological Survey of India, Calcutta.

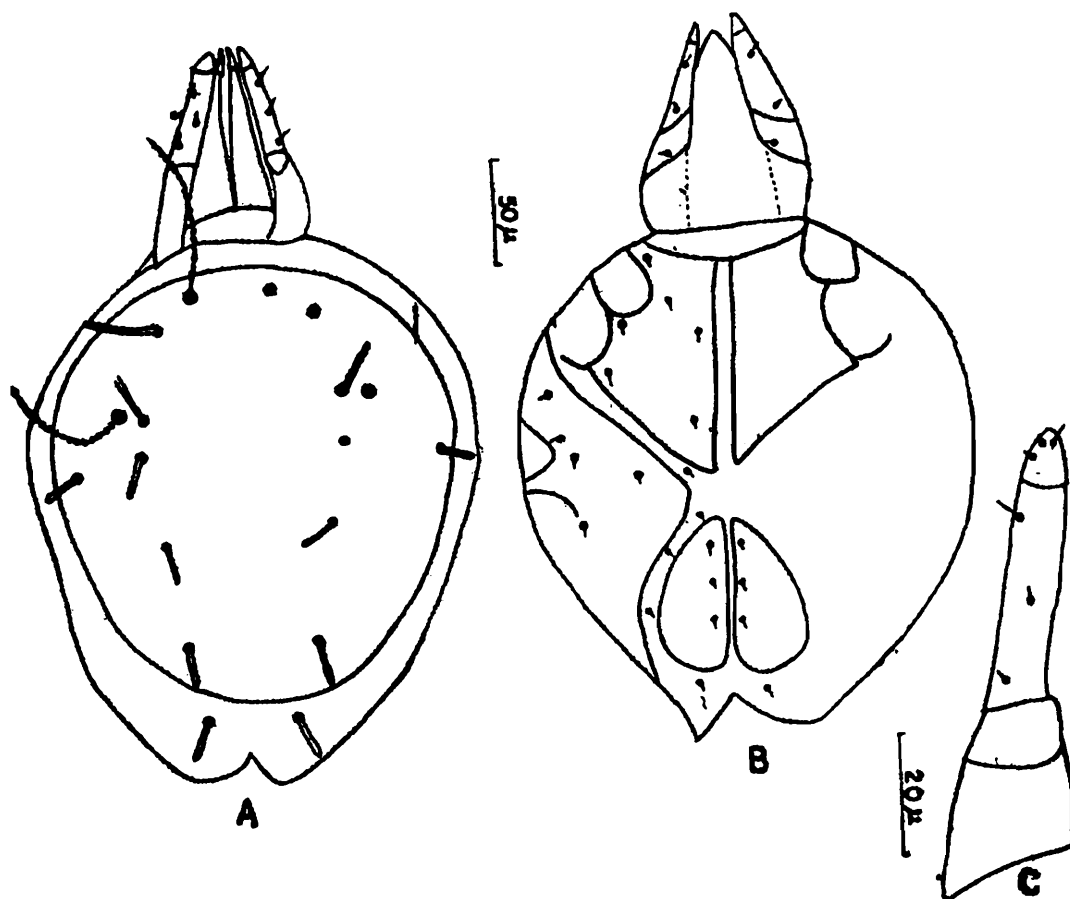
* Present Address : *Zoological Survey of India, Calcutta*

Family I CUNAXIDAE

Genus 1. *Neocunaxoides* Smiley1. *Neocunaxoides pradhani* sp. nov.

(Text. fig.—1)

Female.—Palp 3 segmented, 112, long, almost as long as hypostome, chaetotaxy of palp, trochanter—none, femur—setae not discernible; tibiotarsus—2 outer lateral (one basal, one distal), one mediodorsal, 3 simple setae distally and a short strong claw. Chelicera broad basally, gradually tapering distally, extending beyond base of tibiotarsus; movable digit sharp, dorsum of chelicera tuberculated. Dorsally propodosoma and hysterosoma covered with one single shield;



Text-fig. 1. *Neocunaxoides pradhani* sp. nov., A—Dorsal surface of female (legs omitted), B—Ventral surface of female (legs omitted), C—Palp.

2 pairs of sensory setae and 2 pairs of thick rod like setae (slightly expanded distally) are present in propodosomal region. Ventrally, 2 distinct plates with coxae I and II divided medially, coxae III and IV coalesced forming 2 elongate strong lateral plates. Idiosoma anterior ventral plates each with 6 pairs of simple setae; 5 pairs of simple

setae on lateral ventral plates ; 4 pairs of setae on genital shield. Legs I and II directed anteriorly, legs III and IV directed posteriorly. Chaetotaxy of basifemur, telofemur, genu, tibia and tarsus of legs : I—2, 3, 8, 7, 14—not discernible ; II—2, 3, 7, 6, 14+1 solenidion ; III—not discernible 3, 6, 14, 10 ; IV—not discernible 2, 6, 5, 9+1 trichobothrium. Body 300 long, 224 wide.

Holotype.—♀, INDIA ; Andaman Islands, Port Blair, South point, on Jack fruit (*Artocarpus integrifolia* L.), 1. i. 1973. (Z.S.I. Reg. No. 3144/17)

Paratype.—1 ♀, same data as for holotype. (Z.S.I. Reg. No. 3145/17)

Remarks.—It differs from *Neocunaxoides andrei* (Baker and Hoffman, 1948) in lacking mushroom shaped seta on palp tibiotarsus.

The species is named after Mr. K. S. Pradhan, formerly of Zoological Survey of India who lead the survey party to these islands.

Genus 2. *Cunaxoides* Baker and Hoffman

2. *Cunaxoides nicobarensis* sp. nov.

(Text. fig. 2)

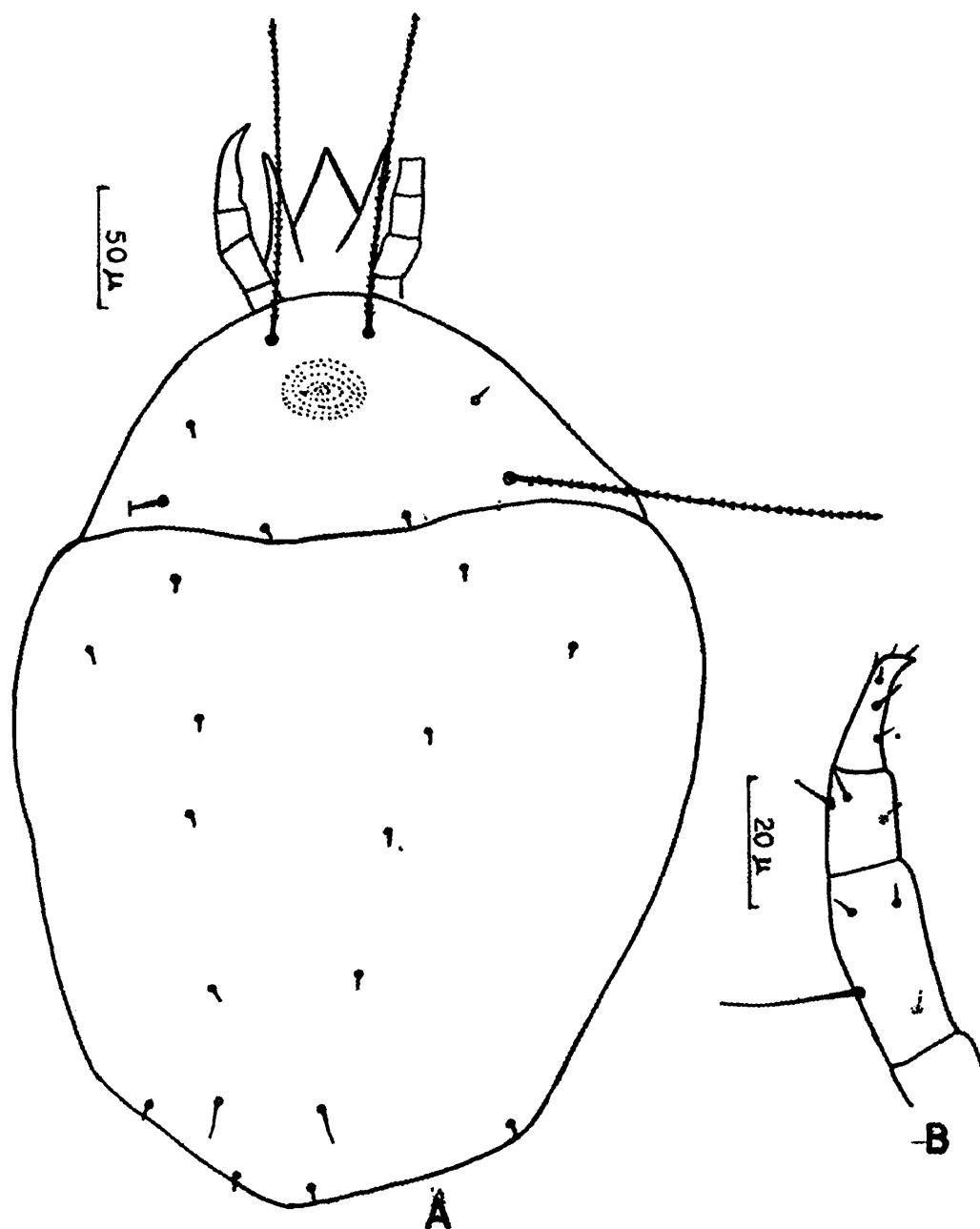
Female.—Body spindle-shaped with a distinct furrow. The dorsum finely striated and tuberculated. Propodosoma hemispherical with 2 pairs of long sensory setae and 2 pairs of short simple setae ; eyes scarcely visible. Hysterosoma with 8 pairs of simple setae arranged as in figure. Venter with 6 pairs of short and simple setae ; 4 pairs of simple setae on genital plate. Palp 86 long, 3 segmented, 1st segment with one outer lateral seta, one proximal midventral seta and 2 distal middorsal setae ; second segment with one inner midventral, one outerlateral and one middorsal setae ; 3rd segment with 2 innerlateral setae, distal one longer than proximal one and 3 setae on the distal portion, Chelicera broad basally and tapering distally with small chela, chelicera reaches upto middle of 3rd palpal segment. Legs with 2 claws on each ; chaetotaxy of basifemur, telofemur, genu, tibia and tarsus of legs : I—2, 4, 5, 4+1 solenidion. 9+1 solenidion ; II—3, 3, 4, 5, 9+1 solenidion ; III—3, 3, 5, 5, 6 ; IV—1, 3, 4, 4, 6 ; coxae I and II contiguous, coxae III and IV also contiguous. Body 451 long, 280 wide.

Male.—Body 390 long, 250 wide ; other characters being same as of female.

Holotype.—♀, India ; Car Nicobar Isl., Kakana, on an unidentified host, 25. xii. 1972. (Z.S.I. Reg. No. 3146/17)

Paratypes.—2 ♀♀, 2 ♂♂, with the same data as for holotype. (Z.S.I. Reg. No. 3146/17)

Remarks.—This new species differs from *Cunaxoides croceus* (Koch 1838) in the chaetotaxy of dorsum, in the chaetotaxy and structure of palp.



Text-fig. 2. *Cunaxoides nicobarensis* sp. nov., A—Dorsal surface of female (legs omitted), B—Palp.

Genus 3. *Indocunaxa* Gen. nov.

Diagnosis.—Dorsum covered with one shield on propodosomal region and that is weakly granulated, hysterosoma without shield,

variously striated. Palpi—4 segmented, gnathosoma enormously large, palp tibia and tarsi modified for clasping purpose with spine like setae ; all legs long, tarsi I-IV tapering with a pair of claws.

Type species : *Indocunaxa smileyi* sp. nov.

Remarks.—This genus is distinguished from *Dactyloscirus* Berlese as diagnosed by smiley (1975) by its enormously large gnathosoma with clasping modification of palp, tibia and tarsus.

3. *Indocunaxa smileyi* sp. nov.

(Text—fig. 3)

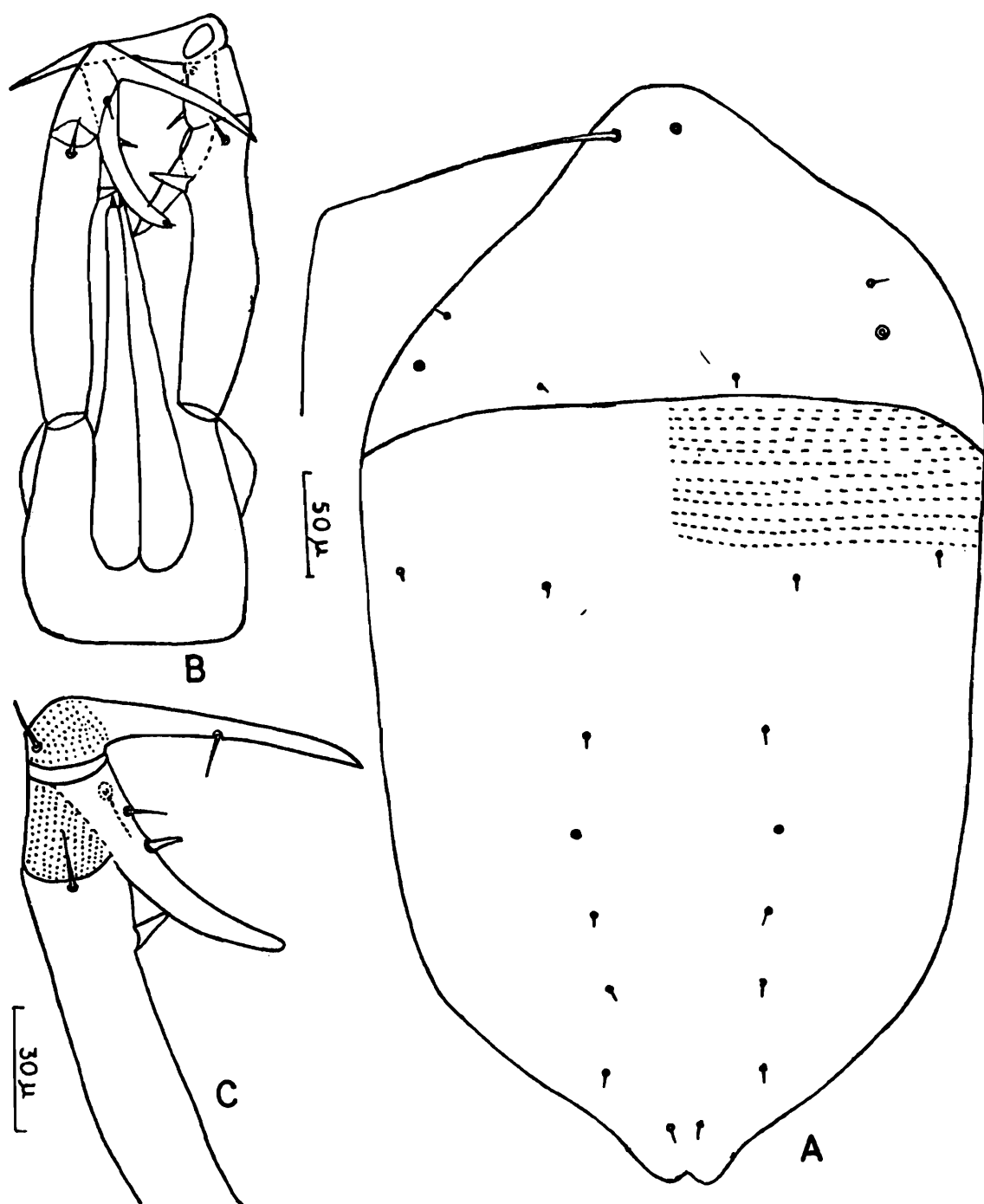
Female.—Dorsum with propodosomal shield with 2 pairs of long sensory setae ; propodosomal shield weakly granulated. Palpi—4 segmented, 1st segment with one small seta mediodorsally, one strong seta distally, one strong claw on the inner surface and another strong claw close by on the ventral surface ; the second segment with one long fine seta basally facing inward, one strong spine like seta at the distal end and another stout and pointed seta on the outer surface ; 3rd and 4th segment being clasping organ. Fixed digit with a long pointed seta and the movable digit with a strong spine medially and another more strongly developed spine at the tip. Chelicera reaches barely upto the tip of the first palpal segment ; gnathosoma squarish at base. Hysterosoma with fine striae and 8 pairs of setae, all being simple and short. Ventrally coxae I and II contiguous, coxae III and IV also contiguous ; 7 pairs of setae present ventrally between coxae II and posterior tip of body ; 4 pairs of setae present on the genital plate. Chaetotaxy on basifemur, telofemur, genu, tibia and tarsi of legs : I—2, 4, 5, 5+1 duplex setae, 16+4 solenidion, II—3, 5, not discernible, not discernible, 15 ; III—3, 5, 4, 4, 16 ; IV—2, 4, 6, 5, 14.

Holotype.—♀, INDIA ; Andaman Isl., Bednabad, on cane (*Calamus tenuis* Roxb.), 21 xii. 1972. (Z.S.I. Reg. No. 3147/17)

Paratype.—1 ♀, Car Nicobar Isl., Sawai, on an unidentified host, 24. xii. 1972. (Z.S.I. Reg. No. 3148/17)

Remarks.—This species differs from all the known species by its gnathosoma and by its palpal character.

This species is named after Dr. R. L. Smiley of the United States Dept. of Agriculture, Beltsville, U. S. A. for his valuable contribution to the family Cunaxidae.



Text-fig. 3. *Indocunaxa smileyi* sp. nov., A—Dorsal surface of female (legs omitted), B—Gnathosoma, C—Palp.

Genus 4. **Cunaxa** von Heyden

4. **Cunaxa setirostris** (Hermann)

Scirus setirostris Hermann, 1805. *Mem. Apteologique* : 62

Diagnosis.—Strong spine present on the inner anterolateral margin of the palpal telofemur.

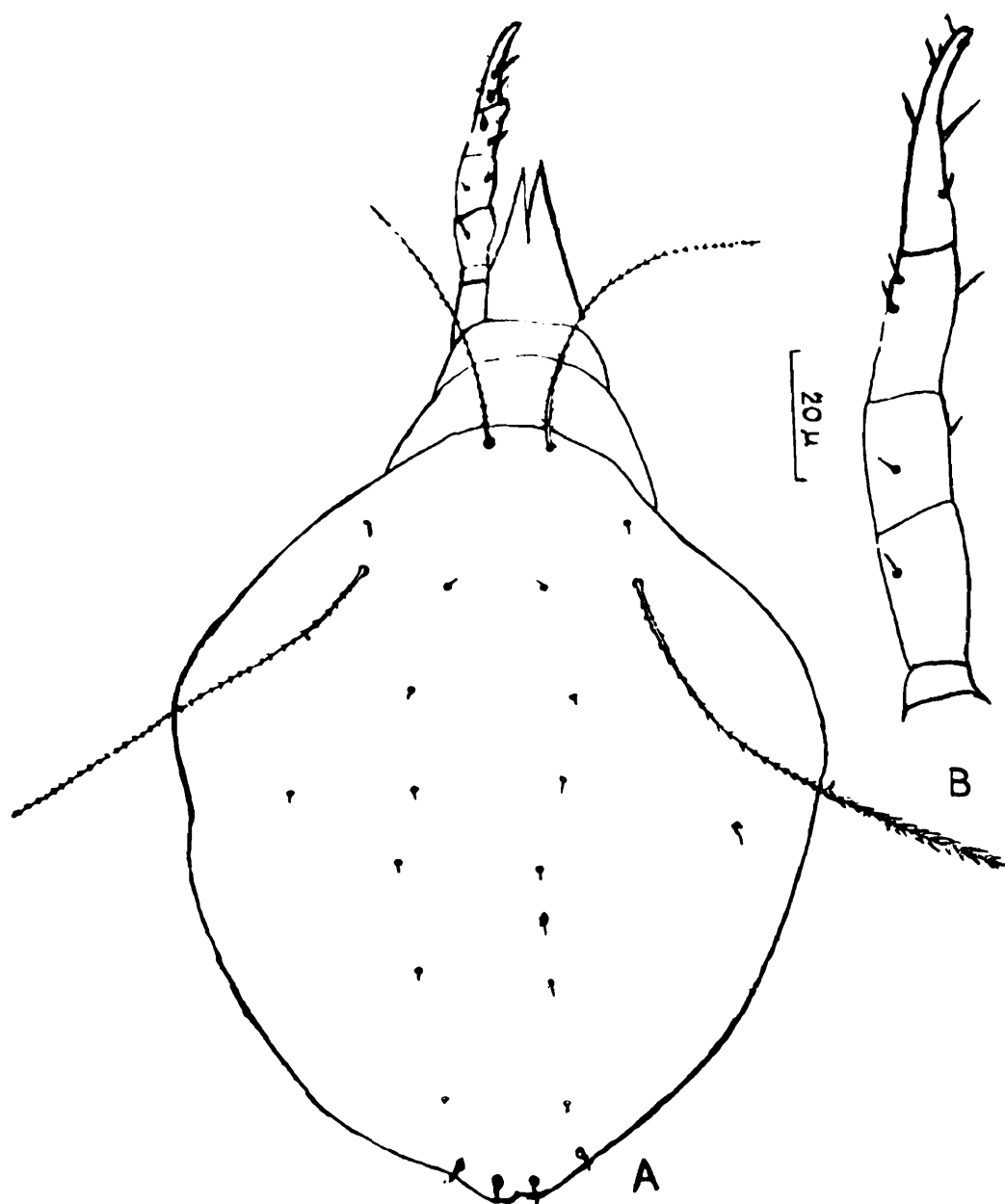
Material examined.—2 ♀ ♀, Andaman Isl., Port Blair, Zoological-

Horticultural garden, on *Tabernaemontana coronaria* Willd., 12. xii. 1972.

Distribution.—Cosmopolitan.

5. *Cunaxa myabunderensis* sp. nov.

(Text-fig. 4)



Text-fig. 4. *Cunaxa myabunderensis* sp. nov., A—Dorsal surface of female (legs omitted), B—Palp.

Female.—Palpi 5 segmented, 172 long, exceeding length of hypostome; chaetotaxy of palpus; trochanter—nil; basifemur—one outerlateral seta; telofemur—one weak spine like seta on the inner surface and one outerlateral simple seta; genu—inner surface with a sharp spine like seta and one small seta anterolaterally with one anteromedian seta; tibiotarsus with one small sharp seta on the inner surface, anterior to this one long, sharp spine like seta on the inner surface, opposite to strong spine a short seta, anterior to it another short seta, in addition one short seta at the tip—all being almost of same length. Chelicera broad at base, gradually tapering anteriorly extending upto tip of telofemur; fixed digit absent, movable digit not well discernible. Propodosomal shield indistinct, 2 pairs of finely branched sensory setae and 2 pairs of short setae. Hysterosomal region with fine striations with 6 pairs of short setae (L_1 , D_1 - D_5). Coxae I and II almost contiguous, coxae III and IV also contiguous. Coxal setal formula: 2: 1: 3: 1. Five pairs of setae on the ventral surface between coxae II and posterior tip of body excluding genital and anals. Genital plate with 4 pairs of setae, all of same length. Legs I and II directed anteriorly, III and IV directed posteriorly; leg IV longest. Tarsi I-IV attenuated, each with 2 claws. Body 420 long, 300 wide. Leg chaetotaxy of basifemur, telofemur, genu, tibia and tarsus of legs: I—3, 4, 5+1 solenidion+1 duplex seta, 3+1 solenidion+1 duplex seta, 17+not discernible solenidion; II—2, 4, 5+1 solenidion, 5+1 solenidion, 17+1 solenidion; III—2, 3, 4, 4+1 solenidion, 15+not discernible: IV—1, 4, 4, 12.

Male.—Body 380 long, 250 wide; other characters being same as of female.

Holotype.—♀, INDIA: Andaman Isl., Myabunder Isl., on wood apple (*Aegle marmelos* Corr.) 10. i. 1973. (Z.S.I. Reg. No. 3149/17)

Paratypes.—1♂, data same as for holotype (Z.S.I. Reg. No. 3149/17); 1♀, Nicobar Isl., Chuckchucha, on an undetermined host, 24. xii. 1972. (Z.S.I. Reg. No. 3150/17)

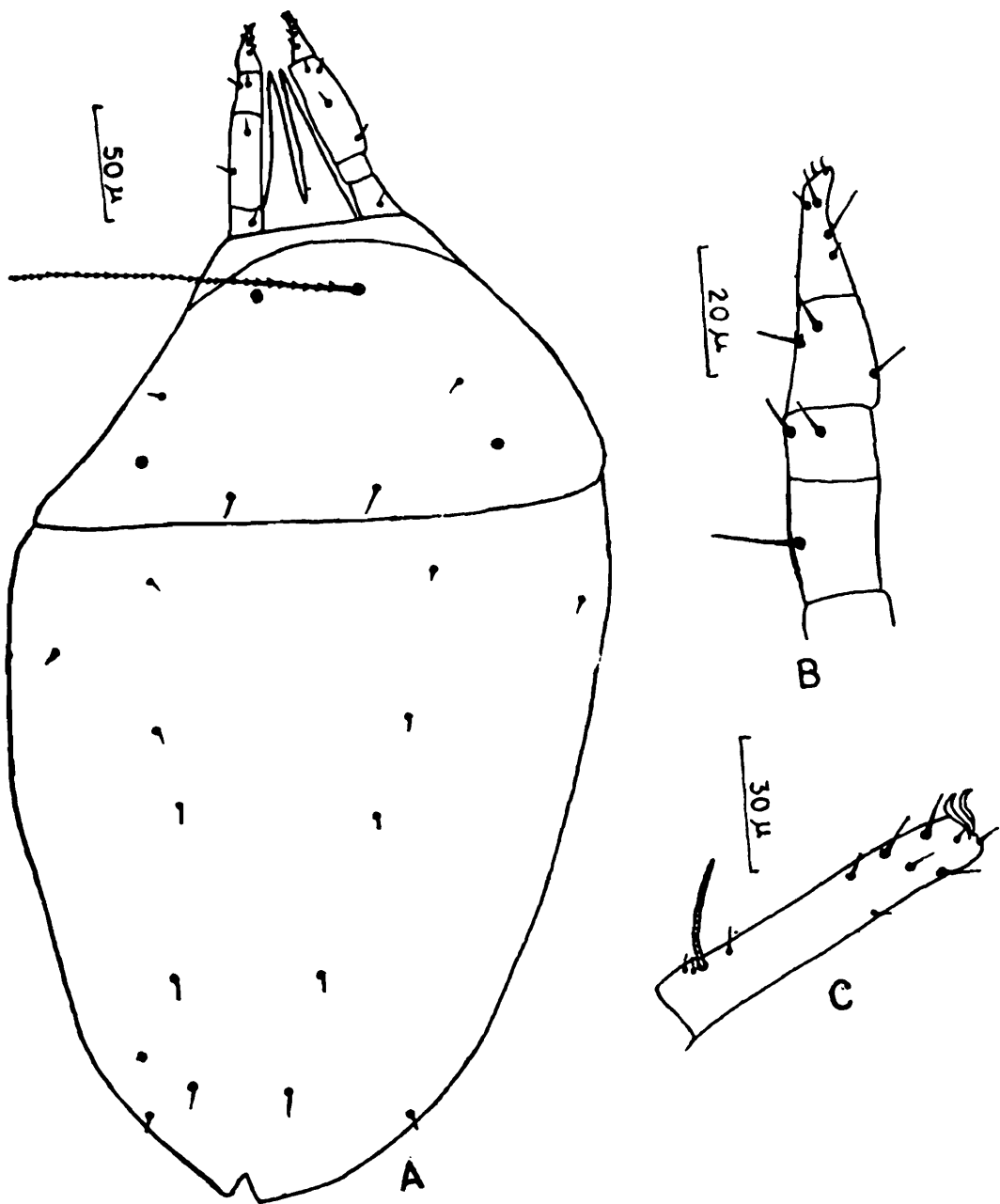
Remarks.—This new species differs from *C. setirostris* (Hermann) and *C. cynodona* sp. nov., in relative length of chelicera and in chaetotaxy of palp segments.

6. *Cunaxa cynodona* sp. nov.

(Text-fig. 5)

Female.—Palpi 5 segmented, 129 long, slightly exceeding the length of hypostome. Chaetotaxy of palp: trochanter—nil, basifemur with one outer lateral seta; telofemur with one outer and one anterodorsal seta; genu—one outerlateral, one innerlateral and one anterodorsal—all being simple; tibiotarsus—2 unequal simple setae on innerlateral surface, proximal one small, distal one larger, 4 setae present on the

anterior tip. Chelicera pointed, broadest at base, extending beyond palp genu, fixed digit absent, movable digit small with one seta. Gnathosoma subtriangular, attenuate distally. Propodosoma with a shield, hysterosoma without shield with fine striations, setae L_1 , D_1 - D_5 shorter. Coxal setal formula : 2 : 1 : 2 : 1. Ventrally five pairs of simple setae located between coxae II and distal tip of body ; four pairs of setae on genital plate, all similar in length. Leg IV being longest ; tarsi longer than other leg segments ; tarsi I-IV with 2 claws. Body 430 long, 300 wide. Leg chaetotaxy of basifemur, telofemur, genu, tibia and tarsus of legs : I—2, 3, 5, 4+1 duplex seta+1 solenidion ; II—4, 2, 4+1 solenidion, 3+1 solenidion, 13+1 solenidion III—2, 2, 4, 4, 14 ; IV—1, 2, 4, 3, 10.



Text-fig. 5. *Cunaxa cynodonae* sp. nov., A—Dorsal surface of female (legs omitted), B—Palp, C—Tarsus I.

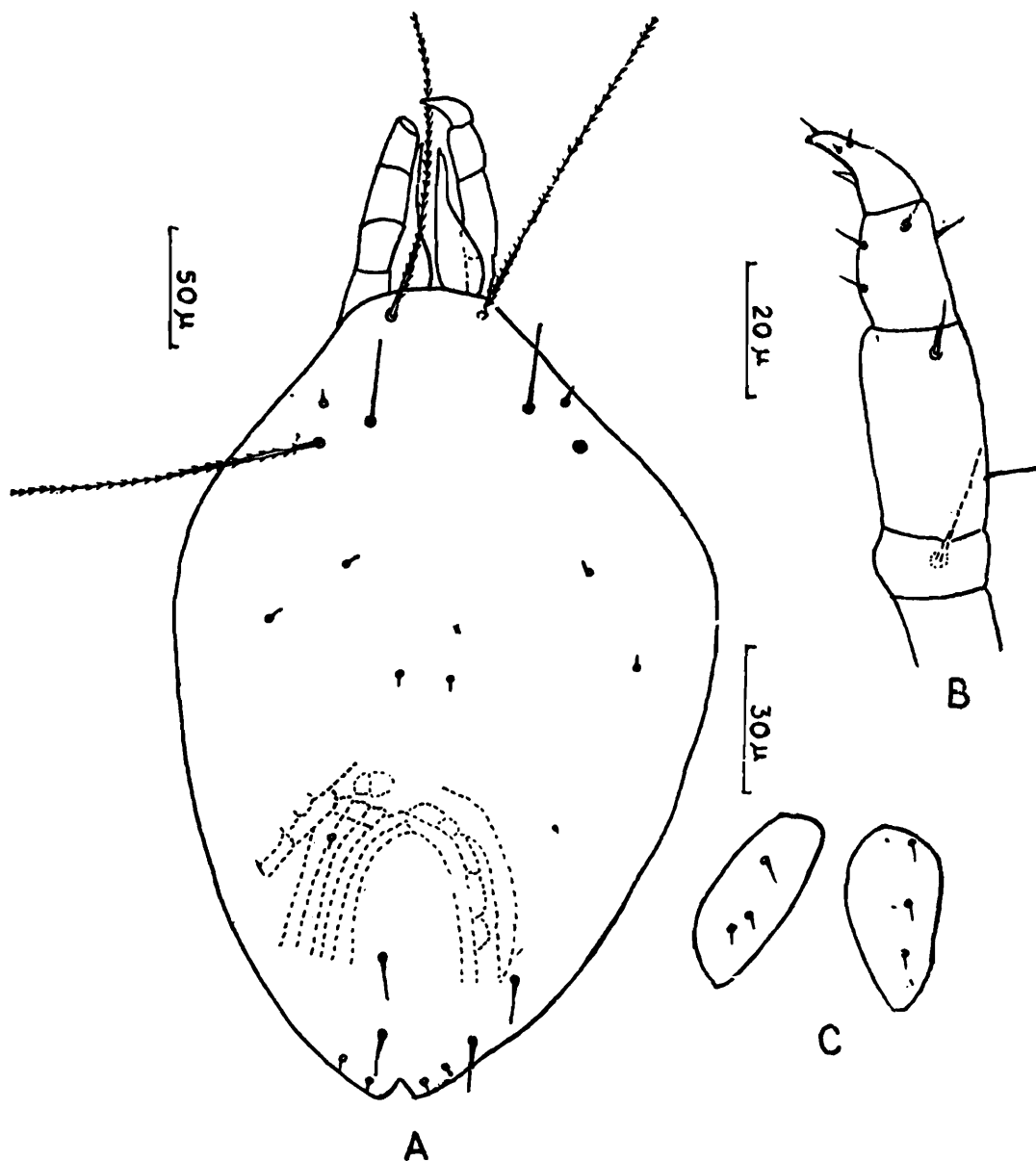
Holotype.—♀, INDIA, Car Nicobar Isl., on *Cynodon* sp., 25. xii. 1972. (Z.S.I. Reg. No. 3151/17)

Paratypes.—1 ♀, data same as for holotype (Z.S.I. Reg. No. 3151/17); 3 ♀♀, Andaman Isl.; Ferrargunj, on black berry (*Sizigium cuminii*), 14. i. 1973. (Z.S.I. Reg. No. 3152/17)

Remarks.—It differs from *C. taurus* (Kramer) in lacking large mesal process between tibia and tarsus.

7. *Cunaxa bambusae* sp. nov.

(Text-fig. 6)



Text-fig. 6. *Cunaxa bambusae* sp. nov., A—Dorsal surface of female (legs omitted), B—Palp, C—Genital plate.

Female.—Palpi 5 segmented, 130 long, chaetotaxy of palp : trochanter—nil, basifemur—one midventral seta ; telofemur—one outerlateral and one anteromiddorsal seta ; genu—2 setae innerlateral, one outerlateral and one anteromiddorsal ; tibiotarsus—one strong spine on innerlateral surface, anterior to it one small seta and 2 setae on outerlateral surface, anterior one longer and stronger. Chelicera broad at base, gradually tapering anteriorly, movable digit sharp. Gnathosoma somewhat covered under propodosoma. Propodosoma apparently with no shield, with 2 finely branched sensory setae and 2 fairly long simple setae. Hysterosoma without shield and with setae L_1 , D_1 - D_5 D_4 and D_5 fairly long. Coxal setal formula 3 : 1 : 2 : 2. Five pairs of setae present ventrally between coxae II and caudal tip of body (excluding those on genital and anal regions) ; 4 pairs of setae on genital plate, legs I and II broken, chaetotaxy of basifemur, telofemur, genu, tibia and tarsus of legs : III—1, 4, 4, 4, 14 ; IV—1, 2, 4, 4, 16. Body 409 long, 275 wide.

Holotype.—♀, INDIA ; Andaman Isl., Ferrargunj, on bamboo (*Bambusa arundinacea* Willd.), 6. i. 1973. (Z.S.I. Reg. No. 3153/17)

Paratype.—1 ♀, Data same as for holotype. (Z.S.I. Reg. No. 3153/17)

Remarks.—This species is easily differentiated from *C. myabunderensis* sp. nov. and *C. cynodonae* sp. nov. in having chelicera slightly longer than tibiotarsus. Besides, they also differ in palpal chaetotaxy. Further, it is distinguished from *C. womersleyi* Baker & Hoffman, 1948. in lacking spur like femoral process.

Family II. TENUIPALPIDAE

Genus 5. *Brevipalpus* Donnadieu

8. *Brevipalpus essigi* Baker

Brevipalpus essigi Baker, 1949. *Amer. midl. Nat.* 42 : 367.

Diagnosis.—Hysterosoma with reticulations evenly distributed along dorsomedian ridge ; dorsocentral hysterosomals setiform ; anterior and posterior medioventrals greatly unequal, tarsus II with single sensory rod and hysterosoma with six pairs of dorsolaterals.

Material examined.—1 ♀, Car Nicobar Isl., Lapathi, on sponge gourd (*Luffa aegyptica* Mill.), 28. xii. 1972.

Distribution.—California, MEXICO ; INDIA : Car Nicobar Isl.

Remarks.—This species is reported here for the first time from India.

Genus 6. *Tenuipalpus* Donnadieu9. *Tenuipalpus quadrisetosus* Lawrence

Tenuipalpus quadrisetosus Lawrence, 1940. *J. ent. Soc. Sth. Afr.*, 3 : 114.

Diagnosis.—Hysterosoma without a flagellate dorsolateral seta ; dorsocentral hysterosomals well developed and leaf like.

Material examined.—2 ♀ ♀, Andaman Isl., Manclutan, on an undetermined host, 17. xii. 1972.

Distribution.—AFRICA : Natal ; INDIA : Andaman Isl.

Remarks.—This species is reported here for the first time from India.

10. *Tenuipalpus hastaligni* De Leon

Tenuipalpus hastaligni De Leon, 1956. *Florida Ent.* 39 (2) : 57.

Diagnosis.—Podosoma with one pair of anterior medioventral and one pair of posterior medioventral ; hysterosoma with a differentiated expansion anterior to coxae III, second dorsolateral longer than distance between second and third dorsolaterals ; third dorsal propodosomal attenuate and about 1/2 as long as distance between its base and posterior margin of propodosoma.

Material.—2 ♀ ♀, Andaman Isl. Port Blair, Zoo. Horticultural garden, on black berry (*Sizigium cumini* L.), 11 xii. 1972.

Distribution.—U.S.A. : Florida ; INDIA : Andaman Isl.

Remarks.—This species is recorded here for the first time from India.

11. *Tenuipalpus micheli* Lawrence

Tenuipalpus micheli Lawrence, 1940. *J. ent. Soc. Sth. Afr.* 3 : 111.

Diagnosis.—Dorsocentral hysterosomals minute and setiform ; anterolateral expansion of hysterosoma broad and subquadrate.

Material examined.—2 ♀ ♀, 2 ♂ ♂, Andaman Isl. Manclutan, on arecanut (*Areca catechu* L.) 17. xii. 1972.

Distribution.—AFRICA : Natal, INDIA : Karnataka, Andaman Isl.

Remarks.—Nagesha Chandra & Channa Basavanna (1974) reported this species from India on *Sizigium* sp,

12. *Tenuipalpus tetrazygiae* De Leon

Tenuipalpus tetrazygiae De Leon, 1956. *Florida ent.* 39 (2) : 55.

Diagnosis.—Hysterosoma with 4 pairs of nonflagellate setae caudally and dorsocentral hysterosomals narrowly lanceolate.

Material examined.—2 ♀ ♀, Andaman Isl, Chiriatapu, on cashewnut (*Anacardium occidentale* L.), 20. xii 1972.

Distribution.—U. S. A. : Florida ; INDIA : Andaman Isl.

Remarks.—This species is recorded for the first time from India.

Family III BDELLIDAE

Genus 7. *Bdellodes* Oudemans

Subgenus *Hoploscirus* Thor

13. *Bdellodes (Hoploscirus) affinis* Atyeo

Bdellodes (Hoploscirus) affinis Atyeo, 1963. *Bull. Univ. Nebraska Sta. Mus.*, 4 (8) : 185-187.

Diagnosis.—Chelicera with a single seta ; palpal tibiotarsus with 8 setae.

Material examined.—1 ♀, Andaman Isl. : Rangat Isl., Panchawati, on arecanut (*Areca catechu* L.), 8. i. 1973.

Distribution.—AUSTRALIA ; INDIA : Andaman Isl ; Rangat Isl.

Remarks.—This species is reported here for the first time from India.

14. *Bdellodes (Hoploscirus) sp. nr. procincta* Atyeo

Bdellodes (Hoploscirus) procincta Atyeo, 1963. *Bull. Univ. Nebraska Sta. Mus.*, 4 (8) : 143-145.

Material examined.—1 ♀, Andaman Isl.; Ferrargunj, on black berry (*Sizigium cumini* L.), 8. i. 1973.

Distribution.—AUSTRALIA ; INDIA : Andaman Isl.

Remarks.—The identity of the specimen is somewhat doubtful but it appears to be very close to *procincta* Atyeo if not the same one.

Subgenus **Bdellodes** Oudemans15. **Bdellodes (Bdellodes) sp.**

Material examined.—2 ♀ ♀, Andaman Isl., Port Blair, Zoo. Horticultural garden on “Chalta”, (*Dillenia indica* L.) 11. xii. 1972.

Remarks.—Specific identity could not be ascertained from the literature available to the authors. However, it appears to be an undescribed one.

Family IV CHEYLETIDAE

Genus 8. **Chelacaropsis** Baker16. **Chelacaropsis moorei** Baker

Chelacaropsis moorei Baker, 1949. *Proc. U. S. Nat. Mus.* 99 : 315-316.

Diagnosis.—Palpal claw long and narrow, palp tarsus with 2 sickle and 1 comb like setae ; dorsal shield absent, dorsum covered with striations ; dorsal setae squamiform, 6 pairs of propodosomal and 8 pairs of hysterosomal setae ; femur of legs with squamiform setae.

Material examined — 1 ♀, Andaman Isl., Ferrargunj, on paddy (*Oryza sativa* L.), 18. i. 1973.

Distribution.—U. S. A. : Florida ; INDIA : Andaman Isl.

Remarks.—This species was not hitherto known from India.

Family V TYDEIDAE

Genus 9. **Pronematus** Canestrini17. **Pronematus fleschneri** Baker

Pronematus fleschneri Baker 1968. *Ann. ent. Soc. America* 61 (5) : 1092-1093.

Diagnosis.—Terminal palpal segment short with distally placed solenidion ; 4 distal setae of tarsus I serrate.

Material examined.—1 ♀, Andaman Isl., Port Blair, Jungleghat, on paddy (*Oriza sativa* L.) 14. xi. 1972 ; 7 ♀ ♀, Rangat Isl., on bamboo (*Bambusa arundinacea* Willd.) 11. i. 1973.

Distribution.—INDIA : new Delhi, Andaman Isl., Rangat Isl.

Remarks.—Bamboo is the new host record for the species.

Genus 10. **Parapronematus** Baker

18. **Parapronematus acaciae** Baker

Parapronematus acaciae Baker, 1965. *Advances in Acarology*, 2 : 116-117.

Diagnosis.—P₂ seta on propodosoma lacking, forked seta on femur IV as long as width of the segment ; pl seta shifted between sensory setae.

Material examined.—2 ♀ ♀, Car Nicobar Isl., Kimus, on bamboo (*Bambusa arundinacea* Willd.), 27.xii.1972.

Distribution.—AFRICA : Belgian Congo, Ruanda Urundi, Trinidad ; U.S.A. : Florida, Hong Kong ; INDIA : Andaman Isl.

Remarks.—This species was not hitherto known from India.

19. **Parapronematus** sp.

Material examined.—2 ♀ ♀ Car Nicobar Isl., Agril. Farm, on mango (*Mangifera indica* L.), 26. xii. 1972.

Remarks.—The specific identity could not be ascertained with the literature available to the authors.

Genus 11. **Lorryia** Oudemans

20. **Lorryia africana** Baker

Lorryia africanus Baker, 1965. *Advances in Acarology*, 2 : 107.

Lorryia africana Baker, 1968. *Ann. ent. Soc. America*, 61 (4) : 1002.

Diagnosis.—Trochanter I without seta ; empodia with claws. and dorsal body setae lanceolate.

Material examined.—1 ♀, Rangat Isl., garden adjoining P. W. D. Bunglow, on cashewnut (*Anacardium occidentale* L.), 6. i. 1973.

Distribution.—AFRICA : Belgian Congo ; India : Rangat Isl.

Remarks.—This is the first record of this species from India.

Family VI TARSONEMIDAE

Genes 12. **Polyphagotarsonemus**

21. **Polyphagotarsonemus latus** (Banks)

Tarsonemus latus Banks, 1904. *Proc. U. S. Nat. Mus.* 32 (1553) : 615.

Diagnosis.—Terminal claw of leg IV of male reduced to a small tubercle.

Material examined.—4 ♀ ♀, 3 ♂ ♂, Car Nicobar Isl., Agril. Farm, on Chillies (*Capsicum* sp.), 29. xii. 1972.

Distribution.—Cosmopolitan.

Remarks.—This species is known from India on a number of hosts (Dhooria and Bindra, 1977).

Family VII STIGMAEIDAE

Genus 13. *Agistemus* Summers

22. *Agistemus fleschneri* Summers

Agistemus fleschneri Summers, 1960. *Proc. ent. Soc. Wash.* 62 : 237-240.

Diagnosis.—One pair of paragenital setae ; main dorsal plates conspicuously reticulate with polygonal cells ; reticulum on median row with 12-14 cells. This conforms with the diagnosis of Gonzalez (1965).

Material examined.—4 ♀ ♀, Andaman Isl., Port Blair on guava (*Psidium guajava* L.) 11. xii. 1972 ; 1 ♀, Port Blair, Bamboo flat, on an undetermined host, 18. xii. 1972.

Distribution.—U. S. A. : California, Kansas, Nebraska, Lancaster, Wisconsin, Missouri, Illinois, Kentucky, Ohio, Virginia, North Carolina ; CHILE ; INDIA : Assam, Andaman Isl., Punjab.

Genus 14. *Cheyllostigmaeus* Willmann

23. *Cheyllostigmaeus* sp.

Material examined.—1 ♀, Little Andaman Isl., on fig (*Ficus* sp), 31. xii. 1972.

Remarks.—This is a very interesting genus having two principal dorsal plates, chelicera prominent with fixed digit tapered, palpal claw robust with 13 pairs of dorsal setae. As the specimen was badly damaged, further identification was not possible. The genus was so far not known from India.

Genus 15. *Indostigmaeus* Gen. nov.

Diagnosis.—Body broadly rounded ; dorsum covered with single shield, beautifully reticulated with polygonal cells ; palp tarsus with

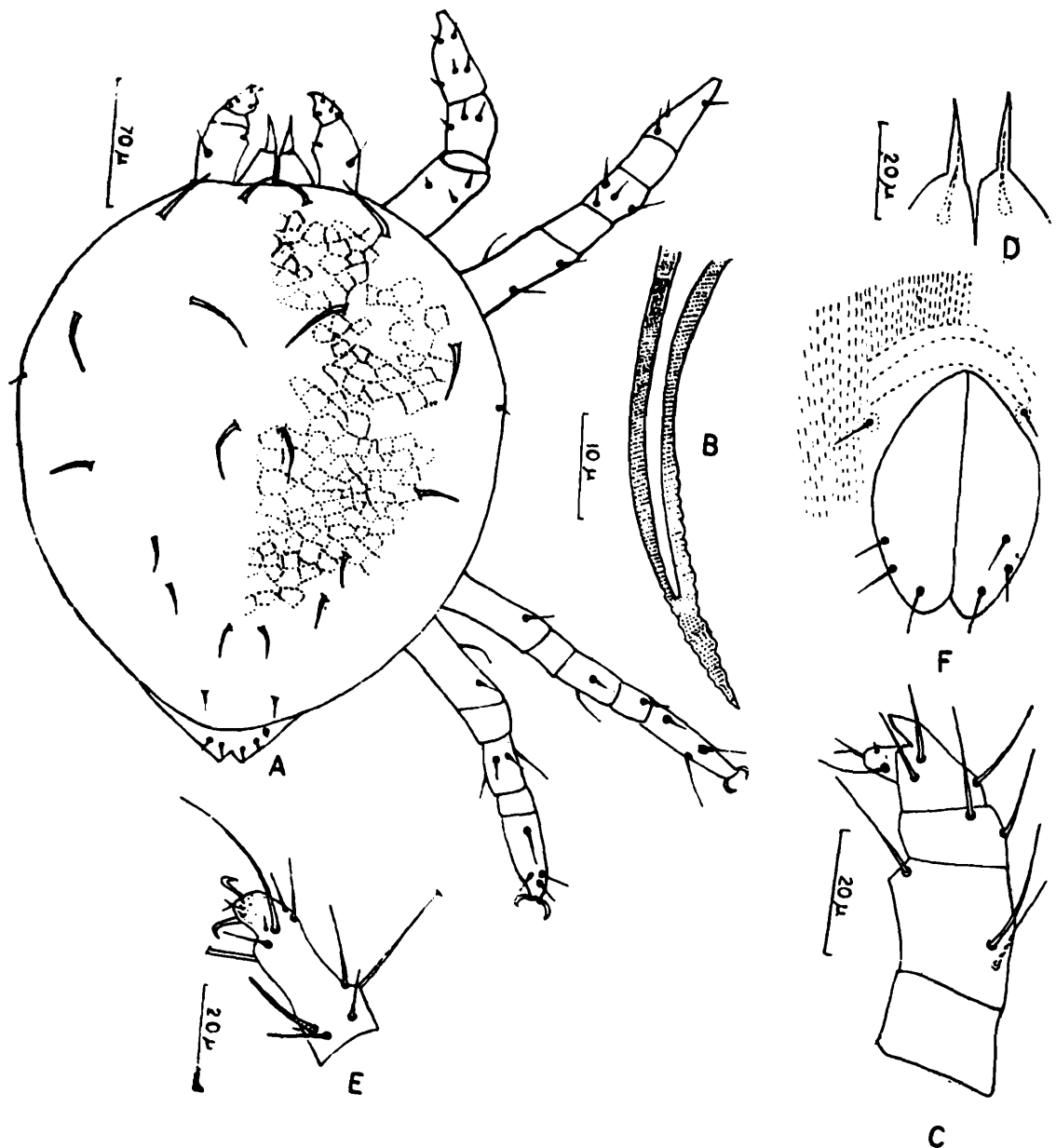
terminal sensillum bifid ; 13 pairs of strong thick setae on dorsum originating from weak tubercles ; 2 pairs of subcapitular setae.

Type *Indostigmaeus rangatensis* sp. nov.

Remarks.—Shape of body, reticulation, setae on dorsum and structure of palp tarsal sensillum are very distinctive by which it can be separated from the known genera of stigmatidae.

24. *Indostigmaeus rangatensis* sp. nov.

(Text-fig. 7)



Text-fig. 7. *Indostigmaeus rangatensis* sp. nov., A—Dorsal surface, B—Enlarged view of dorsocentral dorsal seta, C—Palp, D—Chelicera, E—Tarsus of leg I, F—Opisthosomal portion.

Female.—Body almost rounded ; 323 long, 275 wide ; body covered with a single plate covering both propodosoma and hysterosoma. Dorsum beautifully reticulate except towards margin, cells polygonal, larger centrally while smaller towards anterior and posterior parts as well as towards margin. Dorsal setae long, margin somewhat corrugated, set on weak tubercles. Dorsolateral dorsal setae small, while others are fairly large and almost of equal length, all the setae being shorter than the longitudinal intervals between successive bases. Two pairs of unequal paragenital setae ; 3 pairs of annogenital setae present. Ventral striations longitudinal between coxae I and II as well as between coxae III and IV, transverse striations centrally ; 1 pair of setae present between coxae I, another pair slightly above coxae III.

Measurements of setae.—ae-34, be-38, ce-34, he-10.5, a-38, b-34, c-20.5, la-24, lm-22, ln-20.5, li-14, le-17, e-17 ;—leg I 153 long.

Holotype.—♀, INDIA, Rangat Isl., Panchawati on citrus (*Citrus medica* L.) 6. i. 1973. (Z.S.I. Reg. No. 3154/17)

Paratype.—1 ♀, same data as for holotype. (Z.S.I. Reg. No. 3155/17)

Family VIII TETRANYCHIDAE

Genus 16. *Aponychus* Rimando

25. *Aponychus corpuzae* Rimando

Aponychus corpuzae Rimando, 1966. *Philip. Agric.* 50 : 107.

Diagnosis.—Dorsocentral hysterosomal setae much shorter than intervals between them ; second pair of dorsolateral setae equal in length to 1st pair of dorsolaterals and first three pairs of dorsocentrals ; 1st to 3rd pair of dorsocentral hysterosomals subspatulate.

Material examined.—2 ♀ ♀, Rangat Isl., on paddy (*Oryza sativa* L.) 14. i. 1973.

Distribution.—PHILIPPINE Isl. ; JAPAN ; THAILAND ; INDIA : Rangat Isl.

Remarks.—Earlier this species was recorded from Rangat Isl. on bamboo (Gupta, 1976).

Genus 17. *Eotetranychus* Oudemans

26. *Eotetranychus hirsti* Pritchard and Baker

Tetranychus fici. Hirst, 1926. *Proc. zool. Soc. Lond.* 2 : 828.

Eotetranychus hirsti Pritchard and Baker, 1955, *Pacific Coast Ent. Soc. Mem. Ser.*, 2 : 200.

Diagnosis.—Dorsum with 14 pairs of setae, clunals minute, aedeagus bent dorsal and upward portion slender, tapering and sigmoid.

Material examined.—18 ♀ ♀, 2 ♂ ♂, Car Nicobar Isl., Kakana, on fig. (*Ficus cunea* Ham.), 25. xii. 1972.

Distribution.—INDIA : Punjab, Karnataka, Delhi, Andhra Pradesh, Bihar, Tamil Nadu, West Bengal, Car Nicobar Isl.

Remarks.—This species is recorded here for the first time from Nicobar Isl.

Genus 18. *Schizotetranychus* Tragardh

27. *Schizotetranychus andropogoni* (Hirst)

Tetranychus (*Schizotetranychus*) *andropogoni* Hirst, 1926. *Proc. zool. Soc. Lond.* 2 : 829.

Diagnosis.—Aedeagus distally forms a dorsally directed sigmoid curve ; idiosomal setae broad at base gradually tapering at the tip.

Material examined.—26 ♀ ♀, 6 ♂ ♂, Andaman Isl., Humphrygunj, on paddy (*Oryza sativa* L.), 17. xii. 1972.

Distribution.—THAILAND ; PAKISTAN ; INDIA : Punjab, West Bengal, Bihar, Tamil Nadu, Delhi, Andaman Isl.

Remarks.—This mite is known from India on a number of hosts (Gupta, 1976). It is recorded for the first time from Andaman Isl.

Genus 19. *Oligonychus* Berlese

28. *Oligonychus indicus* (Hirst)

Paratetranychus indicus Hirst, 1923. *Proc. zool. Soc. Lond.* 1923 : 990.

Diagnosis.—Aedeagus forms an acute angle with the axis of the shaft.

Material examined.—5 ♀ ♀, Andaman Isl., Port Blair, South Point, on grass, 2. i. 1973.

Distribution.—PAKISTAN ; MEXICO ; INDIA : Punjab, West Bengal, U. P., Andhra Pradesh, Bihar, Haryana, Karnataka, Orissa, Tamil Nadu, Delhi, Andaman Isl.

Remarks.—This species is known from India on a number of hosts

(Gupta, 1976). However, this is for the first time that the species is recorded from Andaman Isl.

Genus 20. *Tetranychus* Dufour

29. *Tetranychus fijiensis* Hirst

Tetranychus fijiensis Hirst, 1924. *Ann. Mag. nat. Hist.* (9) 14 : 523.

Diagnosis.—Aedeagus much elongated, bends upwards and tapers gradually ; female empodium with 2 pairs of empodial hairs, dorsal pair shorter than ventral pair.

Material examined.—5 ♀ ♀, 1 ♂, Andaman Isl., Jungleeghat, on coconut (*Cocos nucifera* L.), 14. xii. 1972.

Distribution.—FIJI Isl. ; THAILAND ; Likiep Isl. ; Nakuoro Isl., INDIA : Andaman and Nicobar Isl., Assam, Karnataka, Tamil Nadu.

Remarks.—This was earlier known (Gupta, 1976) from Nicobar Isl. and now it is reported from Andaman Isl.

30. *Tetranychus* sp.

Material examined.—2 ♀ ♀, Andaman Isl., Bamboo flat, on banana (*Musa* sp.), 18. xii. 1972.

Remarks.—Since no male specimen was available, the specific identity was not possible.

Key to the families, genera and species of Prostigmatid mites treated in this Paper

1. Gnathosoma with minute palpi, lying closely approximate laterally ; chelae tiny and stylet like with 4 pairs of legs, stigma of female opening behind gnathosoma ; male without stigma or tracheae, empodium usually a membranous flap like organ attached to claws.

Family Tarsonemidae

males with body laterally compressed, tibia and tarsus or tibiotarsus slender, elongate more than 3 times as long as basal width of tibia or tibiotarsus

Genus *Polyphagotarsonemus*

leg IV of male ends in a small reduced, blunt, button like claw, hysterosoma of female with a pair of setae between coxae IV

Polyphagotarsonemus latus

- Gnathosoma usually conspicuqus with large chelicerae ; palpi usually well developed ; stigma opens at base of chelicera ; empodium free pad like or claw like arising from tarsus 2
- 2. Without a palpal thumb claw complex ... 3
- With a palpal thumb claw complex 19
- 3. Cheliceral bases fused, or if not fused, not capable of lateral scissors like motion over gnathosoma 4
- Chelicera free, attached at base and free to move like scissors laterally across gnathosoma 11
- 4. Chelicerae long recurved and whip like ; female genital opening transverse ; tarsal claws with tenent hairs ; palpi simple ... Family Tenuipalpidae - 5
- Chelicerae short needle like, genital opening not transverse Family - Tydeidae - 9
- 5. Palpus with 4 or 5 segments Genus *Brevipalpus*
- Hysterosoma with 6 dorsolaterals, reticulations evenly distributed along dorsomedian ridge *Brevipalpus essigi*
- Palpus with 3 segments Genus *Tenuipalpus* 6
- 6. Hysterosoma without a flagellate dorsolateral setae *T. quadrisetosus*
- Hysterosoma with penultimate dorsolateral seta flagellate 7
- 7. Hysterosoma with dorsocentrals minute and setiform 8
- Hysterosoma with 3 pairs of dorsocentrals narrowly lanceolate *T. tetrazygiae*
- 8. Anterolateral expansion of hysterosoma broad and subquadrate *T. micheli*
- Anterolateral expansion of hysterosoma conical *T. hastaligni*
- 9. Hysterosomal seta L_2 in normal lateral position Genus *Lorryia*
- Coxa IV with one seta, palpal tarsus long, palpal tibia with one seta *Lorryia africana*
- Hysterosomal seta L_2 in dorsal position ... 10
- 10. Without anal setae, femora III and IV each with a prominent forked seta Genus *Parapronematus*
- P_2 seta lacking on propodosoma, forked

- seta of femur IV twice as long as width of the segment *P. acaciae*
- With a single pair of anal setae; setae normal on femora III and IV Genus *Pronematus*
- Terminal palpal segment short with distally placed solinidion *P. fleschneri*
11. With 2 pairs of genital suckers; the relatively long palpi turned inward, distal segment usually claw like Family Cunaxidae 12
- With 3 pairs of genital suckers; the relatively long palpi elbow like with distal setae Family Bdeliidae 18
- Chela with inner surface of movable digit sickle shaped, dentate or edentate; chelice-
ral bases usually not inflated Genus *Bdellodes* 18
- Anterior and posterior pseudostigmata usually differently constricted neither goblet shaped; diameter of posterior stigmata less than depth; posterior sensilla usually reduced in size Subgenus *Hoploscirus* 18
12. Gnathosoma enormously developed, palpal tibia and tarsus modified for clasping organ Genus *Indocunaxa* gen. nov.
- Body robust, palpi 4 segmented, last two segments forming clasping organ *Indocunaxa smileyi* sp. nov.
- Gnathosoma normal, not enormously developed, tibia and tarsus do not form clasping organ 13
13. Palpi 3 segmented 14
- Palpi 5 segmented Genus *Cunaxa* 15
14. Dorsum without conspicuous shield or shields Genus *Cunaxoides*
- Spindle shaped body with distinct furrow, hysterosoma with 8 pairs of simple setae; venter with 6 pairs of short simple setae *Cunaxoides nicobarensis* sp. nov.
- Dorsum with conspicuous shield... .. *Neocunaxoides* ,
- Hysterosoma with 4 pairs of thick rod like setae *N. pradhani* sp. nov.
15. Palp telofemur with spine on inner antero-lateral margin *Cunaxa setirostris*
- Palp telofemur without such spine 16
16. Chelicera longer than tibiotarsus *Cunaxa bambusae* sp. nov.
- Chelirera shorter than tibiotarsus 17
17. Chelicera barely reaches the base of genu *C. myabundrensis* sp. nov.

- Chelicera extends to tip of tibiotarsus ... *C. cynodona* sp. nov.
- 18. Chelicera with 2 setae *Bdellodes* (H.) nr. *procincta*
- Chelicera with 1 seta *B.* (H.) *affinis*
- 19. Cheliceral bases closely fused with gnathosoma and without indication of suture, peritreme usually 'M' shaped may be present on gnathosoma Family Cheyletidae
- Palp tarsus with 2 sickle and 1 comb like setae ; without dorsal shield Genus *Chelacaropsis*
- Setae on dorsum broadly squamiform ; palpal claw long and narrow ; 6 pairs of setae on propodosoma and 8 pairs of setae on hysterosoma *C. moorèi*
- Cheliceral bases fused with each other but not with gnathosoma having suture conspicuous ; peritreme usually present on anterior portion of propodosoma ... 20
- 20. Movable chela forming a long whip like stylet curving within body ; cheliceral bases fused to form stylophore Family Tetranychidae 21
- Movable chela straight, stiff and relatively short, no stylophore Family Stigmaeidae 25
- 21. Tarsus I with single set or without closely associate duplex setae or dup ex setae absent Genus *Aponychus*
- 1st to 3rd pair of dorsocentral hysterosomals subspatulate *Aponychus corpuzae*
- Tarsus I with 2 pairs of duplex setae, the proximal member of each pair shorter than the distal member, empodium claw like or splits distally 22
- 22. With 2 pairs of paraanal setae 23
- With 1 pair of paraanal setae 24
- 23. Empodium claw like Genus *Schizotetranychus*
- Dorsal body setae as long as intervals between their bases, aedeagus less acutely turned distally *S. andropogoni*
- Empodium ending into tuft of hairs ... Genus *Eotetranychus*
- Distal portion of aedeagus sigmoid ... *E. hirsti*
- 24. Empodium claw like with proximoventral hairs, duplex setae of tarsus I distal and approximate Genus *Oligonychus*
- Aedeagus with distal end enlarged ... *O. indicus*

- Empodium splits distally, usually into 3 pairs of hairs, duplex setae of tarsus I well separated Genus *Tetranychus*
- Empodium with 2 pairs of empodial hairs, the dorsal pair shorter than ventral pair, mediodorsal spur of empodium nearly 1/2 as long as medioventral hairs *T. fijiensis*
- 25. Dorsum covered with a single shield with reticulation, margin without reticulations *Indostigmaeus* gen. nov.
- Polygonal cells larger centrally, smaller anteriorly and posteriorly with 13 pairs of thick setae on dorsum, 2 pairs of unequal paragenital setae *Indostigmaeus rangatensis* sp. nov.
- Dorsum covered with more than one shield 26
- 26. Propodosomal plate carries 3 pairs of setae Genus *Agistemus*
- Reticulum on median plate with 12-14 cells in median longitudinal row *A. fleschneri*
- Propodosomal plate carries 4 pairs of setae, chelicera adnate with septum persisting ... Genus *Cheylostigmaeus*

SUMMARY

A taxonomic account of 30 species of prostigmatid mites belonging to 8 families and 20 genera from Andaman and Nicobar Islands collected during December, 1972 — January, 1973 is presented in this paper. This includes 2 new genera one each of Cunaxidae and Stigmaeidae and 7 new species, 6 of Cunaxidae and 1 of Stigmaeidae. In addition, 9 species and 7 genera are represented here for the first time from India. All but 2 species are new reports from these islands. A key to the families, genera and species of prostigmatid mites treated in this paper is given.

ACKNOWLEDGEMENTS

The authors express grateful thanks to the Director, Zoological Survey of India and to Dr. P. D. Gupta, Officer-in-Charge, G.P.R. Station, Patna for the facilities. Sincere thanks are also due to Dr. A. P. Kapur, former Director, Zoological Survey of India for kindly sending the senior author to these islands for survey which enabled him to bring this collection. Mr. K. S. Pradhan, formerly Superintending Zoologist, Entomology Division, Z. S. I., Calcutta, being leader of the Survey party, provided constant encouragements in the collection work and to whom also the authors express their gratitude.

REFERENCES

- BAKER, E. W AND HOFFMAN, A. 1948. Acaros de la familia Cunaxidae, *An. Esc. Nac. Cienc. Biol. Mex.*, **5** : 229-273.
- DHOORIA, M. S. AND BINDRA, O. S. 1977. *Polyphagotarsonemus latus* (Banks) a mite pest of chilli and potato in Punjab. *Acarology Newsletter*, **4** : 7-9.
- GONZALEZ - RODRIGUEZ, R. H. 1965. A taxonomic study of the genera *Mediolata*, *Zetzellia* and *Agistemus* (Acarina : Stigmaeidae), *Univ. Calif. Pub. Ent.*, **41** : 1-64.
- GUPTA, S. K. 1976. Contribution to our knowledge of tetranychid mites (Acarina) with descriptions of three new species from India. *Oriental Ins.*, **10** (3) : 327-351.
- GUPTA, S. K. 1977. Phytoseiidae (Acarina : Mesostigmata) of Andaman Nicobar Islands with descriptions of eight new species, *Oriental Ins.*, **11** (4) : 623-638.
- GUPTA, S. K. New species of the genus *Iphiseius* Berlese and *Paraamblyseius* Muma from India (Acarina : Phytoseiidae). *Ent. Mon. Mag.*, (In press).
- KOCH, C. L. 1838. *Deut Crust.*, *Myr. Arach.*, fase. 20.
- MEYER, M. K. P., LOOTS, G. C., PLETZEN, R. VAN., ENGELBRECHT, C. M. AND WALKER, JANE B. 1973. Acari of the Ethiopian region, *Dept. of agr., Republic S. Afr. Entomology Memoir*, No. 29 : 1-19.
- NAGESHA CHANDRA, B. K. AND CHANNABASAVANNA, G. P. 1974. Faunistic study of false spider mites (Acarina : Tenuipalpidae) of India, *IV Int. Congr. Acarology, Austria* (Abstract)
- PRASAD, V 1974. *A catalogue of mites of India*, (Indira Acarology Publishing House) Ludhiana (Punjab). 320 pp.
- SMILEY, R. L. 1975. A generic revision of the mites of the family Cunaxidae (Acarina), *Ann. Ent. Soc. America*, **68** (2) : 227-244.

ON FRESHWATER MOLLUSCS OF ANDAMAN AND NICOBAR ISLANDS

By

N. V. SUBBA RAO, A. K. DAS* AND S. C. MITRA

Zoological Survey of India, Calcutta

(With 4 Plates)

INTRODUCTION

Andaman and Nicobar Islands had been frequently explored in the past for marine fauna. There is very little information on the freshwater fauna, specially molluscs. Mörch (1872) in his Catalogue mentioned about 15 species of freshwater molluscs belonging to families Thairiidae, Neritidae and Cyrenidae (=Corbiculidae). Preston (1908, 1915) described five new species and his account included 34 species (including varieties) reported from these Islands.

Knowledge of freshwater molluscs is all the more essential as they serve as intermediate hosts for many helminth parasites. It has become more pertinent as wealth of livestock in the Islands is being improved.

Keys are provided to genera and species, as an aid to identification. Freshwater molluscs are variable in their shell characters and identifications based on shell morphology alone cannot be completely relied upon. Measurement (in mm.) are given for the largest, medium and smallest specimen of each species.

Freshwater habitats are scarce in the Islands. Stagnant freshwater pools are found in certain Islands of Andaman group and in Great Nicobar. There are perennial streams and rivers in Middle Andaman and Great Nicobar Islands. In general there are more streams than stagnant water ponds. As a result, the stream inhabiting freshwater forms belonging to Thairiidae and Neritidae are of common occurrence.

2. *List of Species*

Class GASTROPODA

Order ARCHEOGASTROPODA

Family NERITIDAE

1, *Neritina (Neritina) pulligera* (Linnaeus)

* Zoological Survey of India, Andaman and Nicobar Regional Station, Port Blair.

2. *N. (Vittina) variegata* Lesson
3. *N. (Vittina) turrita* (Gmelin)
4. *N. (Neripteron) auriculata* Lamarck
5. *Clithon corona* (Linnaeus)
6. *C. bicolor* (Recluz)
7. *Neritodryas subsulcata* (Sowerby)
8. *N. cornea* (Linnaeus)
9. *Septaria lineata* (Lamarck)
10. *Septaria porcellana* (Linnaeus)

Order 'MESOGASTROPODA

Family PILIDAE

- 11. *Pila scutata* (Mousson) subsp. *compacta* (Reeve)

Family VIVIPARIDAE

- 12. *Bellamya bengalensis* f. *typica* (Lamarck)

Family HYDROBIIDAE

- 13. *Digoniostoma pulchella* (Benson)
 14. *Stenothyra hungerfordiana* Nevill

Family THIARIIDAE (Melaniidae)

15. *Brotia fuscata* Born
- *16. *Faunus ater* (Linnaeus)
- *17. *Thiara cybele amara* (Mörch)
- *18. *T. (Radina) hastula subacutissima* Nevill
- *19. *T. (R.) zeleborii* (Brot)
T. (R.) zeleborri nana Nevill
T. (R.) zeleborri solidiuscula Nevill
20. *T. scabra* (Müller)
21. *T. amarula* (Linnaeus)
- *22. *Melanoides tuberculatus* (Müller)
23. *M. charon* (Preston)
24. *M. expatriata* (Preston)

- 25. *M. multistriata* (Preston)
- 26. *M. subluatosa* (Nevill)
- 27. *M. turricula* (Lea)
- 28. *M. nevilli* (Brot)
- 29. *M. nevilli andamanica* (Reeve)
- 30. *M. nicobarica* (Reeve)
- 31. *M. punctata* (Lamarck)
- 32. *M. granifera pergranosa* Nevill
- 33. *M. torulosa* (Bruguere)
- 34. *M. crebra* (Lea)
- 35. *M. rivularis* (Philippi)
- 36. *M. fontinalis* (Philippi)
- 37. *M. tigrina raoi* Ray
- 38. *M. prashadi* Ray
- 39. *M. semigranosus* (v.d. Busch)

Order BASOMMATOPHORA

Family LYMNAEIDAE

- 40. *Lymnaea ovalis* Gray
- 41. *L. acuminata* f. *rufescens* Gray
- 42. *L. luteola* f. *typica* (Lamarck)

Family PLANORBIDAE

- 43. *Indoplanorbis exustus* (Deshayes)
- 44. *Gyraulus convexiusculus* (Hutton)
- 45. *Segmentina taia* Annandale & Rao

Class BIVALVIA

Order EULAMELLIBRANCHIATA

Family UNIONIDAE

- 46. *Pseudodon (Pseudodon) nicobaricus* (Mörch)

* denotes species not studied by us.

••denotes species recorded for the first time.

Family CORBICULIDAE

47. *Geloina galathea* (Mörch)48. *G. siamica* Prime49. *Batissa inflata* Prime50. *B. similis* Prime

Family SOLENIDAE

51. *Novaculina andamanensis* Preston

Key to the families

1. Shell operculate	...	...	...	2	
— Shell non-operculate	...	...	...	6	
2. Shell small to moderate size, thick, solid, subglobular or subpatelliform, variously sculptured or with spiny outgrowth, aperture 'D' shaped	...	...	...		Neritidae
— Shell small to large, globosely conical fusiform or turretted, aperture ovate, surface usually with bands or smooth or with tubercles or spines	...	...	...	3	
3. Shell large globosely inflated, aperture large, operculum usually calcified and concentric	...				Pilidae
— Shell small to medium size, conical, fusiform or turretted, aperture ovate, operculum multispiral, surface smooth, with or without bands or with nodules or spines	...	...	...	4	
4. Shell of moderate size, smooth, with or without bands, narrowly perforate or imperforate, aperture orbicular, found in stagnant waters	...	...	...		Viviparidae
— Shell small, fusiform or elongately turretted, operculum horny usually spirally whorled, very narrowly perforate or imperforate	...			5	
5. Shell small, corneous, fusiform with small oval aperture, operculum horny, spirally-whorled, sometimes with thickened peristome, usually occur in stagnant waters, sometimes in estuarine waters also	...				Hydrobiidae
— Shell elongately turretted, usually many whorled often with varied sculptures - spines or tubercles, sometimes rather smooth with roundish appearance, aperture ovate, usually angular below ; usually found in streams	...				Thiariidae

6. Shell thin, smooth, polished and ovate, spire elevated and pointed, 'body whorl' large, columella twisted Lymnaeidae

- Shell discoidally flattened, quite often disc-shaped, spire very rarely raised Planorbidae

Pelecypoda

Shell thick and massive, trigonal or roundly ovate, with coarse spiral striations, umbones often eroded Corbiculidae

- Shell transversely elongate, more or less gaping at both ends, umbones not prominent, external ligament on an elongate ridge Solenidae

SYSTEMATIC ACCOUNT

Class GASTROPODA

Order ARCHAEOGASTROPODA

Family NERITIDAE

The family Neritidae was dealt in detail by Subba Rao (1975). He reported 4 genera and 9 species from the streams in these Islands.

Key to the genera

1. Shell symmetrical cap-like, without whorls, small apex, very wide aperture ; operculum squarish, not closing the aperture and without apophyses *Septaria*
- Shell asymmetrical, with one or more spiral whorls, aperture comparatively small, operculum semicircular with two apophyses at the posterior end, closing the aperture completely 2
2. Shell small, pea-shaped, surface more or less coarsely striated with growth lines, some with spines, radula with anteriorly expanded central, supported by an extra lamella from the centre of the base *Clithon*
- Shell generally large, generally smooth and shining or with very fine striae but never with spines 3
3. Operculum with longitudinally grooved rib, ridges ending in finger-like projections at the free end ; inner marginal teeth of radula with a few denticles (2-4) *Neritodryas*
- Rib of operculum not grooved ; inner marginal teeth of radula with several denticles along the cutting edge *Neritina*

Genus *Neritina* Lamarck, 1816

Neritina Lamarck, 1816, *Encycl. Method. Vers.*, 2, pl. 155

Type species : by subsequent designation *Nerita pulligera* Linnaeus, Children, 1823.

The genus has a very wide distribution occurring in the streams in Asia, Africa, America and Australia. The genus is reported by about 70 species in all, but 4 species are so far recorded from these Islands.

Subgenus *Neritina* S.St.*Neritina* (*Neritina*) *pulligera* Linnaeus

(Pl. I fig. 1)

Nerita pulligera Linnaeus 1767, *Syst. Nat.* ed. 12, p. 1253, no. 726. Type-locality : "Rivers of India".

Neritina pulligera Linnaeus : van Benthem Jutting 1956 *Treubia*, 23 (3) : 307, fig. 24.

Material examined.—102 ex. from Cholung range : Jikra-Dhani Kari stream near Manglutan : Rangat river : streams near Baratang ; Port Blair — Andamans. Streams near Champion village, Nan Cowry Island and Ramjao village, Kamorta Islands in Nicobars.

Distribution.—Common in Andaman and Nicobar Islands. On the mainland India it was reported from Coleroon river, South India (Subba Rao, 1975). Elsewhere : Thailand, Indonesia, North western Australia, Celebes, New Guinea, New Caledonia, Fiji Island, Philippines and Japan.

Remarks.—The collection exhibits uniformity in the shape of the shell and colouration. The shell is orbicularly ovate with an expanded aperture. Columellar callus is bluish black on the outer half, gradually fading to the inner half. A deep orange band runs on the inner margin of outer lip.

Egg capsules were seen over the surface of shells from January to May.

Measurements (in mm.).—

	Length	Width	Height of the aperture
Smallest (Ramjao)	9.05	7.20	5.00
Medium (Port Blair)	29.25	20.55	14.40
Largest (Kachal)	41.60	31.20	25.60

Subgenus *Vittina* Baker, 1923

Neritena (*Vittina*) *variegata* Lesson, 1831

(Pl. I fig. 2)

Neritina variegata Lesson 1831, *Voy Coquille Zool.* 2 : 378. Type-locality : New Ireland.

Neritina variegata Lesson : van Benthem Jutting 1956, *Treubia*, 23 (2) : 305, fig. 29.

Material examined.—250 ex. Andaman and Nicobar Islands.

Distribution.—It is not known to occur on the mainland India. It was reported earlier from Nicobar Islands but it is a first record from Andaman Islands. Elsewhere : Indonesia ; Australia, Queensland to North western Australia ; New-Calenodia, New Guinea, New Ireland Samoa, Fiji, Tahiti and Philippines.

Remarks.—The animals were found adhering to stones and other solid substrata in running freshwater streams, showing preference for strong current.

The species exhibits much polymorphism. All kinds of shells banded, spotted or reticulated are represented in the collection. The orange spot on the columellar callus is absent in some specimens. In some the apices were eroded.

Measurements.—

	Length	Width	Height of the aperture
Smallest (Wright myo)	3.90	3.05	1.90
Medium (Baratang)	18.65	13.60	10.00
Largest (Jirkatang)	27.90	21.05	19.20

Neritina (*Vittina*) *turrita* (Gmelin, 1791)

(Pl. I figs. 3 & 4)

Nerita turrita Gmelin, 1791, *Syst. Nat.*, ed 13 : 3686, no. 71. Type-locality : Islands of Antilles.

Neritina turrita Lamarck ; van Benthem Jutting, 1956, *Treubia* 23 (2) 302, fig. 23.

Material examined.—3 ex. Kamorta Island and Passa bridge, Car Nicobar.

Distribution.—The species was reported for the first time from Nicobar Islands (Subba Rao, 1975). Elsewhere : Indonesia, Moluccas, New Guinea, Marianas, Carolines and Philippines.

Remarks.—The habitat of the species in Kamorta is not known but in Car Nicobar, it was collected from back waters.

It is variable in colour pattern. Basing on this von Martens (1879) distinguished three varieties viz : *Neritina strigilata* Lamarck, *Neritina seciconica* Lamarck and *Neritina cumingiana* Recluz. The present material includes the variety *strigilata* characterised by black, oblique spiral stripes and *semiconica* distinguished by three transverse bands of black spots.

Measurements.—

	Length	Width	Height of the aperture
Smallest (Passa bridge)	11.80	7.85	5.80
Medium (Kamorta)	23.25	15.00	11.35
Large (Kamorta)	31.60	20.25	16.55

Subgenus *Neripteron*

Neritina (*Neripteron*) *auriculata* Lamarck, 1816

Neritina auriculata Lamarck, 1817 *Encycl. Meth. Explic. Planches*, pl. 55, fig. 6. Type-locality : New Holland.

Neritina auriculata Lamarck : van Benthem Jutting, 1956, *Treubia*, 23 (2): 297, fig. 22.

Material examined.—1 ex. stream near Forest Department Camp office, East coast of Smith Islands, North Andamans; 1 ex.; Daring Village, Camorta Islands; 2 ex. Stream near Passa village, Car Nicobar.

Distribution.—Subba Rao (1975) reported it for the first time from Porto Novo, Andaman and Nicobar Islands. Elsewhere : Madagascar, Sri Lanka, Indonesia, Moluccas, New Ireland, Australia; New Caledonia, Philippines.

Remarks.—The shell is semiglobular with wide aperture and a well-developed columellar callus. Peristome is broad and produced into two “auricles” or “wings” at the upper and lower columellar sides.

The species is known for its variation in the development of “auricles”. But the two specimens in our collections show moderate growth of auricles.

Measurements.—

	Length	Width	Height of the aperture
Medium	11.05	7.95	6.40
Smallest	4.85	4.20	3.35

Genus *Neritodryas* von Martens, 1869

Neritodryas von Martens, 1869, *Sitzungsberichtser Gasellschaft naturforschender Freunde in Berlin*, p. 21 Type species : *Nerita cornea* Linnaeus.

Members of this genus generally occur by the sides of streams. It occurs in tropical freshwater streams of Asia.

It is represented by four species in all, of which two species namely, *N. cornea* and *N. subsulcata* are reported from the Islands. Recent collections by the senior author include only the latter species. The former is represented by two specimens in the old collections.

***Neritodryas subsulcata* (Sowerby, 1836)**

(Pl. I fig. 6)

Neritina subsulcata Sowerby, 1836, *Conch. Illustr.*, no. 50, figs. 50. Type-locality : Philippine Islands.

Neritodryas subsulcata Sowerby, van Benthem Jutting, 1956, *Treubia*, 23 (2) : 294, fig. 18.

Material examined.—24 ex., Stream near Ramjao village, Kamorta ; Creeks in Kachal ; Stream near Chiriatapu, South Andamans.

Distribution.— Andaman and Nicobar Islands. Elsewhere : Indonesia ; Moluccas ; New Hebrides ; Fiji and the Philippines.

Remarks.—The species is characterised by a semiglobular shell with conspicuous and raised broad spiral ribs, crossed by fine longitudinal striations. Aperture is bluish-white with diffused black penetrating from the outer margin of columellar callus.

It was found feeding on the algae on damp stones by the side of freshwater streams.

'Measurements.—

	Length	Width	Height of the aperture
Smallest	13.00	9.00	8.05
Medium	30.00	21.25	27.05
Largest	39.50	30.00	24.50

***Neritodryas cornea* (Linnaeus)**

Nerita cornea Linnaeus, 1758, *Syst. Nat.* ed. 10 : 777

Neritodryas cornea Linnaeus ; Benthem Jutting 1956, *Treubia*, 23 (2) : 291 figs. 2, 16.

Material examined.— 2 specimens from “Kachal” in the old collections of National Zoological Collections.

Distributions.—From Nicobar Islands to New Caledonia including the Malay Archipelago, the Philippines and Fiji.

Remarks.—It can be distinguished from the above species by its superficial spiral grooves and black spiral bands. Columellar callus is either white or yellow.

According to van Benthem Jutting (1956) it is a brackish water species and occurs in mangrove regions. As such it may not be a primary freshwater species.

Genus *Clithon* Montfort, 1810

Clithon Montfort, 1810, *Conch. Syst.*, 2 : 326 Type species : *Nerita corona* Linnaeus.

Clithon corona (Linnaeus, 1758)

(Pl. I fig. 8)

Nerita cornona Linnaeus, 1758, *Syst. Nat.* ed. 10 : 777. Type-locality : Rivers of Asia.

Clithon corona (Linnaeus) van Benthem Jutting, 1956 *Treubia*, 23 (2) : 225.

Material examined.— 405 ex. All from Andaman Islands.

Distribution — Andaman and Nicobar Islands to Melanesia and north to the Philippines.

This is a first record from Andaman Islands.

Remarks.—It is strongly polymorphic. A single population showing variation contained specimens with spires of varying heights and colouration. The shouldering of the body whorl and the development of spines were also variable. The spined and spineless forms were found occupying the same habitat.

Measurements.—

	Length	Width	Height of the aperture
Smallest (Port Blair)	6.40	4.65	2.95
Medium ,,	13.40	10.25	8.15
Largest ,,	20.00	14.70	10.90

Clithon bicolor (Recluz, 1842)

(Pl. I fig. 7)

Nerita bicolor Recluz, 1842, *Proc. Zool. Soc. Lond* p. 172. Type-locality : Agoo (in a mountain stream), Philippines.

Theodoxus (*Clithon*) *bicolor* (Recluz) : Ray 1947, *Rec. Indian Mus.*, 45 (4) : 308.

Clithon bicolor (Recluz) : van Benthem Jutting, 1956, *Treubia*, 23 (2) : 272, fig. 5.

Material examined.—232 ex. All from Andamans.

Distribution.—Andmans ; Indonesia ; the Philippines and Formosa.

Remarks.—The shell is generally olive green or olive-brown with small dark squares and the spire is more produced than in the preceding species.

It is generally found in fresh and running waters sticking to small stones and pebbles.

Measurements.—

	Length	Width	Height of the aperture
Smallest	11.25	9.00	8.20
Medium	17.25	15.00	13.15
Largest	19.65	16.90	14.85

Genus *Septaria* Ferussac, 1807.

Septaria Ferussac, 1807, *Essai d'une meth. Conch.*, p. 61 Type species : *Patella borbonica* Bory de St. Vincent, 1803.

In this genus the shell assumes a more open limpet-like form. The spire which has a simple convoluted form in other genera is transformed into a simple nucleus of the spire with the apex inflected into the form of a beak. The columellar callus is transformed into a septum or shelf. The operculum is very much reduced when compared to the size of the aperture and do not close it.

Distribution.—It is common in tropical regions of Madagascar, Comoros, Seychelles, Mauritius, Reunion Islands, India, Sri Lanka, Malay Archipelago, the Philippines and many Pacific Islands.

The genus is represented by 24 species in the Indo-Pacific region. The following two species are known from the Islands.

Septaria lineata (Lamarck, 1816)

(Pl. I fig. 9)

Navicella lineata Lamarck, *Encycl. Meth. Vers. Explic. Planches.*, pl. 456, fig. 2, Type-locality : Not known.

Septaria lineata (Lamarck) : van Benthem Jutting, 1956, *Terubia*, **23** (2) : 317, fig. 4 and 33.

Material examined.—44 ex. Port Blair and Great Nicobars.

Distribution.—India : West Bengal, Calcutta ; Tamilnadu, Porto Novo and Andaman & Nicobar Islands. Elsewhere : Sri Lanka ; Indonesia ; New Guinea ; the Philippines and Fiji.

Remarks.—The shell varies in shape depending on the nature of substratum. It shows considerable colour variation also.

Measurements.—

	Length	Width	Height of the the aperture	Width of Septum
Smallest (Great Nicobar)	12.70	8.20	10.50	2.20
Medium (Port Blair)	24.70	15.25	18.05	4.60
Largest (Great Nicobar)	37.55	26.45	30.15	7.40

Septaria porcellana (Linnaeus, 1758)

(Pl. II fig. 1)

Patella porcellana Linnaeus 1758, *Syst. Nat.* ed. 10 : 781. Type-locality : "O. Indiae".

Septaria porcellana Linnaeus ; van Benthem Jutting, 1956, *Treubia*, **23** (2) : 315, fig. 31.

Material examined.—88 ex. Andamans.

Distribution.—Andaman and Nicobar Islands. Elsewhere : Sri Lanka ; Singapore ; Indonesia ; New Guinea ; New Caledonia ; Samoa Archipelago ; Tahiti and the Philippines.

Remarks.—The collection does not show much variation in the shell structure. The colour pattern, however, shows variation. The meshes of the colour network may be wide or narrow, some times coalescing or appearing as zigzag markings or triangular radiating marks.

Some shells are found with egg capsules over them.

Measurements.—

	Length	Width	Height of the aperture	Width of septum
Smallest	15.40	10.60	11.05	2.40
Medium	24.20	17.55	18.30	2.70
Largest	28.30	21.15	21.05	4.25

Order MESOGASTROPODA

Family PILIDAE

Genus *Pila* (Bolten) Roding, 1798

Pila Bolten, 1798, *Mus. Bolten.* p. 145 Type species *Helix ampullacea* Linnaeus.

It is very common in the freshwater ponds and pools of the mainland India, but in the islands it is rare. In general it is distributed in the tropical regions of Africa and Asia.

Only one species is known from these Islands.

Pila scutata compacta (Reeve), 1856

(Pl. II fig. 2)

Ampullaria compacta Reeve, 1856, *Conch, Icon.* 10.

Ampullaria, pl. XIV, fig. 62, pl. XV, fig. 71. Type-locality Malacca.

Pila conica (Gray), var. *compacta* (Reeve), Prashad 1925, *Mem. Indian Mus.*, 3 : 79, pl. XV, figs. 9, 10.

Material examined.—Two ex., Port Blair.

Distribution.—The typical form is widely distributed extending from Burma to Celebes and north to the Philippines. It is not found in Moluccas or New Guinea (van Benthem Jutting, 1956).

Hitherto, the subsp. *compacta* (Reeve) was known from Burma only. It is recorded for the first time from Andaman and Nicobar Islands and thus its range extends further westwards.

Remarks.—Hitherto, the species was known as *Pila conica* (Gray, 1828). But as the specific name is preoccupied by *Ampullaria conica* Lamarck, 1804, for a fossil french shell the immediately available name *Pila scutata* (Mousson) is used.

Prashad (1925) gave good figures and description of this subspecies.

Measurements.—

Length 40.00 Width 40.00 Height of aperture 30. 90.

Family VIVIPARIDAE

The representatives of this family are exclusively freshwater forms and none are found in marine and brackish waters. The family is very widely distributed with the exception of South America. Prashad (1928) made a detailed study of the zoogeographical distribution of the family.

Recent authors are more inclined to distinguish the family into two subfamilies Viviparinae and Bellamyinae. Representatives of the former are found in Europe, Asia Minor, northern Asia and North America, while that of the latter are distributed in Africa, tropical Asia and Australia. Accordingly all those species from Africa and South and East Asia and Australia which were formerly placed in the genus *Viviparus* Montfort, 1810 are now accommodated in the genus *Bellamyia* Jousseume, 1886.

We accept the above contention and hence treat the species under the genus *Bellamyia*. It is represented by a single species in the islands.

Genus *Bellamyia* Jousseume, 1886*Bellamyia bengalensis* form *typica* (Lamarck)

(Pl. I fig. 5)

Paludina bengalensis Lamarck, 1822, *Hist. nat. Anim. sans. Vert.*, 6 (2) : 174.

Viviparus bengalensis race *bengalensis* : Annandale & Rao, 1921, *Rec. Indian Mus*, 22 : 270, pl. 1, figs. 1-3.

Material.—12 ex., Andamans (Coll. G. H. Booley).

Distribution.—Common throughout India, Bangladesh, Burma and Sri Lanka.

Remarks.—No recent collections of this species have been made.

Measurements :

Largest Length 32.20 Width 23.40 Height of the aperture 15.70.

Family HYDROBIIDAE

The representatives of the family are more common in brackish water with a few species extending into freshwater. Like the family

Viviparidae, it is also very widely distributed. It is represented by two genera, including one species each.

Genus **Digoniostoma** Annandale, 1920

Digoniostoma Annandale, 1920, *Ind. J. Med. Research*, VIII, p. 104 Type species : *Digoniostoma cerameopoma* (Benson).

Digoniostoma pulchella (Benson)

Paludina pulchella Benson, 1836, *J. Asiat. Soc. Beng.*, 5 : 746, (Refers to No. 1 *Valvata* ? Hutton, *J. Asiat. Soc. Beng.* 3 : 90 (Type-locality : Mirjapore).

Digoniostoma pulchella (Benson) ; Ray & Mukherjee, 1963, *Rec. zool. Surv. India*, 61 : 418, pl. 18, figs. 8, 8a.

Material.—Five ex., Magar Nallah, Great Nicobar, July, 1976. (Coll. Sharma Deorani).

Distribution.—Very widely distributed in Mainland India. It is recorded for the first time from the Andaman & Nicobar Islands.

Genus **Stenothyra** Benson, 1856

Stenothyra Benson, 1856, *Ann. Mag. nat. Hist.*, (2) 17 : 469 Type species : *Stenothyra deltae* Benson.

Stenothyra hungerfordiana Nevill

Stenothyra hungerfordiana, 1880, Nevill, *J. Asiat. Soc. Beng.*, 49 (2) 159. Type-locality : Andamans ; 1881 Nevill, *J. Asiat. Soc. Beng.*, 50 : 156, pl. 7, fig. 9 ; Prashed, 1921, *Rec. Indian Mus.*, 22 : 127.

Material.—1 ex. Andamans (Coll. F. Stoliczka).

Distribution.—This species is so far known from Andamans only.

Measurements.—

Length 2.70 Width 1.30 Height of the aperture 0.75.

Family **THIARIIDAE**

The family has very wide distribution extending to temperate, subtropical and tropical regions of the world.

In the islands members of this family show a preference for slow-moving streams. Some representatives of the genus *Melanoides* particularly *M. nicobaricus* (Reeve), are even found in stagnant freshwater

pools. Qualitatively and quantitatively this family is more represented than the other families.

Key to the genera

1. Operculum multispiral, nucleus central, shell with longer spire in relation to the body whorl (ratio of height of the shell to height of aperture 3 : 1) *Brotia*.
- Operculum few-whorled, nucleus at basal side, shell more turretted and more sculptured ... 2
2. Shell pagoda-like with spire descending in regular steps ; often with spines or sharp nodules *Thiara*.
- Shell more elongated with evenly descending spire, surface of the shell variously ornamented but never with spines or sharp nodules *Melanoides*.

Genus *Brotia* H. Adams, 1866

Brotia H. Adams., 1866, *Proc. zool. Soc. London*, p. 150

***Brotia fuscata* (Born)**

(Pl. II fig. 8)

Helix fuscata Born, 1780, *Test Vindob*, p. 390.

Tiara (Radina) fuscata Preston, 1915, *Fauna Brit. India. Mollusca, Fresh-water Gastropoda & Pelecypoda*, p. 13.

Material.—(i) Four ex. Nicobars (Coll. ?) (ii) 12 ex. Natural freshwater springs near Ramjao, Camorta, 20. 3. 72 (Coll. A. G. K. Menon & Party).

Distribution.—Nicobars. Elsewhere : Fiji.

Measurements.—

Largest	Length 4.50	Width 11.50	13.75

Genus *Thiara* Röding, 1798

Thiara Röding, 1798, *Museum Boltenianum*, 2 : 109. Type species : *Helix amarula* Linnaeus.

Key to the species

1. Shell large and thick, usually black or dark olive-brown, smooth. Zone between suture and crown of spines little sloping ... *amarula*.

- Shells thinner and smaller, spines on the
axial whorls generally sharp no thick ridge
along the suture *scabra*

***Thiara scabra* (Müller)**

(Pl. II fig. 3)

Buccinum scabrum Müller, 1774, *Hist. Verm. Terr. Fluv.* 2 : 136. Type-locality : Tranquebar.

Thiara scabra Benthem Jutting, 1956, *Treubia*, 23 (2) : 393-397, figs. 72 & 88.

Material.—(i) Four ex., Andamans (Coll. ?). (ii) 40 ex., On the underside of rotting leaves in weedy pools with muddy bottom in the course of a stream near Rangat Camp, M. Andaman, 25. 12. 34 (Coll. H. S. Rao)

Distribution.—Widely distributed throughout India. *Elsewhere* : Indonesia ; Java, Timor ; Seychelles ; Mauritius.

***Thiara amarula* (Linnaeus)**

(Pl. III figs. 7 & 8)

Helix amarula Linnaeus 1758, *Syst. Nat.* Ed. 10 : 774. Type-locality : "Asiae".

Thiara amarula Benthem Jutting, 1956, *Treubia*, 23 (2) : 387-89, fig. 82.

Material.—Two ex., (Great Nicobars (Coll. ?) Reg. No. M 1325.

Distribution.—India : Nicobar Islands. Elsewhere : Mauritius, Indonesia, Philippines, Fiji, New Caledonia.

Measurements.—

Largest Length 31.30 Width 17.15 Height of the aperture 20-15.

Remarks.—No recent collections were made. Preston (1915) reported *Thiara cybele* var *amara* (Morch), which perhaps may belong to this species.

Genus *Melanoides* Olivier, 1807

Melanoides Olivier, 1807, *Voyage à l'Emp. Ottoman*, 2 : 40. Type species : *Nerita tuberculata* Muller.

Key to the species in Andaman & Nicobar Islands.

1. Nodules, spiral/longitudinal ridges more or
less uniformly present throughout ... 2

- Sculpture absent or consists of irregular microscopic striae, or spiral/longitudinal ridges, not uniform throughout the shell ... 6
- 2. Shell thick nodules present throughout the surface 3
- Spiral/longitudinal ridges or ribbings uniformly present 4
- 3. Shell rather small, nodules equally strong throughout *granifera* subsp. *pergranosa*
- Shell large, nodules along suture stronger than those on other parts, below the periphery nodules weak *torulosa*
- 4. Shell straw coloured, prominent vartical ribbings give the shell a coarse appearance. Often irregular brownish blotches or streaks present *crebra*
- Spiral grooves more prominent, fine sculpture uniform throughout 5
- 5. Shell dark brown, strong spiral striae present, sutures deep incised, whorls nearly flat, aperture proportionately small *multistriata*
- Shell elongately pointed, spiral grooves uniform on upper whorls, on lower whorls grooves present only on lower parts (above the sutures) *nevilli*
- 6. Sculpture consists of spiral or longitudinal ribbings or ridges prominent only on upper whorls 7
- Shell smooth or with irregular microscopic striae 9
- 7. Shell rather fusiform, upper whorls conspicuously vertically ribbed, rest of the shell more or less smooth *punctata*
- Shell with upper whorls spirally grooved ... 8
- 8. Shell rather thin of moderate size pale-olive, spiral grooves on lower part (above the suture of upper whorls) *tigrinus* subsp. *raoi*
- Shell moderately thick, larger, blackish brown, spiral grooves present on upper whorls, very often infra-sutural ridge present on body whorl *nicobarica*
- 9. Shell thick, elongate, brownish black, growth-lines prominent, faint spiral sculpture present, columella extends to form a slight callus ... *charon*
- Shell smaller, thick brownish, faint irregular spiral striae present *fontinalis*

Melanoides charon (Preston)

(Pl. II fig 7)

Thiara (Radina) charon Preston, 1908, *Rec. Indian Mus.*, 2 : 196, pl. 15, fig. 22 (Type-locality — Andaman Island).

Material.—One ex. (Holotype)—Andamans (Coll. ?).

Distribution.—So far known from Andaman Islands.

Measurements.—

Length 48.70	Width 11.20	Height of the aperture 13.00

Remarks.—After Preston's (1908) original description, this species has not been collected. It may actually belong to the genus *Brotia* and may turn out to be a synonym of already known species. However, for want of sufficient material we are retaining it as originally designated by the author.

Melanoides expatriata (Preston)

(Pl. II fig. 5)

Melania expatriata Preston, 1908, *Rec. Indian Mus.*, 2 : 196, pl. 15, fig. 23 (Type-locality : Andaman Island).

Material.—1 ex. (Holotype), Andamans (Coll. ?).

Distribution.—So far known from Andaman Islands only.

Measurements.—

Length 32.35	Width 11.35	Height of the aperture 10.80

Remarks.—The specimen studied by Preston (1908) is the only representative from the islands. Except for its decollation it resembles *M. nicobaricus* and can be considered as synonymous with the latter.

Melanoides multistriata (Preston)

(Pl. III fig. 2)

Tiara (Radina) multistriata Preston, 1908, *Rec. Indian Mus.*, 2 : 196, pl. 15, fig. 24 (Type-locality : Andaman Islands).

Distribution.—One (decollated - Holotype) Andamans (Coll. ?).

Material.—So far recorded from Andamans only.

Measurements.—

Length 25.70 (Decollated), Width 9.80 Height of the aperture 10.26

Remarks.—As in the case of preceding two species this is also known by its type only, and none of these has been recorded by any one after Preston (1908, 1915).

Melanoides nevillei (Brot)

(Pl. II fig. 9)

Melania nevillei Brot, 1874, *Conch. Cab.*, 11, pl. 22, fig. 13.

Material.—6 ex., Andamans, Coll. (?).

Distribution.—This species seems to be restricted to Andaman Islands. Elsewhere : Tahiti.

Measurements.—

Length 25.85 Width 7.80 Height of the aperture 7.70

Melanoides nevillei andamanica (Nevill)

(Pl. II fig. 4)

Melania (Striatella) nevillei var. *andamanica*, Nevill, 1884, *Hand list, Moll. Indian Mus.*, 2 : 236 (Type locality — Andaman).

Material.— (1) One ex. Andaman (Coll. ?) Type.
(2) 40 ex. Andaman (Coll. ?).

Distribution.— So far known from Andamans only.

Remarks.—Differs from the Typical form in having uniform sculpture throughout the shell.

Measurements.—

Length 30.60 Width 9.70 Height of the aperture 9.70

Melanoides nicobarica (Reeve)

(Pl. II fig. 10)

Melania nicobarica Reeve, 1859, *Conch. Icon.*, 12, pl. 10, fig. 54 (Type-locality : Nicobars).

Material.— (1) Seven ex., Magar Nallah, Great Nicobar, July, 1976 (Coll. *Sharma Deorani*).

(2) Six ex. Nicobar, (Coll. ?). (3) 15 ex. Andamans. Coll. (?).

Distribution.—Originally describe from Nicobars, subsequently recorded from Andamans Islands.

Remarks.—It is characterised by possessing smooth polished shells with spiral striae on upper whorls, often with an infrasutural ridge on body whorl.

Measurements. —	Length	Width	Height of the aperture
Largest	47.20	14.95	14.25

Melanoides (Radina) punctata (Lamarck)

(Pl. II fig. 11)

Melania punctata Lamarck, 1822, *Hist. Nat. Anim. Sans vert.*, 6 : 165.

Melanoides punctata (Lamarck) : van Benthem Jitting, 1956, *Treubia*, 23 (2): 418 - 20, fig. 97.

Material.—(i) 12 ex. Nicobar, (Coll. ?). (ii) 95 ex. from rock pools in the course of a stream on the east coast of Interview Island, N. Andaman, 26.xii.1933 (Coll. *H. S. Rao*).

Distribution.—In India it is known to occur in the Nicobar Island only. Elsewhere Dutch East Indies, Australia, Philippines Caroline Islands, New Caledonia.

Remarks.—The shells show variations in colour, shape and size. However usually they are yellowish brown with sharply pointed spire and longitudinal ribbings on the apical whorls.

Measurements. —	Length	Width	Height of the aperture
Medium	39.65	12.35	11.45

Melanoides granifera pergranosa Nevill

(Pl. III fig. 1)

Melonia (Tarebia) lineata subvar, *pergranosa* Nevill, 1877 *Hand list Moll. India Mus.*, pt. 11 : 277.

Material.—(1) 23 ex. Janglighat farm, S. Andamans, (Coll. *Head of Entomology Div., I.A.R.I., New Delhi*).

Distribution.—India : West Bengal and Andaman Islands. Elsewhere : Burma.

Measurements.—

Length 15.30 Width 7.50 Height of the aperture 7.50

Melanoides torulosa (Bruguiere)

(Pl. II fig. 6)

Bulimus torulosa Bruguiere, 1789, *Encyl. Meth. Verm.*, 1 : 332.

Tiara (Radina) crunulata Preston, 1915, *Fauna Brit. India* (Freshwater Gastropoda and Pelecypoda), p. 11.

Melanoides torulosa (Bruguiere) van Benthem Jutting, 1956, *Treubia*, 23 (2) : 410, fig. 92.

Material.—(1) Two ex. Andamrns. (Don. *F. A. de Roepstorff*).

Distribution.—Andamans, Vizagapatnam, Andhra Pradesh. Elsewhere : Burma, Sri Lanka, Malaysian Islands, Solomon Islands and Philippines.

Measurements.—Largest specimen

Length 42.95 Width 12.90 Height of the aperture 16.20

Remarks.—Seshaiya (1940) studied the breeding of these species.

Melanoides crebra (Lea).

(Pl. III fig. 5)

Melania crebra Lea, 1850, *Proc. zool. Soc., Lond.*, p. 193,

Material.—(i) 10 ex., S. Andamans (Coll. ?) (ii) 25 ex. In weedy pools with muddy bottom in the course of a stream near Ramgat Camp, M. Andaman, 25.3.34. (Coll. *H. S. Rao*), (iii) 10 ex. Magar Nallah, Great Nicobar, July, 1976 (Coll. *Sharma Deorani*).

Distribution.—Andamans and Nicobar Islands ; Philippines ; Prepara Island, Bay of Bengal (Preston).

Remarks.—The shells are characterised by a coarse sculpture of crisscrossing spiral and vertical ridges throughout.

Measurement.— Length Width Height of the aperture
39.50 11.75 11.45

Melanoides fontinalis (Philippi)

(pl. III fig. 4)

Melania fontinalis Philippi, 1851, *Abbild. und. Beschr. Conchyl.*, 3 : 57-58, pl. 5, fig. 7.

Material.—28 ex. In a small muddy stream near Golpatrar, Buhive Hill, near Long Island, N. Andaman, 24.3.34. (Coll. H. S. Rao).

Distribution.—In India it is restricted to Andamans only.

Eleswhere : Malaysia ; Java ; Burma.

Remarks.—Rather small and narrow shells with rounded whorls, very often encrusted.

<i>Measurement.</i> —	Length	Width	Height of the aperture
Medium	15.80	6.04	5.55

Melanoides tigrina raoi Ray

(Pl. III fig. 3)

Melanoides tigrina (Hutton) var. *raoi* Ray, 1947, *Rec. Indian. Mus.*, 45 : 303-304, lest fig. 1, b. (Type-locality : Port Blair, S. Andaman).

Material.—(i) Two ex. Stream, South west of Golf Course, Aberdeen, Port Blair, 11.2.34 (Coll. H. S. Rao). (ii) 17 ex. Stream, North of coconut plantation, Long Island, M. Andaman, 27.3.34 (Coll. H. S. Rao).

Distribution.—So far known from Andamans only.

Remarks.—Ray (1947) has given detailed description and figures for this species.

Measurements.—

Length	24.85	Width	8.30	Height of the aperture	4.80

Melanoides semigranosa (v.d. Bursch)

Melania semigranosa, v.d. Busch, 1842, in Philippi's *Abbild. Buschr, Conchyl.*, 1 : 2, pl. 1, fig. 13a, b (Type-locality — Java).

Material.—10 ex., In pools in the course of a dry stream near Rangat Camp, M. Andaman, 25.3.34. (Coll. H. S. Rao).

Distribution.—India : Andaman Islands. Elsewhere : Java, Banka, Bali, Sumatra, Borneo, Celebes, Cambodia also Burma.

Remarks.—It was treated as a variety of *M. lineata* by Preston (1915). This species however, differs from it in having broader shells with much more prominent nodules, deeply incised sutures and the spire being much shorter in relation to the body whorls.

Order BASOMMATOPHORA

Family LYMNÆIDAE

Genus *Lymnaea* Lamarck, 1799.

Lymnaea Lamarck, 1799, *Prodr. Nouv. clas. Cog.*, p. 74

Type species : *Lymnaea stagnalis* (Linnaeus) Hubendick, 1951, *Recent Lymnaeidae*, pp. 1-122, pls. 1-5. Text figs. 1-369.

Lymnaea ovalis Gray

(Pl. III fig. 6)

Limnaea (Limnaea) ovalis Gray, 1820, in Sowerby's *Genera Rec. Shells*, pt. 7: *Limnaea*, fig. 4.

Lymnaea acuminata f. *rufescens* Gray

Limnaea rufescens Gray in Sowerby's *Genera of shells*, 1. *Limnaea*, fig. 2.

Limnaea (Pseudosuccinea) acuminata f. *rufescens* Annandale and Rao, 1925, *Rec. Indian Mus.*, 27 : 181, fig. 111.

Material.—Seven ex. Andamans (Coll. ?).

Distribution.—Common throughout India, For Andaman and Nicobar Island it is a new record.

Measurements.—

Length 20.40 Height 12.75 Height of the aperture 15.85

Remarks.—According to Hubendick (1937) it is probably synonym of *L. luteola*.

Material.—14 ex. Andamans (Coll. ?).

Distribution.—Widely distributed in mainland India. It is recorded for the first time from Andaman & Nicobar Islands also. Elsewhere : Bangladesh, Burma and Pakistan.

Measurements.—

Length 32.50 Width 16.70 Height of the aperture 24.25

Remarks.—Hubendick (1951) stated that the name *acuminata* is preoccupied by a fossil species (*acuminata* Brongnial, 1810) and hence should be replaced by *L. auricularia* race *rufesens*.

***Lymnaea luteola* f. *typica* (Lamarck)**

(Pl. III fig. 9)

Limnaea luteola Lamarck, 1822, *Hist. Nat. Anim. sans. vert.*, 6 (2) : 160.
Type-locality : Bengal.

Limnaea (Pseudosuccinea) luteola f. *typica* : Annandale and Rao, 1925, *Rec. Indian Mus.*, 27 : 184

Material.—20 ex. Dhobi line, Atlanta Point, Port Blair, 20.7.78. (Boll. M. Sil).

Distribution.—Common throughout Indian mainland, Sri Lanka, Pakistan, Bangladesh, Burma and Nepal.

Measurements.—

Length 20.50 Width 13.40 Height of the aperture 16.20

Family PLANORBIDAE

Key to the genera

1. Shell relatively large, discoidal with convex whorls and deep sutures, aperture ear-shaped	<i>Indoplanorbis</i>
— Shell minute, very much suppressed, disc-like, whorls nearly flattened 	2
2. Shell paucispiral, whorls rapidly increasing, aperture rather wide 	<i>Gyraulus</i>
— Shell very minute, orbicular, furnished with internal transeverse partitons (marking externally visible) aperture circular 	<i>Segmentina</i>

Genus *Indoplanorbis* Annandale & Prashad, 1920

Indoplanorbis Annandale & Prashad, 1920, *Rec. Indian Mus.*, 22 : 578-580.
Type species : *Planorbis exustus*, Deshayes.

***Indoplanorbis exustus* (Deshayes)**

(Pl. III fig. 10)

Planorbis exustus Deshayes, 1834, *Beleng, Voy. Ind. Orient Zool.*, p. 417, pl. 1, figs. 11-13.

Material.—Six ex., Dairy Farm Port Blair, 20.1.78. (Coll. M. Sil).

Distribution.—This species is for the first time recorded from the Andaman & Nicobar Islands. In mainland it is widely distributed. Elsewhere : Bangladesh, Pakistan, Sri Lanka, Burma, Kalay Peninsula and Archipelago, Thailand, China Tibet and Iran.

Remarks.—The shell is discoidal with convex whorls, it shows considerable variations in general shape. This species is very common and found almost in every freshwater pool of S. Andamans.

Genus *Gyraulus* Charpentier, 1837

Gyraulus "Agassiz" Charpentier, 1837, *Neue Denkschar. sllg. Schreuz, Gesell*, 2(2) : 21 Type species : *Planorbis albus* Muller (Subsequently designated by Dal in 1870).

Gyraulus convexiusculus (Hutton)

Planorbis convexius Hutton, 1850, *J. Asiat. Soc. Beng.*, 18(2) : 657 (Chandahar, in tanks ; Quetta and the Kojuck pass).

Material.—Four ex., Dilthanman. tank, Port Blair, 16.2.78. (Coll. M. K. Dev Ray).

Distribution.—Common throughout mainland India, extends from Iran to the Phillippines and Japan. Now it is recorded from the Andaman & Nicobar Islands for the first time.

Genus *Segmentina* Fleming, 1828

Segmentina Fleming, 1828, *Hist. Brit Anim.* p 279. Type species *Planorbis nitidus* Muller.

Segmentina taia Annandale & Rao

Segmentina taia Annandal & Rao, 1925, *Rec. Indian Mus.*, 27 : 110-111, fig. 2 (Type-locality : Inle lake, Burma).

Distribution.—Annandale and Rao described this species from Inle lake, Burma. Its present record extends its range to Andamans.

Material.—Eight exs., Attached to small gravel in sluggish stream, with muddy bottom, below Machligaon, Port Blair, (Coll. H. S. Rao).

Class BIVALVIA

Order EULAMELLIBRANCHIATA

Family CORBICULIDAE

Key to the genera

Shell oval subtrigonal, convex, generally of			
a brownish-green colour, right valve with			
four lateral teeth 			<i>Geloina</i> .

Shell roundly ovate or sub-trigonal, relatively thicker, usually covered with a blakish, brown periostracum, spiral striations coarser ; right valve with double lateral teeth ... *Batissa*.

Genus *Batissa* Gray, 1852

Batissa Gray, 1853, *Ann. Mag. Nat. Hist.*, (2) 11 : 38 Type species : *Batissa tenebrosa* Hinds.

Batissa similis Prime

(Pl. IV figs. 1 & 2)

Batissa similis Prime, 1859, *Ann. Lyceum. Nat. Hist. Soc.* New York, 7 : 112 ; Prashad, 1921, *Rec. Indian Mus.*, 22 : 147.

Batissa capillata Preston, *Rec. Indian Mus.* 2 : 207, pl. 16, fig. 39.

Material.—(i) One ex. Andaman (Coll. Rev. J. Warneford). (ii) 3 ex. Andamans (Coll. ?). (iii) 15 ex., Great Nicobar Expd ; (10.4.1966, Coll. A. Daniel & Party).

Distribution.—Andaman & Nicobar Islands.

<i>Measurements.</i> —	Length	Height	Thickness
Largest	113.75	86.00	47.20

Batissa inflata Prime

Batissa inflata Prime, 1860, *Proc. Zool. Soc.*, London, P. 320 ; Prashad, *Rec. Indian Mus.*, 22 : 149.

Material.—Ond ex., Andaman Islands. (Coll. ?).

Genus *Geloina*

Geloina galathea Mörch

(Pl. IV fig. 3)

Cyrena (Corneocyclar) galathea (Reinhardt MS.), Mörch, 1850, *Cat. Conch. Elerulf*, p. 32, pl. 2

Cyrena galathea ; Prashad, 1921, *Rec. Indian Mus.*, 22 : 144-45, pl. 20, figs. 14-17.

Material.—(i) Six ex., Nicobar Islands (Car Nicobar, Kondul, Trincat), (ii) 1 ex., John Lawrence island Andamans (Coll. ?).

Remarks.—Prashad (1921) gave a detailed description of the shell. It is greatly inequilateral and vaulted ; distal half of posterior margin highly truncated ; umbo placed anteriorly, hinge curved and placed anteriorly with compact but strong laterals.

Distribution.—Originally recorded from Galathea river in Great Nicobar Island, the species was reported from Car Nicobar ; Kondul and Trinked Islands in the Nicobars and John Lawrence and Havelock Islands in the Andamans.

<i>Measurements</i> .—	Length	Weight	Thickness
Largest	77.15	71.60	46.75

***Geloina siamica* (Prime, 1861)**

(Pl. IV fig. 4)

Cyrena siamica Prime, 1861, *Proc. Acad. Nat. Sci. philadelph* P. 126 ; Prashad, 1921, *Rec. Indian Mus.*, 22 : 139-140, pl. 20, figs. 3-5.

Material.—Two ex., Nicobar Islands. (Coll. ?)

Distribution.—It has a wide range from Cochin-China, Siam, Cambodia to Burma and the Nicobar Islands.

Measurements.—

Length 55.00	Height 7.85	Thickness 30.60

Family SOLENIDAE

Genus *Novaculina* Benson, 1830

Novaculina Benson, 1830, *Glean. Sci.*, 2 No. 13 : 63 Type species : *Novaculina gangetica* Benson.

***Novaeulina andamanensis* Preston**

(Pl. IV fig. 5)

Novaculina andamanensis Preston, 1908, *Rec. Indian Mus.*, 2 : 209, pl. 16, fig. 40 (Type-locality : Andaman Islands 1915, *Fauna Brit. India*, Freshwater Gastropoda and Pelecupoda, p. 230.

Material.—Holotype, Reg. No. M 20765/4

Distribution.—Not known beyond Andamans.

Remarks.—As Preston (1915) remarked “no further specimen has come to light”. The shell is smaller and thinner than that of *Novaculina gangetica*, the type species. More specimens are necessary to assess the validity of this species.

Measurements.—

Length 17.5	Height 7.85	Thickness 3.75

GENERAL REMARKS

A comprehensive and up to-date picture of freshwater molluscan fauna of Andaman and Nicobar group of islands is presented. The study includes concerned literature, named and unnamed collections both old and recent collections available in Zoological Survey of India.

The up-to-date list presented here includes 51 species of gastropods and Bivalves occurring in these islands, 9 species are recorded for the first time. Among gastropods, neritids (9 species) and thiariids (25 species) are the most successful. Perhaps with their thick and strongly built shell, they have best adapted themselves to streams. Interestingly, many of these species are restricted to these islands only and do not occur in mainland India. However, *Paludomus*, a common thiariid, which abounds in the streams of Western ghats and also in North-eastern regions on the mainland, is absent here. Other usually common freshwater gastropods are very poorly represented and hitherto none of these was known to occur here. Thus, *Pilidae* (1 sp.), *Viviparidae* (1 sp.), *Hydrobiidae* (2 spp.) and *Planorbidae* (3 spp.) are all new records for these islands, the record of species like *Indoplanorbis exustus* (Deshayes), *Gyraulus convexiusculus* (Hutton), *Lymnaea acuminata* (Lamarck) etc. should be viewed seriously since, all these are known to act as intermediate hosts of important helminth parasites. Among the species recorded here for the first time, *Pila scutata* (Mousson) and *Segmentina taia* Annandale & Rao were so far known from Burma only.

The families Unionidae and Sphaeriidae the ancient freshwater forms and cosmopolitan in distribution, are conspicuously absent from these islands. The occurrence of *Novoculina andamanensis* has to be received with some doubt. The bivalves are further interesting in that the genus *Batissa* is not represented on the mainland. The genus is distributed in the Malay Archipelago and other islands.

From the present knowledge it is difficult to attach any biogeographical importance to the malacofauna of these islands. Nevertheless, the occurrence of typical stagnant water dwellers in poor numbers suggests the recentness of this fauna. Of the several species reported only two species of thiariids are endemic to the islands. This again points to the recentness of the fauna. In the presence of several species of neritiids and thiarids, the fauna bears resemblance to that of Indonesia.

It is likely that further attempts may add some more species to the list and may bring to light some other aspects of distribution as well. Special efforts are necessary to collect bivalve molluscs.

SUMMARY

A comprehensive account of the freshwater molluscs of the

Andaman and Nicobar Islands is given in the paper. Fifty one species of gastropods and bivalves are reported from the islands ; and ten of them are recorded for the first time. Keys to the identification of families, genera and species are given. The present study revealed the dominance of gastropods as individuals and in number of species. The families Neritidae and Thairidae are the most common among gastropods. Several other common freshwater families occurring on the mainland are either absent or poorly represented. Of the total number of species, except for two thairiids, none of them are found to be endemic to the islands. However, the biogeographical importance of the freshwater molluscs is not very high.

ACKNOWLEDGEMENTS

We are grateful to the Director, Zoological Survey of India for the necessary facilities and encouragement. We are very much obliged to Dr. K. C. Jayarama Krishnan, Deputy Director for kindly going through the manuscript and making useful suggestions. Our thanks are also due to Shri G. Ramakrishna for helpful suggestions ; to Surgeon Commander N. B. Idnani, INHS KALYANI, and Dr. Sharma Deo Rani, ICAR, Port Blair for the collection of some molluscs reported in this paper, and to Shri K. Dey, Photographer and Shri M. K. Sengupta, Artist for the illustrations.

REFERENCES

- HUBENDICK, B., 1951. Recent Lymnaeidae - Their variation morphology, Taxonomy, Nomenclature and distribution. *Kungl. Svenska Vetenskapsakademiens Handlingar*, 30 : 1-222.
- JUTTING, Y. S. S. VAN BENTHEM, 1956. Systematic studies on the non-marins mollusca of the Indo-Australian Archipelago - V. Critical revision of the Javanees Freshwater Gastropods, *Treubia*, 23(2) : 259-476, figs. 1-135.
- MÖRCH, O. A. L., 1872. Catalogue des Mollusques terrestres et fluviales des anciennes colonies danoises du golfe du Bengale., *J. de Conch.*, 20 : 303-345 & *vid. Medd.* XI, 9-35.
- PRASHAD, B., 1921. Notes on lamellibranchs in Indian Museum, *Rec. Indian Mus.*, 22 : 139-149.
- PRASHAD, B., 1925. Revision of the Indian Ampullaridae, *Mem. Indian Mus.*, 8 : 69-89, pl. 13.
- PRASHAD, B., 1928. Recent and fossil Viviparidae, A study in distribution, evolution and palaeogeography, *Mem. Indian Mus.*, 8 : 153-251, pl. 91.

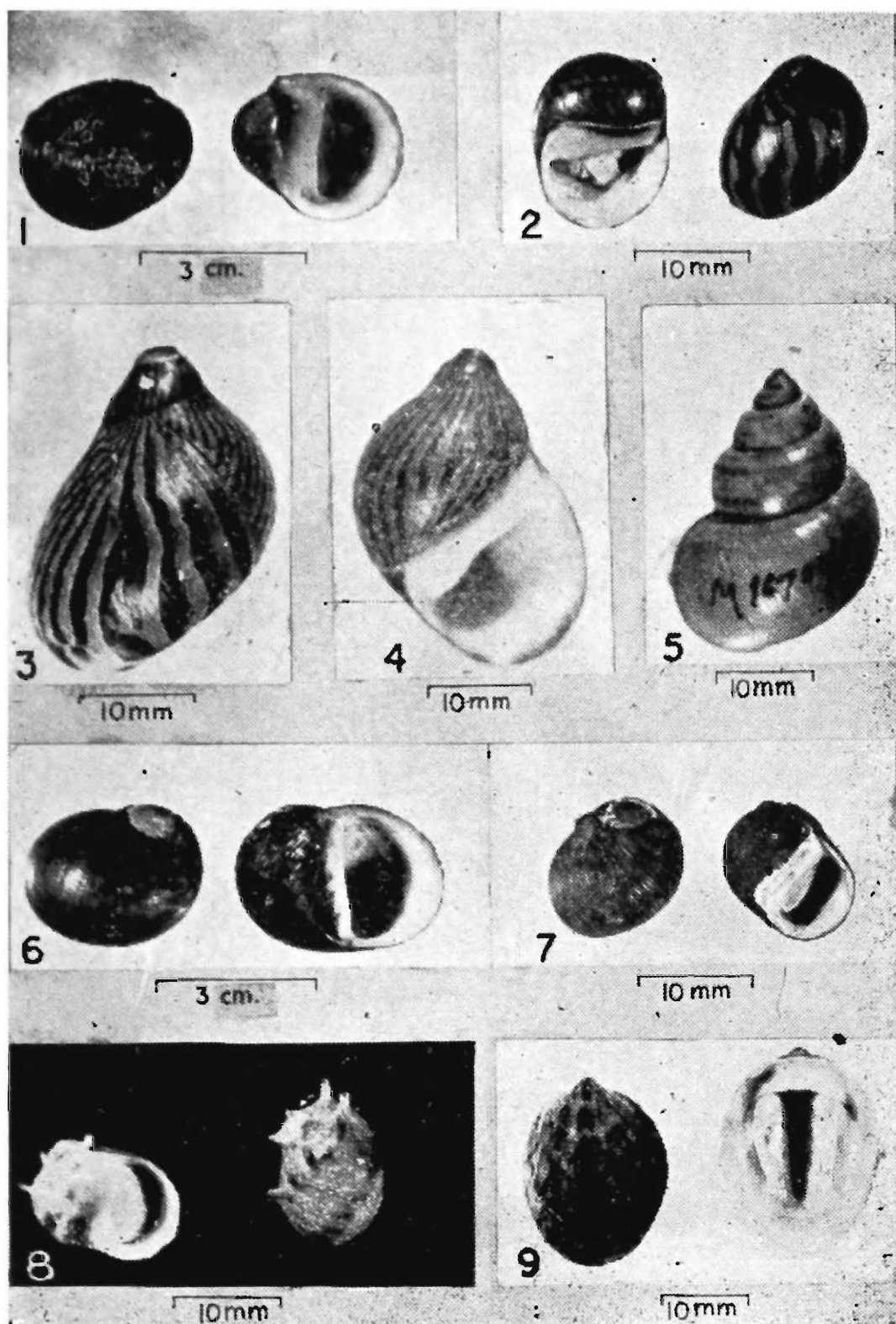
PRESTON, H. B., 1908. Descriptions of new land, marine and fresh-water shells from the Andaman islands, *Rec. Indian Mus.*, **2**(1) : 187-210, pl. 20, Text figs. 1-7.

PRESTON, H. B., 1915. *Fauna of British India*, Mollusca (Freshwater Gastropoda & Pelecypoda) London, 1-224.

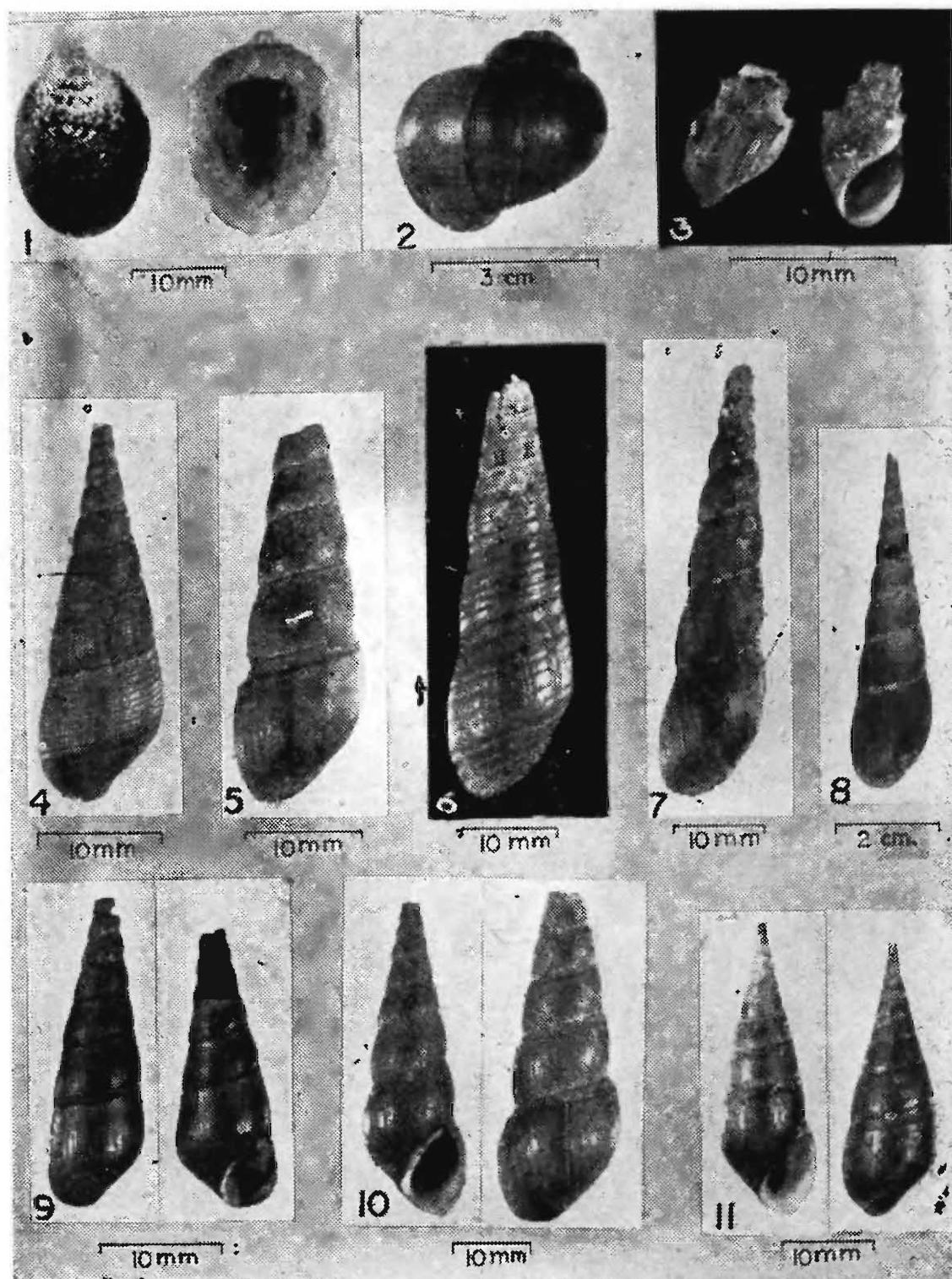
RAY, H. C., 1947. On a collection of Melaniids and Neritids (Mollusca : Gastropoda) from the Andaman islands, *Rec. Indian Mus.*, **45** : 299-308, Text-figs. 1 & 2.

SESHAIYA, R. V., 1940. A free larval stage in the life history of a fluviatile gastropod, *Curr. Sci.*, **9**(7) : 331-332.

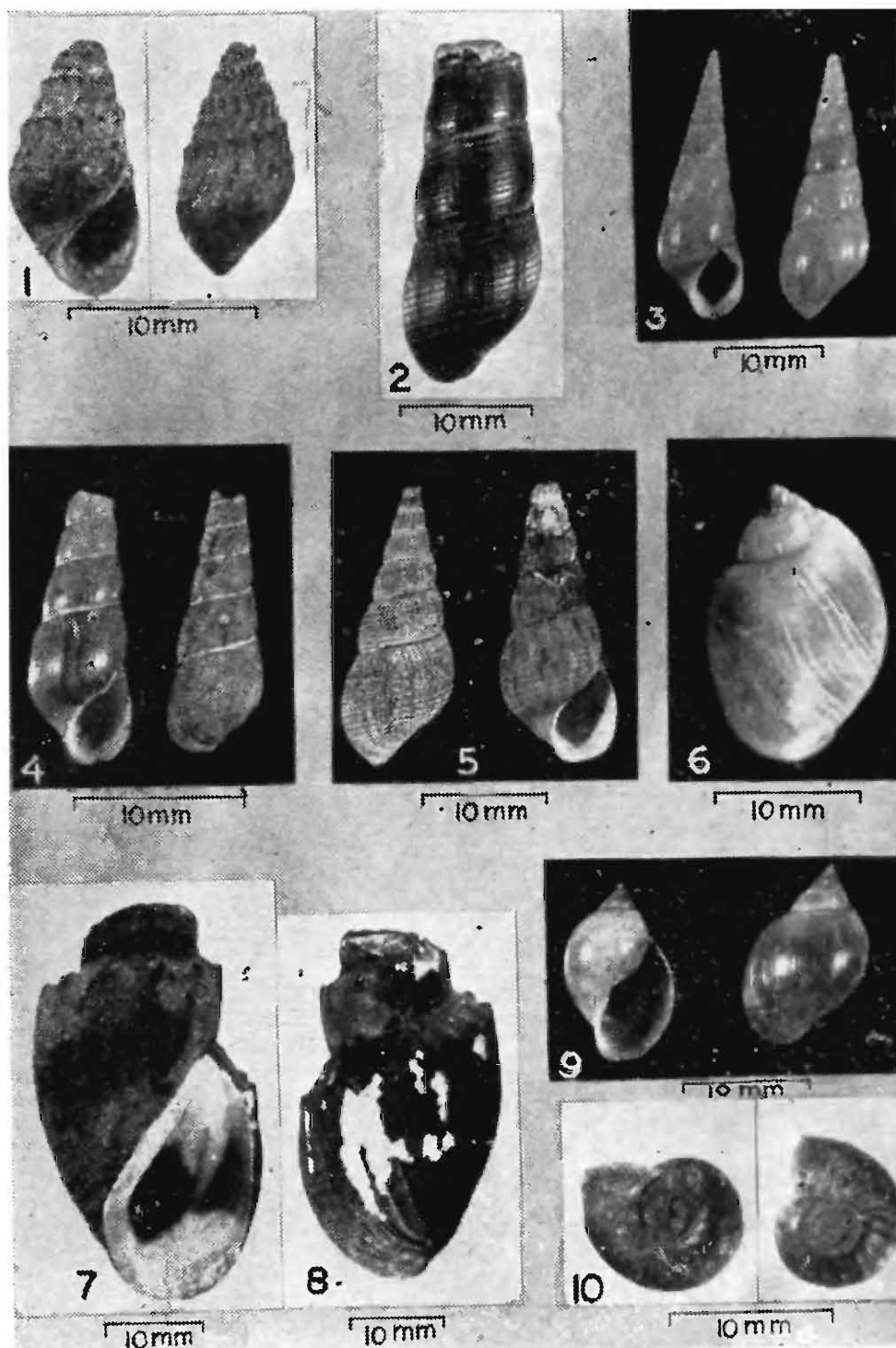
SUBBA RAO, N. V., 1975. Studies on Indian Neritids, Ph.D. Thesis, University of Calcutta. 311 pp.



1. *Neritina (Neritina) pulligera* (Linnaeus), 2. *Neritina (Vittina) variegata* Lesson, 3 & 4. *Neritina (Vittina) turrita* (Gmelin), 5. *Bellamya bengalensis* f. *typica* (Lamarck), 6. *Neritodryas subsulcata* (Sowerby), 7. *Clithon bicolor* (Recluz), 8. *Clithon corona* (Linnaeus), 9. *Septaria lineata* (Lamarck).



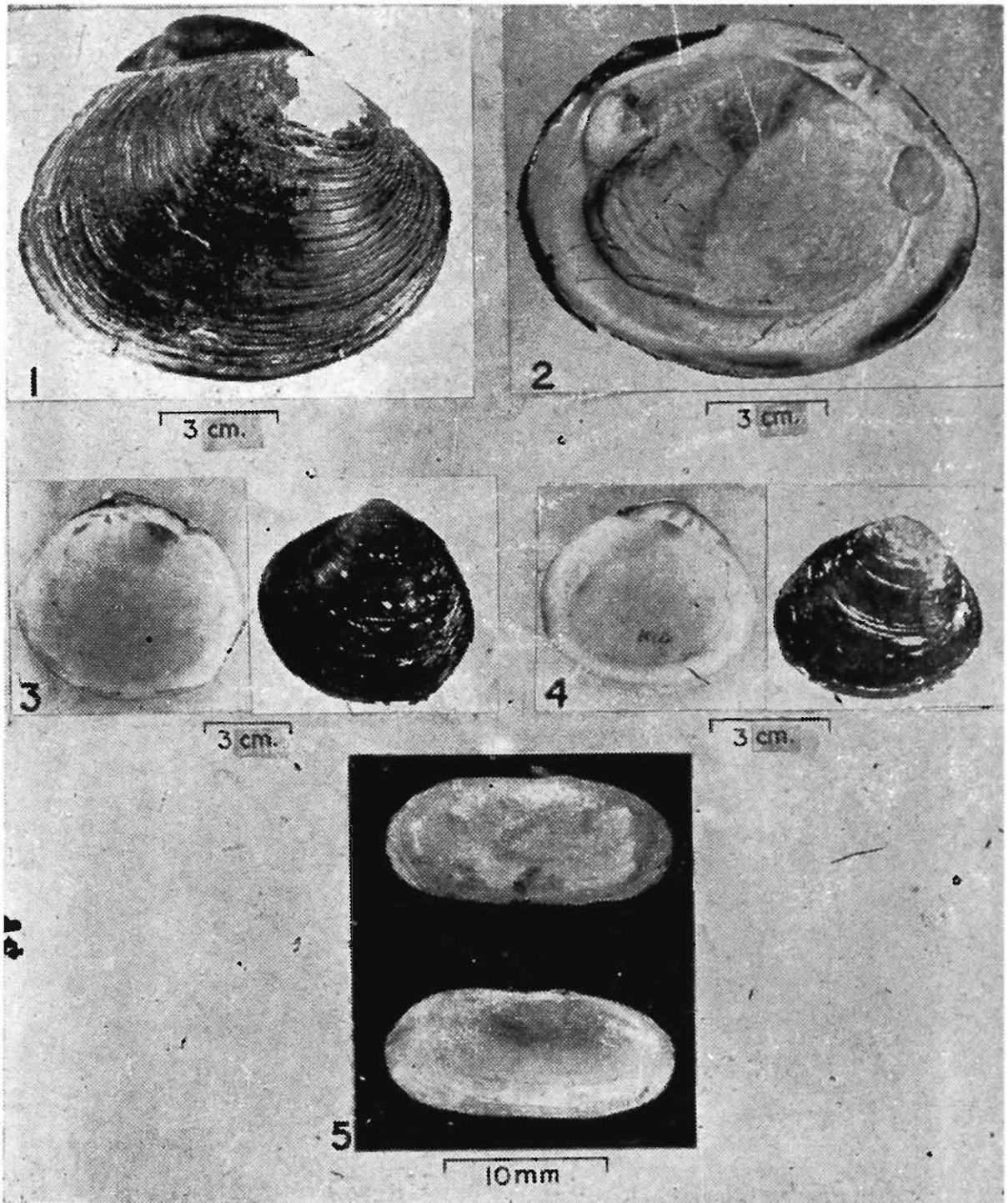
1. *Septaria porcellana* (Linnaeus), 2. *Pila scutata compacta* (Reeve), 3. *Thiara scabra* (Muller), 4. *Melanoides nevillei andamanica* (Nevill), 5. *Melanoides expatriata* (Preston), 6. *Melanoides torulosa* (Bruguiere), 7. *Melanoides charon* (Preston), 8. *Brotia fuscata* (Born), 9. *Melanoides nevillei* (Brot), 10. *Melanoides nicobarica* (Reeve), 11. *Melanoides punctata* (Lamarck)



1. *Melanoides granifera pergranosa* Nevill, 2. *Melanoides multistriata* (Preston), 3. *Melanoides tigrina raoi* Ray, 4. *Melanoides fontinalis* (Philippi), 5. *Melanoides crebra* (Lea), 6. *Lymnaea ovalis* Gray, 7. & 8. *Thiara amarula* (Linnaeus), 9. *Lymnaea lutiola* f. *typica* (Lamarck), 10. *Indoplanorbis exustus* (Deshayes).

SUBBA RAO, DAS & MITRA

PLATE IV



1 & 2. *Batissa similis* Prime, 3. *Geloina galathea* (Mörch), 4. *Geloina siamica* (Prime), 5. *Novaculina andamanensis* Preston

ON A SMALL COLLECTION OF NEUROPTERA FROM ANDAMAN AND NICOBAR ISLANDS

By

S. K. GHOSH

Zoological Survey of India, Calcutta

(With 1 Text-figure and 1 Plate)

INTRODUCTION

(a) *General*

The neuropteran fauna of the Andaman and Nicobar islands is still far from being well known. Apart from some scattered references by Fabricius (1793), Brauer (1865) and Navas (1912, 1929), the neuropteran fauna of the Andaman and Nicobar islands has not been studied thoroughly. The reason may be due to the lack of intensive faunistic surveys in the areas. The present study was undertaken with a view to record the species occurring in these islands and also comparing the distribution of the species with the mainland of India. All the species except *Ankylopteryx octopunctata* (Fabricius) and *Distoleon audax* (Walker), studied by the author, are recorded for the first time from the area under study. Moreover, this paper also includes the new record of the genus *Sencera* Navas from India, a detailed description of the species *Chrysopa* (*Glenochrysa*) *marmorata* (Needham) (Family Chrysopidae), a list of species hitherto recorded from these islands, the synonymies and distribution of all the species in India and a key to the genera and species belonging to the family Chrysopidae.

(b) *Acknowledgement*

I am grateful to the Director, Zoological Survey of India, Calcutta, for placing the material at the author's disposal and the facilities provided for this work

(c) *Abbreviations used*

Coll., Collected by ; Ex. Example

LIST OF NEUROPTERA OF THE ANDAMAN AND NICOBAR ISLANDS

Seven species studied by the author along with 4 species recorded previously are listed below. The species marked with * were recorded from the Nicobar Islands by the previous authors.

Order NEUROPTERA

Family 1. OSMYLIDAE

1. *Spilosmylus tuberculatus* (Walker)

Family 2. BEROETHIDAE

- * 2. *Acroberotha nicobarica* Navas

Family 3. CHRYSOPIDAE

3. *Chrysopa lacciperda* Kimmins
- + *4. *Chrysopa* (*Glenochrysa*) *faceta* Navas
- *5. *Chrysopa procubitalis* Navas
6. *Chrysopa* (*Glenochrysa*) *marmorta* (Needham)
7. *Ankylopteryx octopunctata* (Fabricius)
8. *Ankylopteryx tessellatus* Needham
9. *Sencera* sp.

Family MYRMELEONIDAE

- *10. *Myrmeleon nicobaricus* Brauer
11. *Distoleon audax* (Walker)

SYSTEMATIC ACCOUNT

Family 4. OSMYLIDAE

***Spilosmylus tuberculatus* (Walker)**

1853. *Osmylus tuberculatus* (Walker), *Cat. Brit. Mus. Neur.*, 2 : 255.
1913. *Osmylus tuberculatus* : Petersen, *Entt. mitt*, 2 : 27.
1893. *Osmylus modestus* Gerstaecker, *Naturwiss. Ver. Neu-Vorpom. u. Rugen, Mitt.*, 25 : 77,
1914. *Osmylus* (*Lysmus*) *japonicus* Okamoto. *Ent. Mitt.*, 3 : 23.
1915. *Spilosmylus modestus* : Krüger, *Stett. Ent. Ztg.*, 76 : 78.
1937. *Spilosmylus japonicus* : Banks, *Phil. Jour. Sci.*, 62 : 278.
1914. *Spilosmylus tuberculatus* : Nakahara, *Zool. Jap. Ann.*, 8 : 502.
1955. *Spilosmylus tuberculatus* : Nakahara, *Kontyu*, 23 : 11.
1956. *Spilosmylus tuberculatus* : Nakahara, *Shikoku Ent. Soc., Trans.* 3 : 22-23.

Material : 1 ♂, Tugapur rest house. Mayabandar, North Andaman, 11.v.1971, Coll. B. K. Tikader.

Distribution : India : North Andaman.

+ Banks, N. (1930). *Fed. Malay Mus., Jour.*, 41 : 380 states, "*Chrysopa faceta* Navas is the same form" of *Chrysopa splendida* Weele.

Family CHRYSOPIDAE

Key to the genera represented in the collection from Andaman and Nicobar Islands.

1. Costa steep at base; forewing much broader than hindwing 2
- Costa at base very narrow, then gradually widening *Chrysopa* Leach
2. Third cubital cell divided *Ankylopteryx* Brauer
- Third cubital cell undivided *Sencera* Navas

Key to species of *Chrysopa* Leach

- Both wings with the cross veins tinged golden brown, more strongly upto the basal third and along the margin, but suffused on the disc *marmorata* (Needham)
- Both wings with the cross veins uniformly pale fuscous *lacciperda* Kimmins

***Chrysopa lacciperda* Kimmins**

1955. *Chrysopa lacciperda* Kimmins, *Indian J. Ent.*, 17 (2) : 217-218.

Material : 1 ♂, "Cheria Tapu", S. Andamans, 19.iv.1964, Coll. B. S. Lamba.

Distribution : India : Bihar; S. Andamans.

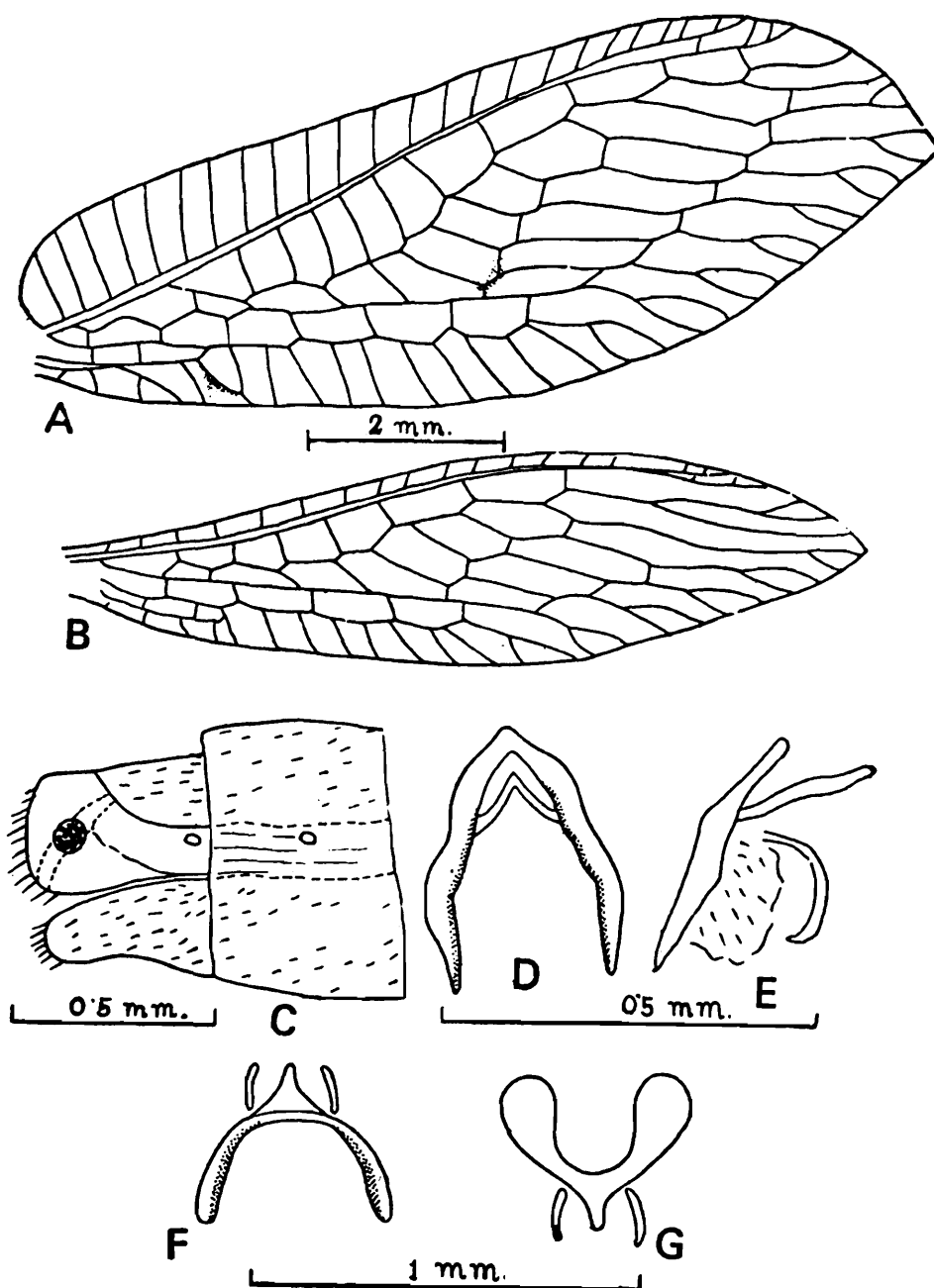
***Chrysopa* (*Glenochrysa*) *marmorata* (Needham)**

1909. *Eremochrysa marmorata* Needham, *Rec. Indian Mus.*, 3 : 205.

1940. *Glenochrysa marmorata* : Kimmins, *Ann. Mag. nat. Hist.*, (11)5 : 449.

Redescription : Vertex dark brown; clypeus brownish ; genae dark brown; frons yellowish; epicranium : a black stripe between the antennae continuing along the inner margin of toruli; antennae : scape yellow but black at the base ; flagellum yellowish ; pronotum : bright yellow with black lateral margins and a pair of distinct black patches on the anterior margin; meso—and metanota : yellow, each with a pair of large brown spots towards the wing base ; legs : yellow, claws brown ; wings (Pl. V) : rather broad with angular tip, hyaline, forewing : costal veins black; pterostigma dark brown; subcostal crossveins black; all other veins yellow; all cross veins bordered pale brown, more strongly on basal third of the wing; some milky-white, elongated and irregular spots on the apical portion in between the branches of the

radial sector; veins on the hindmargin of the apical part forked, alternately yellow and dark brown; cell *im* elongate, its tip extending beyond 1st radio-medial cross vein; number of gradates $3/4$; hindwing: narrower than forewings; costal crossveins black and bordered brown; 1st crossvein between R and Rs, a crossvein between Psm and Psc, some of the cubital and anal crossveins partly or wholly bordered dark brown; abdomen: dark brown; ♂ genitalia (Text-fig. 1 F & G): gonarcus with rounded lateral pieces and a narrow central piece; arcessus attached to gonarcus, entoprocessus as shown in figs.



Text-fig. 1 (A-E) *Sencera* sp., male: A—Forewing; B—Hindwing; C—Apex of abdomen (lateral view); D—Gonarcus with entoprocessus, (dorsal view); E—Gonarcus with entoprocessus, part of gonosaccus and pseudopenis (lateral view). (F-G) *Chrysopa* (*Glenochrysa*) *marmorata* (Needham) F—Gonarcus with arcessus (dorsal view) and G—same (Caudal view).

Material : 1 ♂, "Cheria Tapu", South Andamans, 9.iv.1964, Coll. B. S. Lamba.

Remarks: Needham (1909) described *Eremochrysa marmorata*, from upper Assam by one broken and incomplete specimen. His description was mainly on the measurements of antennae, body and wings as well as the marking on the wings. He also indicated the repository of type as the Indian Museum. But unfortunately after a thorough search, the author is unable to find out the type in the National collection at Zoological Survey of India and it seems thus to be lost. So the specimen collected from the Andamans has been carefully studied with the available literature on the species and a detailed description of the species along with the illustrations of genitalia and a photograph of the wings are given. After detailed study, the author feels that the species should be placed in the subgenus *Glenochrysa* of the genus *Chrysopa*, as considered by Tjeder (1966).

Distribution : India : Assam; Andaman Islands.

Key to species of *Ankylopteryx* Brauer

Both wings with the veins yellow; hindwing with the inner gradates and tips of cubitals immaculate	...	...	...	<i>octopunctata</i> (Fabricius)
— Both wings with the veins whitish, hindwing with the inner gradates and tips of cubitals spotted brown	...	...	...	<i>tesselatus</i> Needham

Ankylopteryx octopunctata (Fabricius)

1793. *Hemerobius octopunctata* Fabricius, *Ent. Syst.*, 2 : 85.
 1798. *Hemerobius candidus* Fabricius, *Ent. suppl.* : 202.
 1851. *Chrysopa candida* Schneider, *Mon. chrysop.* : 161.
 1853. *Chrysopa candida* : Walker, *Cat. Brit. Mus. Neur.* : 274.
 1864. *Ankylopteryx candida* : Brauer, *Zool. -bot. Ges. Wien. Verh.*, 14 : 901.
 1858. *Chrysopa punctata* Hagen, *Syn. Neur. Ceyl.*, 1 : 483.
 1864. *Ankylopteryx punctata* : Brauer, *Zool. -bot. Ges. Wien. Verh.*, 14 : 901.
 1853. *Hemerobius trimaculatus* Girard, *Ann. Soc. Ent. Fr.*, (3) 7 : 163.
 1864. *Ankylopteryx trimaculata* : Brauer, *Zool. -bot. Ges. Wien. Verh.*, 14 : 901.
 1864. *Ankylopteryx anomala* Brauer, *Novara Exp. Zool.*, 11 : 35.
 1893. *Ankylopteryx sigillaris* Gerstaecker, *Naturwiss. Ver. Neu-Vorpom. U. Rugen, Mitt.*, 25 : 162.
 1909. *Ankylopteryx octopunctata* : Weele, *Leyden Mus., Notes*, 31 : 57-58.
 1935. *Ankylopteryx octopunctata* : Handschin, *Rev. Suisse Zool.*, 42 : 695-696.

Material : 1 ex. (damaged), Mayabundar, N. Andaman, 26.iii.1969, Coll. T. D. Soota. 2 ♀ ♀, Cowria Ghat, S. Andamans, 8.iv.1964, Coll.

B. S. Lamba. 1 ♀, "Cheria Tapu", S. Andamans, 8.iv.1964, Coll. *B. S. Lamba.*

Distribution : India : Andamans.

Ankylopteryx tessellatus Needham

1909. *Ankylopteryx tessellatus* Needham, *Rec. Indian Mus.*, 3 : 205.

Material : 1 ♂ Wrafters creek, Baratang, S. Andamans, 18.iii.1964, Coll. *B. S. Lamba.* 1 ex. (damaged), Cowria Ghat, S. Andamans, 11.iv.1964, Coll. *B. S. Lamba.*

Distribution : India : Assam ; S. Andamans.

Sencera sp.

(Text-fig. 1 A-E)

Head pale; clypeus yellow; gena unmarked; last joint of maxillary palpus fuscous; antennae pale yellow; vertex yellowish; pronotum mesonotum and legs pale yellow; forewing (Text-fig. 1A) : fine black dots on some of costal crossveins and at the tip of vein along the margin; pterostigma unmarked; brown clouds over basal two of the inner gradate crossveins and first radio-medial crossvein; faint brownish clouds on last two branches of first anal; no divisory veinlet in the 3rd cubital cell; the last branch of first anal and 1st cubital branch meet at margin and enclose an elongated cell with triangular tip; radial sector sinuous with 6 branches; 4 radio-medial crossveins; inner gradates with 5 crossveins and outer gradates with 7; hindwing (Text-fig. 1B) : no brownish clouds anywhere; inner and outer gradates each with 4 crossveins; abdomen (Text-fig. 1C-E) : pale yellow; posterior margin of tergite 9 and ectoproct straight in lateral view ; tip of the sternites 8 and 9 rather narrow and rounded; gonarcus and entoprocessus as in fig. 1D ; pseudopenis slender and slightly curved; gonosaccus with a few gonosetae.

Length of the forewing, 10 mm. ; of hindwing, 9 mm.

Material : 1 ♂, Kamorta island, Nicobar, 22. iii. 70. Coll. *B. K. Tikader.*

Distribution : India : Nicobar Island.

Remarks : The genus is for the first time recorded from India. The species is very similar to *Sencera exquisita* Nakahara, but the wings of the species is not so exquisitely marked. The species also differs from *S. exquisita* by the body colour and size of the wings. Due to the paucity of material, it is not possible at the moment to describe the species as new to science.

Family MYRMELEONIDAE

Distoleon audax (Walker)

1853. *Myrmeleon audax* Walker, *Cat. Brit. Mus. Neur.* : 338.
 1853. *Myrmeleon gravis* Walker, *l.c.* : 339.
 1853. *Myrmeleon vafer* Walker, *l.c.* : 345.
 1853. *Myrmeleon dirus* Walker, *l.c.* : 346.
 1853. *Myrmeleon lentus* Walker, *l.c.* : 346.
 1853. *Myrmeleon desperatus* Walker, *l.c.* : 359.
 1853. *Myrmeleon perniciosus* Walker, *l.c.* : 360.
 1853. *Myrmeleon malefidus* Walker, *l.c.* : 364.
 1853. *Myrmeleon actus* Walker, *l.c.* : 377.
 1853. *Myrmeleon* ? *insomnis* Walker, *l.c.* : 385.
 1900. *Formicaleo morpheus* Kirby, *Mongr. Christmas Isl.* : 140.
 1865. ? *Formicaleo longicornis* Brauer, *Novara Exp. Zool. II, Neur.* : 42.
 1909. *Formicaleo audax* : Weele, *Leyden Mus. Notes*, 31 : 19-23.

Material : 1 ♀, 3Kms. S. E. of Mayabundar, N. Andamans,
 9.iii.1975. Coll. G. K. Srivastava and party.

Distribution : India : "Nepaul"; Andaman and Nicobar Islands.

Remarks : Considering the characteristics of the wings and legs, the species is being placed under the genus *Distoleon*. Brauer (1865) recorded "? *Formicaleo longicornis*" from the Nicobar Islands. But without the re-examination of the type it is not possible to decide on the merger of Brauer's species with *D. audax* (Walker).

SUMMARY

The present paper deals with the systematic account of seven neuropteran species along with illustrations from the Andaman and Nicobar Islands. One genus *Sencera* Navas is a new record for India, of which the species under study could not be identified but described and the affinities with its nearest ally have been shown. Four species, viz., *Spilosmylus tuberculatus* (Walker), *Chrysopa lacciperda* Kimmins, *Chrysopa (Glenochrysa) marmorata* (Needham) and *Ankylopteryx tessellatus* Needham, are also reported for the first time from the area concerned. Besides, *Chrysopa (Glenochrysa) marmorata* (Needham) has been redescribed. With this, the total number of species hitherto known from the insular area is raised to eleven.

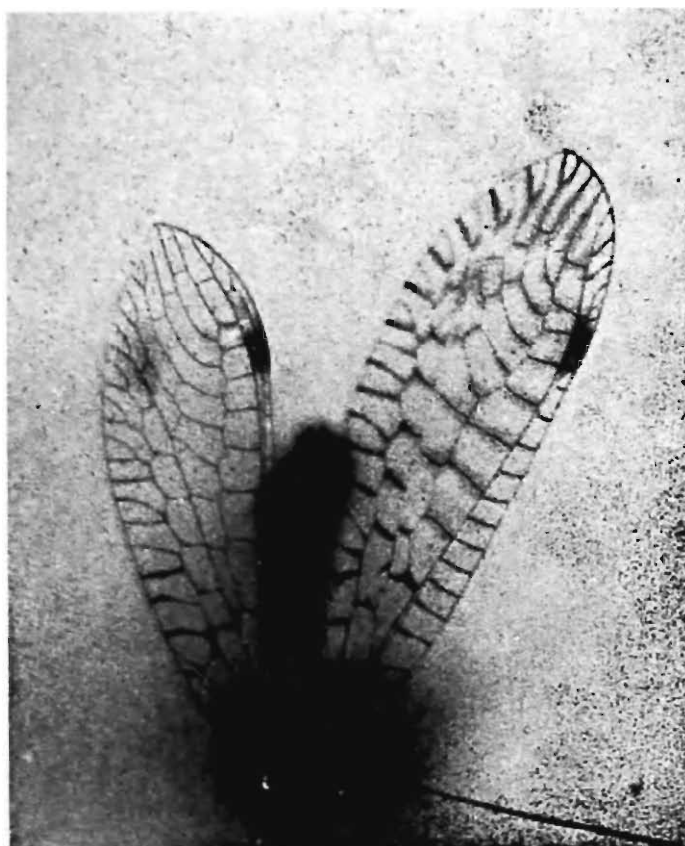
REFERENCES

- BRAUER, F. 1865. Zweiter Bericht über die auf der Wellfahrt der kais. Fregatte Novara gesammelten Neuroptera. *Zool. -bot. Ges. Wien. Verh.*, 15 : 903-908.

- FABRICIUS, J. C. 1793. *Entomologica Systematica*. 2. Proft. Hafniae, 519 pp.
- NAVAS, L. 1912. Crisopidos y Hemerobidos (Ins. Neur.) nuevos o criticos. *Broteria, (Zool.)*, 10 : 98-103.
- NAVAS, L. 1929. Monografia de la familia de los Berotidos (Insectos Neuropteros). *Acad. Cien. Exact. Fis. -Quim. Nat. Zaragoza, Mem.*, 2 : 1-106.
- NEEDHAM, J. G. 1909. Notes on the Neuroptera in the Collection of the Indian Museum. *Rec. Indian Mus.*, 3 : 185-210.
- TJEDER, B. 1966. Neuroptera - Planipennia. The Lace-wings of Southern Africa. 5. Family Chrysopidae. *South Afr. Anim. Life*, 12 : 228-534.

GHOSH

PLATE V



Forewing and hindwing of *Chrysopa (Glenochrysa) marmorata* (Needham).

A REPORT ON THE REPTILIA FAUNA OF ANDAMAN AND NICOBARS ISLANDS IN THE COLLECTION OF ZOOLOGICAL SURVEY OF INDIA

By

S. BISWAS AND D. P. SANYAL
Zoological Survey of India, Calcutta

(With 1 Table and 3 Text-figures)

INTRODUCTION

(a) *General*

Andaman and Nicobar group of islands are situated in Bay of Bengal between 5°40' and 14°15' N. lat. and 92°10' and 93°30' E. long. Andaman group of islands mainly consists of four parts : North, Middle, South and Baratang cut by channels. The Landfall island is in the north and Rutland is just on the south of South Andaman. Interview, North Sentinel, Labyrinth and South Sentinel islands are on the Western side of Andaman islands and Little Andaman is in the south. The various islands forming the group of Nicobar islands are Car Nicobar, Batty Malve, Teressa, Tillangchong, Camorta, Nancowry, Katchall, Little Nicobar and Great Nicobar. There are some more smaller and unimportant islands in both the groups. Andaman and Nicobar groups of islands are separated by 10° channel and the distance between Little Andaman and Car Nicobar is 120 km. These groups of Islands form a continuous chain of submarine mountains sprawling in a crescent between cape Negrais of Burma and Achin Head of Sumatra which is nearly 155 km. away from the southern most point of Great Nicobar. While cape Negrais of Burma is 193 km. away from the Port Blair.

Not much work seems to have been done on the Reptilian fauna of Andaman and Nicobar islands but important contribution made by Blyth (1846), Stoliczka (1870), Annandale (1904, 1905) and Smith (1940-41), (F.B.I., 1931, 1935 & 1943) and recently Tiwari and Biswas (1973), Biswas and Sanyal (1977) may be referred to so far the reptilian fauna of these islands are concerned. The fauna of reptiles of the Great Nicobar islands is comparatively less known than that of Andaman and Nicobar islands. The sea-snakes of the Andaman and Nicobar coasts are also a neglected group of reptiles.

Since 1930, a number of parties of Zoological Survey of India, conducted faunistic surveys in the Andaman and Nicobar. Present report is mainly based on collections made during the period 1930-76.

Importance of studying the fauna of these isolated islands is felt necessary to know the faunal wealth of reptiles and to explain the affinities of Reptilian fauna of Andaman and Nicobar islands in relation to the fauna of Indian mainland and Sri Lanka in one hand and Indo-chinese and Malaysian fauna on the other. The fauna of these islands are also most suitable to study their insular characters and extent of their variations in some cases due to geographical isolation.

So far 71 species of reptiles (Table 1) are known to occur in these groups of island including the Great Nicobar but the collection examined contains only 1 species of chelonia, 16 species of lizards and 13 species of snakes.

(b) *List of surveys from which the material for Andaman and Nicobar Islands Reptilia were studied*

Name of the Survey	Year	Leader of survey party or collector	Areas
Andaman Survey	1930	K. N. Das	Port Blair area.
Andaman Survey	1952	Dr. H. C. Roy	South Andaman
Andaman & Nicobar Survey	1959	Dr. K. K. Tiwari	Andaman & Nicobar Is.
Little Andaman Survey	1961	Dr. A. K. Daniel	Little Andaman Is.
Andaman & Nicobar Survey	1964	Dr. B. S. Lamba	South Andaman
Andaman & Nicobar Survey	1969	Dr. T. D. Soota	Andaman & Nicobar Is.
Andaman & Nicobar Survey	1970 & 1972	Dr. A. G. K. Menon	Andaman & Nicobar Is.
Andaman & Nicobar Survey	1970 & 1971	Dr. B. K. Tikader	Andaman & Nicobar Is.
Andaman Survey	1972	Dr. A. K. Mondal	Andaman Is.
Andaman Survey	1972	Dr. K. Reddiah	„
Andaman & Nicobar Survey	1972	Dr. A. K. Mukherjee	Andaman & Nicobar Is.
Andaman & Nicobar Survey	1974-75	Dr. S. K. Bhattacharya	„
Andaman & Nicobar Survey	1975-76	Dr. P. K. Maiti	„
Andaman & Nicobar Survey	1975-76	Shri G. Ramakrishna	„

(c) *Acknowledgements*

The authors are thankful to the Director, Zoological Survey of

India for the facilities to work out the collections and to Drs. B. Biswas & K. K. Tiwari for helpful suggestions.

SYSTEMATIC ACCOUNT

Order TESTUDINES

Suborder THECOPHORA

Family I. CHELONIIDAE

1. *Eretmochelys imbricata squamata* Agassiz.

1857. *Eretmochelys squamata* Agassiz, *Contr. Nat. Hist. U. S.*, i, p. 382.

1939. *Eretmochelys imbricata* Deraniyagala, *The Tetrapod Rept. Cey.*, Colombo, 1 : 187-217.

1952. *Eretmochelys imbricata squamata* Carr. *Handbook of Turtles*, pp. 273-381.

Material.—1ex., Coral beds at Konamie, 64 km. north of Gaje, Little Andaman, 26.ii.1961, A. Daniel.

Remarks.—This species is popularly known as the Hawksbil turtle for its bird-like head and beak. The two subspecies, typical and the *squamata* distributed in the Atlantic and Pacific respectively can be separated by the shape of the carapace which is more straightline tapering behind in *imbricata* than in East Pacific *squamata* and by colouration, which is deeper and more unrelieved black in the latter than in the former.

Constable (1949) while reporting on a collection from India mentioned about a juvenile specimen of *Eretmochelys* (M.C.Z. 1415) collected by Barnard in 1857 from Bengal designated it as a "Co-Type" of the Pacific race of *squamata* but according to Deraniyagala (1939) there is no valid morphological character on which the above mentioned separation can be based. The possibility of inbreeding between the Atlantic and Pacific Ocean races is very less as they are effectively isolated.

The homing or nesting instinct of this species like other sea turtles is interesting. It has been recorded by Deraniyagala (*loc. cit*) that ringed turtles were found to visit (also *vide* Bennett, 1843) the breeding sites for about thirty two successive years. The "Tortoise Shell" of commerce is made out of the shields of carapace of this species.

Distribution.—This subspecies is found to occur in tropical and subtropical Indian and Pacific Oceans. The northern range of the turtle in the Indo-Pacific is Hainan, China and Japan and is also known from in the South East Australia. The range in the east is

East African coast as far south as Madagascar, but it is not recorded from the cape of Good Hope and on the American Coast the range of distribution extends from Baja California to Peru.

Order SQUAMATA

Suborder SAURIA

Family 2. GEKKONIDAE

2. *Cyrtodactylus rubidus* (Blyth)

1860. *Puella rubida* Blyth, *J. Asiat. Soc. Bengal*, 29 : 109.

Material.—2 ♀ ♀, Port Cornwallis, North Andaman, 31. i. 1959 ; 1 ex. juv., (with mutilated tail), Mayabunder, North Andaman, 20. ii. 1959 ; 1 ♀, Andaman Is., *K. K. Tiwari*, 31 ii. 1959 ; 1 ex., Bugena, 25 km. west of Kwate-tu-kwage, Little Andaman, 25.ii.1961 ; 1 ex., Nachuge, Little Andamans, *A. Daniel*, 27. ii. 1961 ; 9 ex., from different parts of Andamans, *B. S. Lamba*, 22. iii. 1964 to 11. iv. 1964 ; 1 ex., Chiriatapu, S. Andaman, *K. Reddiah*, 5. iv. 1972 ; 1 ex., Chiriatapu, *A. K. Mondal*, 21. vii. 1972 ; 1 ex., Rajendranagar, Great Nicobar, *P. K. Maiti*, 31. xii. 1975.

Remarks.—All the specimens have indistinct pubic groove markings with faint traces of pores which are not traceable in any other species of Indian or Indo-chinese Gekko, except in the Malayan species of *C. marmoratus* (Kuhl) and *C. pulchellus* (Gray). It is very closely allied to *C. marmoratus* (Kuhl) and *C. khasiensis* (Jerdon) known from the Malay Archipelago and Khasi Hills, Assam, respectively.

Distribution.—This species is endemic in the Andaman and Great Nicobar Islands.

3. *Hemidactylus frenatus* Schlegel

1836. *Hemidactylus frenatus* Schlegel, in Dum. & Bir., *Erp. Gen.* iii : 366.

Material.—1 ex., Humphrygunj, South Andaman, 3. iii. 1964, *B. S. Lamba* ; 1 ex., Long Island, Middle Andman, 22. i. 1959 ; 3 ex., Aberden Bay, Port Blair, S. Andaman, 5. iii. 1959 ; 1 ex., Choldari, S. Andaman ; 15. iii. 1959 ; 2 ex., Malaca Vill., Car Nicobar, 22. iii. 1959 ; 2 ex., Mus Vill., Car Nicobar, 28. iii. 1959, *K. K. Tiwari*, 4 ex., Rangat Resthouse, 19. i. 1970, *A. G. K. Menon* ; 1 ex., Camorta, Car Nicobar, 22. iii. 1972 ; 3 ex., Rangat, Middle Andaman, 2. ii. 1972, *A. K. Mukherjee*, 1 ex., Port Blair, 1930, *K. N. Das*.

Remarks.—This species is common in Andamans and Nicobars. Cantor (1847) notes that this species is numerous in Malayan Valley and hills and also its fierce habit often destroys its own species. They prefer human habitation and are often found in houses, boats and steamers which explain its wide distribution.

Distribution.—The distribution of this species is very wide spread and its occurrence is recorded from South Asia, Tropical Australia and East Africa. This species is now established in Mexico.

4. *Ptychozoon kuhli* Stejneger

(Text-fig. 1)

1902. *Ptychozoon kuhli* Stejneger, *Proc. Biol. Soc. Washinton.*, 15 : 37.

Material.—2 ♂♂, Malaca Village, Car Nicobars, 28. iii. 1959 and 2. iv. 1959, K. K. Tiwari ; 1 ex., Nancowry Island, 12. v. 1966, A. Daniel.

Remarks.—The cutaneous expansions on the sides of the head are not much developed. The expansions on the side of the body are broader, but they do not meet or overlap in the belly.

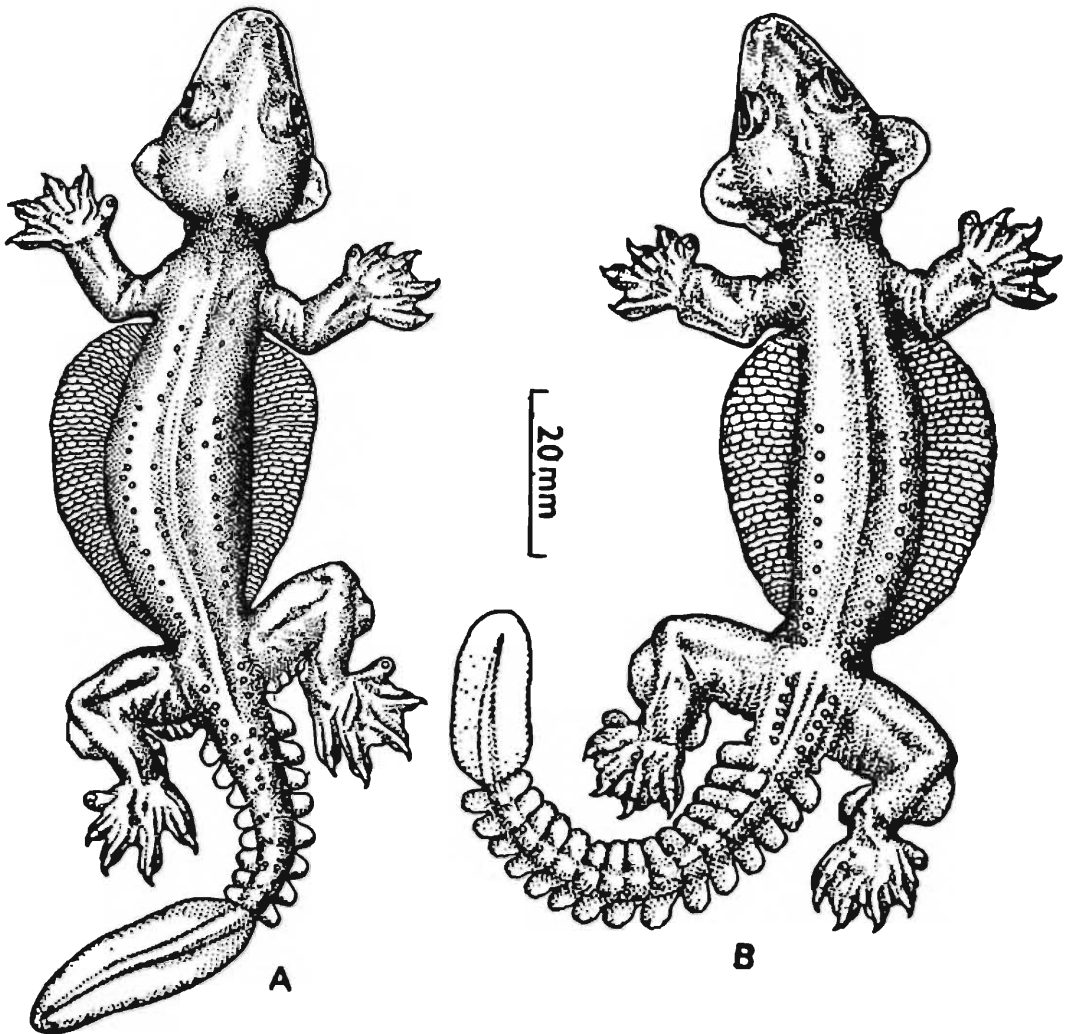
In one of the specimens (2. IV 1959) a regenerated tail is present. It is elongated, depressed and almost half of the tail is fringed with asymmetrical small cutaneous lobes upto the distance of 34 mm. from the vent, after which loose membraneous growth surrounds the tail and tapers down to the tip. There is no expansion at the tip of the regenerated tail. The squamation on it is much poorly developed, uniform in size than those upon the uninjured portion. The dorsal tubercles are completely absent. The original tail has some ornamentation (Text-fig. 1) with whorls of enlarged tubercles. Barbour (1912) has given diagrams of four different types of regenerated tails found in *P. kuhli*. The regenerated tail of the specimen from Car-Nicobars can be compared with it.

In preserved specimens, the general colouration appears to be grayish black with indistinct traces of markings on the body.

Length from snout to vent 84 mm. and 86 mm. ; tail (regenerated) 61 mm., upper labials 13, lower labials 10 to 11. Pre-anal pores 20 and 22 in number. Dorsal tubercles well developed and not arranged in a regular order.

Tiwari (1961) collected a pair of white egg of *Ptychozoon*, from the bark of a tree, at Parsa Bridge, Car Nicobar on 23rd March 1959. At the first sight, the eggs looked like that of *Aristelliger* Cope, a geckonid of American origin. One of the eggs when opened up, a

full grown embryo of *Ptychozoon* was found with cutaneous expansion of the sides of the body and tail paratially developed. The embryo measures snout to vent 20 mm. and tail 17 mm.



Text-fig. 1. *Ptychozoon kuhli* Stejneger. A. and B. showing two kinds of tails found in the collection examined.

Discussion.—Annandale (1904) (in Muller 1892) regarded the character of the lobes of the tail of *Ptychozoon* as being important diagnostic character for distinguishing the species. Thus the specimens with regenerated tail from localities where both *P. kuhli* and *P. horsfieldi* (Gray) are found will pose a great problem to identify them correctly.

Distribution.—*P. kuhli* has been recorded from Java, Sumatra, Penang and Malay Peninsula, whereas *P. horsfieldi* has been recorded from Malay Peninsula and Borneo.

5. *Phelsuma andamanense* Blyth.

1860. *Phelsuma andamanense* Blyth, *J. Asiat. Soc. Bengal*, 29 : 108.

Material.—1 ex., Ferargunge, S. Andaman, Sept. 1950, 1 ex., South point, Port Blair, 17.xii.1975, *P. K. Maiti*.

Remarks.—There were two specimens in the collection but one of them is not traceable now. Length of the specimen - from snout to vent 35 mm. and vent to tail 38 mm., upper labials 10 and lower labials 8 in number, 14 lamellae beneath the fourth toe.

In the spirit, preserved specimen "green above with red or orange spots and marking" is absent. Head is black and body is deep gray or blackish, lower part of the body is brownish.

Distribution.—This speceis is endemic in Andaman.

6. *Gecko smithi* Gray

1842. *Gecko smithi* Gray, *Zool. Misc.*, p. 57.

Material.—1 ex., from Rengachang, S. Andaman, 12. iv. 1964 ; 1 ex., from Wright Myo, Mt. Harriet Range, S. Andaman, 12. iv. 1964, *B. S. Lamba*.

Remarks.—The character used by Smith (1935) in the key to the species that the 'rostral not touching the nostril' is not constant. In one example from the named specimens of Z S. I. collection the rostral is excluded from the nostril on one side but it is touchiug on the other side.

The head is longer than its breadth, dorsal tubercles are less robust and specimens are comparatively slender than the earlier named collection from the Andamans. The differences are may be due to their younger age.

Distription.—India : Andaman and Nicobar Island. Burma, Malacca and Indonesia.

Family 3 AGAMIDAE

7. *Goniocephalus subcristatus* (Blyth)

1860. *Tiaris subcristata*, Blyth, *J. Asiat. Soc. Bengal*, 29 : 109.

Material.—5 ex., Stn. 25, Sl. 928, Malaca Vill., Car Nicobar, 30. iii. 1959 ; 1 ex., Stn. 29, Kakana vill., Car Nicobar, 27. iii. 1959 ;

2 ex., Stn. 32, Sl. 1004, Sawai vill., Car Nicobar, 5. iv. 1959 ; 5 ex., Stn. 25, Sl. 769, Tamalu vill., Car Nicobar, 24. iii. 1959 ; 6 ex., Stn. 25, Sl. 739, Malaca vill., Car Nicobar, 23. iii. 1959 ; 4 ex., Stn. 30, Sl. 1039, Mus vill., Car Nicobar, 7. iv. 1959 ; 2 ex., Stn. 13, Interview Is., N. Andaman, 8. iii. 1959 ; 2 ex., Stn. 24, Sl. 653, Herberabad, S. W. of Port Blair, 15. iii. 1959 ; 2 ex., Stn. 6, Sl. 147, Long Is., M. Andaman, 23. i. 1959 ; 2 ex., Stn. 27, Sl. 1000, Passa Bridge, Car Nicobar, 5. iv. 1959 ; 2 ex., Interview Is., N. Andaman, 7. ii. 1959 ; *K. K. Tiwari* ; 2 ex., Stn. 2, Sl. 207, Bedealdalu, Ca. 32 Km. South of Tekoiluen, Little Andaman, 16.ii.1961 ; 1 ex., Stn. 2, Ranikhar, Port Blair, Andamans, 7. iii. 1961 ; 5 ex., Stn. 2 & 3, different localities of Little Andaman, from 14.ii.1960 to 20.ii.1961, *A. Daniel* ; 82 ex., Stn. 16, 21, 27, 34, 36, 42, 48, 51, 57, 60, 64, 74, 76, 78 & 86, different localities of S. Andamans, from 7. iii. 1964 to 16. iv. 1964, *B. S. Lumba* ; 3 ex., Ca. 2 km. S. E. of Teatop rest house, Car Nicobar, 10-15. iii. 1969, *T. D. Soota* ; 3 ex., Rutland Island, Ca. 6kms. from Chiriatapu & Write Mayo, S. Andaman, 19-25. vii. 1972. *A. K. Mondal* : 6 ex., Neil Island, S. Andaman, 11-12. iv. 1970, Camorta, 22. iii. 1970, Malaca vill., Car Nicobar, 4-8. iii. 1970 and 7 ex., from different localities of Car Nicobar from 17-30. v. 1971, *B. K. Tikader* ; 33 ex., from different localities of Car Nicobar from 29.ii. to 15. iii. 1972, *A. G. K. Menon* ; 2 ex., on way to Mt. Harriet, Port Blair, 30. xii. 1974, *S. K. Bhattacharya* ; 10 ex., from different localities of Andaman & Nicobar Islands from 17. i. to 22. ii. 1972, *A. K. Mukherjee*.

Remarks.—There are altogether 251 specimens in the collection. This species shows variation in respect of both scalation and colouration.

There are eight to nine upper and of the same number of lower labials. Scales in the mid-body varies between 87 to 98 scales. The maximum length from snout to vent is 100 mm. Tail is incomplete in most of the specimens. Stoliczka (1870) noted that *G. subcristatus* is true arboreal lizard, fairly common in the Andamans and are found in abundance in the Nicobar Islands.

Distribution.—Endemic in Andaman and Nicobar Islands.

8. *Calotes cristatellus* (Kuhl)

1820. *Agama cristatella* Kuhl, *Beitr. Zool. Vergel. Anat.*, 1 : 108.

Material.—2 ex., Mus vill., Car Nicobars, 28. iii. 1959, *K. K. Tiwari*.

Remark.—Scale counts (mid-body) 64-70, snout to vent 80 and 98 mm., tail 87 (broken) and 336 mm., upper and lower labials 8, 6 to 8. Upper dorsal scale-row pointing backwards and upwards.

In the living specimen, the body colour is bright green. In the preserved specimen the entire looks black.

Scale count round the body shows that these specimens come very near to the group of specimens from Amboyna. This species is closely allied to *C. jubatus* of Nicobars and Malayan Islands. One of the chief distinguishing characters between these two species could be found in the formation of the upper dorsal scale-rows. It has 6 to 10 upper dorsal scale-rows, where as in *C. jubatus* the dorsal scale-rows varies between 2 to 4.

Distribution.—This is a Malayan species extending its range in the Indo-Chinese subregion. It is found in the East Indian Archipelago except New Guinea, Nicobar Is. and Malay Peninsula. So far it is not recorded beyond 15°N in Burma.

9. *Calotes jubatus* (Dum. & Bibr.)

1837. *Bronchocela jubata* Dum. & Bibr. *Erp. Gen.*, 4 : 397.

Material.—1 ex., Camorta, 18. xi. 1970, B. K. Tikader

Remark.—Scale counts (Mid-body) 50, 4 compressed scales on the temple behind the supercillum. Upper labials and lower labials 9.

Distribution.—The Nicobar Islands, Java, Philippine Islands.

10. *Calotes versicolor* (Daudin)

1802. *Agama versicolor* Daudin, *Hist. Nat.*, Reptilia 3 : 395, pl. XLIV.

Material.—5 ex., from Diglipur about 16 km. N. E. of Cornwallis, N. Andaman, 2. ii. 1959, K. K. Tiwari ; 4 ex., from different localities of N. Andaman, 23-24. iv. 1971, B. K. Tikader.

Remarks.—Scales in the mid-body varies between 42 to 47, snout to vent 78 to 101 mm., tail imperfect.

C. versicolor and *C. andamanensis* are two closely related species, the former having two separated spines above the tympanum where as the spines are missing in the latter.

C. andamanensis has been described by Boulenger (1891, p.288-9) from a single male obtained from Andaman Is. Since then there has been no collection of this species from that area.

Anderson has recorded that “in the Andamans, *Calotes*

versicolor is found only in the Cocos-group, not south of the Table Island. It is essentially a mainland form and does not as a rule, penetrate into primaeval 'jungle.'

11. *Calotes mystaceus* Dum. & Bibr.

1837. *Calotes mystaceus* Dum. & Bibr., *Erp. Gen.*, 4 : 408.

Material.—1 ex., from Andaman, date and collector unknown.

Remarks.—The specimen agrees with the description of typical one mentioned in the literature excepting that the present specimen has 12 upper labials on one side and 13 on the other and the same number of lower labials. The scale round the body are 49 and the tail appears round.

Distribution.—This is an example in which though the distribution is Indo-Chinese but does not extend above lat. 12°N and also available in Andamans.

Family 4 SCINCIDAE

12. *Mabuya multifasciata* (Kuhl)

1820. *Scincus multifasciatus* Kuhl, *Beitr. Zool. Vergl. Anat.*, p. 126.

Material.—1 ex., from Malaca village, Car Nicobar, 24. iii. 1959 ; 1 ex., Tamalu village, Car Nicobar, 24. iii. 1959, K. K. Tiwari ; 2 ex., Car Nicobar, 4-11. xi. 1970, B. K. Tikader.

Remarks.—Kuhl did not mention about the type locality. Pope (1935) on the authority of Meitens (1930, p. 257), suggested that as Kuhl's specimen came from Java, it may be presumed that Java may be taken as type locality.

Distribution.—This species is widely distributed in the Indo-chinese and Malayan Subregions extending in the Nicobar Islands.

13. *Mabuya tytleri* (Theobald)

1868. *Scincus tytleri* Tytler Mss., Theobald, *Cat. Rept. Asiat. Soc. Museum*, p. 23.

Material.—1 ex., Entjie, 26 km. west of Tokoibuea, Little Andaman, 14. ii. 1961.

Remarks.—Scales round the mid body 26, lamellae under fourth toe 29. from snout to vent 133 mm., tail 278 mm.

This is the largest of all the Indian skinks. Stoliczka (1870, p. 169) received specimen of this species from Andaman Is., sent by Roepstroff, measured 20 inches in length of which tail was nearly 12 inches.

Distribution.—This species is peculiar to the Andaman Is. only.

14. *Mabuya andamanensis* Smith

1935. *Mabuya andamanensis* Smith, *Fauna. Brit. India*, Rept. & Amph. 2 : 271.

Material.—1 juv. ex., from forest at Kwate-tu-kwage, Little Andamans, 18. ii. 1961.

Remarks.—Scales in the mid body 30. Lamellae smooth, 27 in number beneath fourth toe.

Brown above with two distinct series of black spots one on either side of the vertebral line.

Distribution.—It is mainly confined to the Andamans, though some specimens have been collected from the Nicobar Islands.

15. *Riopa bowringi* (Günther)

1864. *Eumeces bowringii* Günther, *Rept. Brit. Ind.*, p. 91.

Material.—2 ex., Stn. 21, Andaman, 11. ii. 1927, collector unknown.

Remarks.—Present collection contains two specimens from Andamans without any name of collector which measures :

Length — 44+51 & 25+33 mm. ; scale round the body — 28 & 27 ; scale down middle of the back c. 55 ; upper labials — 7 and lamellae beneath the 4th toe — 14 & 12.

Colouration of the spirit preserved specimens differs markedly from the description. Instead of a dark brown or black dorsolateral stripe a white stripe is present in both the specimens and dorsally between the two stripes it is chocolate colour. In the smaller specimen a short fine line starts from the back of the head. The scales of tails are dotted with reddish colour. The scales are faintly tricarinate.

Distribution.—The species is known from both the Indo-chinese and Malayan subregions.

16. *Sphenomorphus maculatum* (Blyth)

1853. *Lissonota maculata* Blyth, *J. Asiat. Soc. Bengal*, **22** : 653.

Material.—3 ex., Swai, Car Nicobar, 22.ii.1972, *A. K. Mukherjee*.

Remarks.—In all the three specimens the scale round the body are 36. The characters and colouration of these specimens tallies with the description of the species given in the literature.

Distribution.—The Eastern Himalayas (Sikkim ; Darjeeling Dist. ; North Bengal) Assam ; the Andaman & Nicobar Islands ; S. W. Yunnan ; Burma and Thiland as far south as the Isthmus of Kra ; Combodia, S. Annam.

Family 5. VARANIDAE

17. *Varanus salvator andamanensis* Deraniyagala.

1944. *Varanus salvator andamanensis* Deraniyagala, *Spolia Zeylan.*, **24** (1) : 59-62, pls. 10-12.

Material.—1 ex., from Laitora, 26 km. north of Tokiobuea, Little Andaman, 14. ii. 1961 ; 1 ex., Bedcabdula, 32 km. south of Tokoibuea, Little Andaman, 16. ii. 1961 ; 1 ex., 26 km. west of Kwate-tu-kwage, Little Andaman, 20. ii. 1961, *A. Daniel* ; 1 ex., Manarghat, Mt. Harriet Range, S. Andamans; 24.iii.1964 ; 1 ex., Humphraygung, S. Andamans, 8. iii. 1964 ; 1 ex., Burma Nalah, S. Andaman, 19. iv. 1964, *B. S. Lamba*.

Remarks.—Abdominal scales varies between 93 to 95 in the transverse series. Tail compressed, with tooth crest above. Largest specimen a male from Little Andaman measures from tip to tail 1202 mm. and the smallest specimen from S. Andaman 360 mm.

The yellow dorsal body spots are absent and the specimens have a blackish appearance as in the type with few narrow, vertical black V-shaped marks extending on to the sides of the belly.

Deraniyagala (1944) after examining a series of specimens from Ceylon, Andaman, Nicobar, Indochina and Philippines, came to the conclusion that four different races of this species could be found with its range of distribution. The main consideration of its separation into different races was made on the basis of colouration i.e. yellow pigments (Ocelli) or bars present on the dorsal aspect of their bodies. According to him following are the four subspecies :

- 1) *Varanus salvator salvator* "forma typica" from Ceylon, type no. 40, Colombo Museum.

- 2) *Varanus salvator andamanensis* sp. nov. Burma, Indochina and Nicobar Is., type catalog no. 151a, Index No. 84.77, in the Museum d'histoire Naturelle, Paris.
- 3) *Varanus salvator andamanensis* sp. nov. Andaman Is., type no. 2176 of the Indian Museum, Calcutta.
- 4) *Varanus salvator philippinensis* sp. nov., the Philippines, type catalog no. 15.30, Museum d'histoire Naturelle, Paris.

Order SQUAMATA

Suborder SERPENTES

Family 6. TYPHLOPIDAE

18. Typhlops braminus (Daudin) Common blind snake

1803. *Eryx braminus* Daudin, *Hist. Nat. Rept.* 7 : 279: (based on Russell's *Ind. Serp.*, 1, p. 48, pl. XLIII)

Material.—1 ex. juv., from Choldari, S. Andaman 27. ii. 1959, K. K. Tiwari; 1 ex., Mayabandar, N. Andaman, 7. v. 1971, B. K. Tikader; 1 ex., Stn. 3 Monglutan, 20 km. S. W. of Port Blair, 18. xii. 1975, P. K. Maiti; 1 ex., Govt. Agricultural farm, 20 km. W. of Port Blair, 14. i. 1976, G. Ramakrishna; 1 ex., Port Blair, June, 1930, K. N. Das.

Remarks.—Scale rows round the body 20. Total length 130 mm. Stoliczka (1871) described a specimen from Andaman Is., as *T. andamanensis* but the type specimen is unfortunately lost. The main distinguishing factor between *braminus* and *andamanensis* lies in the following characters :—

*T. braminus**T. andamanensis*

Tail ending in a fine point.

Tail obtuse ending in a spine.

20 scales round the body, the diameter of the body 30-45 times into total length.

18 scales round the body; the diameter of which is contained 17-20 times into total length.

Transverse scale-rows on body 290-320.

Transverse scale rows on body.

This is the common Typhlops of the Oriental region.

Distribution.—The whole of India, The Andaman & Nicobar Island, Mexico; Sri Lanka; Indo-china; Hainan; Southern China; The Malay Peninsula and East Indian Is; Persia; Arabia and Africa.

Family 7. COLUBRIDAE

19. *Acrochordus granulatus* (Schneider)

1799. *Hydrus granulatus* Schneider, *Hist. Amph.*, 1 : 243.

Material.—1 ex., Stn. M. 18, opposite Chotagna village, Camorta, Nicobar, 24.iii.1970, B. K. Tikader.

Remarks.—The specimen has been assigned to the species having the following characters :

Nostril on the upper surface of the snout, presence of enlarged scale behind each nasal shield, 10 scales present between the eyes 98 scales round the middle of the body. Dark-gray with whitish cross bars. Head dark-gray with light spots above. Snout to vent 520 mm., vent to tail 65 mm.

Distribution.—The coasts of Sri Lanka, India, Nicobar Is. and Indo-china. The range is as far as Bombay in the West and Vietnam in the East.

20. *Ptyas mucosus* (Linn.)

1758. *Coluber mucosus* Linn., *Mus. Ad. Frid.*, 1 : 27, : 23

Material.—1 ex., from Junglighat, Port Blair, S. Andaman, 29. ii. 1964, B. S. Lamba.

Remarks.—Upper labials 8, 4th and 5th touching eye, dorsal-17, ventral 198, caudal 117 and anal 2.

The dark cross bars on the body which are prominent in the posterior part of the mainland specimens are absent in the present specimen and another important difference is that the labials and dorsal scales on its anterior side are not so prominently edged with black. Smith (1943) also noticed this colour variation in specimens from Chin Hills, Toungi, Mandalay and Andaman. Whether this colour variation is important enough and to be considered in these specimens to give them at least a sub-specific rank can not be just now settled unless some more specimens from Andaman are examined.

Distribution.—The whole of India including Andaman Is., Sri Lanka, Baluchistan, Afganisthan, Turkestan, The whole of Indo-China Yunnan and Southern China ; Hainan.

Genus *Dendrelaphis*

Dendrelaphis Boulenger, 1890, *F.B.I.*, p. 339.

Under mentioned key for the identification of the group of species

belonging to the genus *Dendrelaphis* which have common character of posterior 3 or 4 maxillary teeth enlarged than the other and the costal in 15 rows will help in distinguishing them from each other.

I. Last 3 or 4 maxillary teeth larger.

Stouter and usually larger than the others.

A. Scales in 15 rows.

a. Ventral scales not strongly enlarged, not broader at mid-body than the scales of the outer row.

1. Diameter of the eye not more than its distance from the nostril ; a black temporal stripe, V - 164-200, C-127-164—*Dendrelaphis ahaetulla ahaetulla* (Linn.) and on colour variation - *D. ahaetulla andamanensis* (Anderson).

2. Diameter of the eye more than its distance from the nostril ; no black temporal stripe. *D. granodoculis* (Boulenger)

b. Ventral scales strongly enlarged, broader at mid-body than scales of outer row.

1. Single loreal, V-186-211, C-135-159 ; no black flank stripe
... *D. cyanochloris* (Wall).

2. Single loreal, V-171-178, C-135-148 ; lateral bars in the neck
... *D. humayani* Tiwari & Biswas.

3. Two loreals, V-186-211, *D. bifrenalis* (Boulenger).

21. *Dendrelaphis ahaetulla andamanensis* (Anderson).

1871. *Dendrelaphis picta andamanensis* Anderson, *Proc. zool. Soc.*, p. 184

Material.—1 ex., Aberdeen, Port Blair, S. Andaman, 17. iii. 1952, H. C. Roy ; 1 ex., Ziitiji forest, 26 km. West of Tokoibuea, Little Andaman, 15. xi. 1961 ; 1 ex., near Bugene, 26 km. West of Kwate-tu-kwage, Little Andaman, 20.ii.1961, A. Daniel ; 1 ex., Cowriiaghat, South Andaman, 16. iv. 1964, B. S. Lamba ; 2 ex., Hermandergarh shore, Great Nicobar, 10. i. 1975, S. K. Bhattacharya.

Remarks.—Two colour forms viz. *Dendrelaphis a ahaetulla* and *Dendrelaphis a andamanensis* are known. The former is distributed in Bengal and also from the Eastern Himalayas to S. China and the latter is confined only in Andaman & Nicobar Islands.

The scale counts of the 4 specimens of each of the subspecies are noted below and in the comparative chart the specimens of *D. a. ahaetulla* are from the Indian mainland.

Dendrelaphis a. ahaetulla

Reg. No.	LOC.	D	V	C	Labial	Measurement in mm. body + Tail—Total
7686	Assam	15	184	134	9	665+350—1015
7701	Assam	15	193	122	9	765+340—1105
7886	Chittagong Bangladesh	15	186	140	9	505+290—795
7687	Assam	15	164	57 damaged	9	555+150—710

Dendrelaphis a. andamanensis

20916	L. Andaman	15	185	135	7	660+330—990
2084	Port Blair	15	189	113	7	815+350—1165
21226	S. Andaman	15	189	138	7	755+375—1130
20917	L. Andaman	15	188	137	7	690+355—1045

Over and above the colour differences following are the main differences between the two sub-species.

	<i>D. a. ahaetulla</i>	<i>D. a. andamanensis</i>
Shape of head	More or less elliptical more deep.	Gradally narrower laterally from head to snout, less deep.
Loreal.	Rectangular and broader.	Narrower.
Preocular.	Higher.	Not so high.
Colour.	A prominent black stripe start from behind the nostril reaches up to neck, then a short gap, starts again lateally reaches up to vent.	Without any stripe, if head colour not strong, a narrow stripe is prominent from the nostril to the neck. Head is bluish or bluish black.
Scale count	Ventral 164-200 Subcaudal 185-189.	Ventral 122-164 Subcaudal 133-138.

Distribution.—The species is endemic to Andamans.

22. *Dendrelaphis humayuni* Tiwari & Biswas

1973. *Dendrelaphis humayuni* Tiwari & Biswas, *J. zool. Soc. India*, Calcutta, **25** (1 & 2) : 57-63.

Material.—1 ex., Magarnala, Campbell Bay, Great Nicobar, 7. i. 1975, S. K. Bhattacharya.

Remarks.—Dorsal 15 : 15 : 9, Ventrals 171, Caudals 57 (incomplete), Anal 2.

The ventral scale count in other specimens of the species examined (Biswas & Sanyal 1977) ranges between 172-178 but the count in the specimen examined is 171. So the ventral scale count now ranges between 171-178. The characteristic white bars on the side of the neck are also present in the specimen.

Distribution.—Nicobar group of Islands.

23. *Lycodon aulicus capucinus* Boie

1827. *Lycodon capucinus* Boie, Isis, p. 551 (based on Ruseil ii, pl. xxxvii)

Material.—2 juv. ex., Port Blair, C. M. P's Quarter, 3. iv. 1952, collector not known ; 2 adult ex., Aberdeen, Port Blair, S. Andamans, 24. iii. 1952, H. C. Roy ; 1 ex., Burmah Nallah, S. Andamans 15. iv. 1964, B. S. Lamba.

Remarks.—Total length of two adult specimens (Collected on 24. iii. 1952) 475 and 565 mm. tail 90 and 105 mm.

The colouration of adult specimens is uniform brown above having slight traces of reticulation on the fore part of the body but in the juvenile specimens white reticulation is well marked.

Distribution.—Out of the two races of the species *aulicus*, *L. a. aulicus* (Linn.) is distributed in Sri Lanka, India, Nepal and Burma, north of lat. 17°, whereas *L. a. capucinus* is confined to Burma south of lat. 24° Siam, S. Indo-china, Andaman and Nicobars Islands.

24. *Xenochrophis piscator melanozostus* (Boie)

1826. *Tropidonotus melanozostus* Boie, Isis, p. 206.

Material.—2 ex, Port Blair, found in the compound of C. M. P's Bunglow, 21. iii. 1952 ; 1 ex., Aberdeen, Port Blair, 24. iii. 1952, H. C. Roy ; 5 ex, Wright Myo, Mt. Harriet range, 28. iii. 1964. to 1. iv. 1964 ; 3 ex., Mannarghat, Mt. Harriet range, 30. iii. 1964 ; 1 ex., Katan, Baratang, 21. iii. 1964 ; 2 ex., Rajatgarh Baratang, 19. iii. 1964 ; 1 ex., Cowriaghat, 11. iv. 1964 ; 1 ex., Humphrygung, S. Andaman, 8. iii. 1964. B. S. Lamba ; 1 ex., Chouldhari. S. Andaman, 1. i. 1975, S. K. Bhattacharya ; 1 ex., Port Blair, 8. vi. 1976, A. Bayley *de castro*.

Remarks.—Following are the measurements and scale count of specimens belonging to the three sub-species of *X. piscator* in the collection of Zoological Survey of India.

Above chart shows that beside the typical *X. piscator* there are distinct 4 more races in the Indo-Chinese and Indian subregions. The specimens at present grouped as *melanozostus* from Andaman are two distinct varieties which differ in colouration as well as scale count. Therefore, according to the writers the specimens which differ from the typical *melanozostus*, may possibly be classified under a new sub-specific rank but some more specimens should be examined before coming to a definite conclusion.

25. *Cerberus rhynchops* (Schneider)

1799. *Hydrus rhynchops* Schneider, *Hist. Amph.*, 1 : 246.

Material.—4 ex, Humphrygung ; S. Andaman, 7. iii. 1964, 2 ex., from Mannarghat, 2. ii. 1964 and 3. iv. 1964, B. S. Lamba.

Remarks.—Frontal broken into smaller scales, loreal in contact with 1st, 2nd, 3rd or 4th labials and internasal (this character is variable) ; 9 upper labials, 5th and 6th below eye and separated by subocular, last 2 or 3 scales horizontally divided ; body scales strongly keeled.

Distribution.—It occurs in sea coasts, estuaries and rivers and it is particularly common in East Indian estuaries. This snake is equally well adapted in Sea as well as fresh water rivers.

Family 8. HYDROPHIIDAE

26. *Laticaudata laticaudata* (Linn.)

1758. *Coluber laticaudatus* Linn. *Syst. Nat.* (10th ed.) p. 222.

Material.—1 ex., near Aberdeen Jetty, Port Blair, S. Andaman 18. v. 1951, collector unknown.

Remarks.—Measurement of the present specimen from snout to vent 335 mm. and vent to tail 47 mm. Dorsal 19, Ventral 236, Caudal 42.

The specimen is beautifully coloured with black and a yellow alternating bands. Most of the black bands are complete excepting 5 bands in the middle of the body. There are 55 black rings on the body and 8 on the tail. The median elongated patch of yellow on the jaw is also absent. In this species colour bars are narrower and more in number than that of *L. colubrina* (Schneider).

There are two specimens in the Z.S.I. collection with the following details.

Xenochrophis piscator melanozostus (Bioe), Two colour forms

Reg. No.	Ventrals	Caudals	Lenth in m.m. Snout to Vent + Vent to tip of tail	Locality	Remarks
21216	140	59	665+217	Mannarghat, S. Andaman	140-145, 59-89 ; resembles large spotted Indian form or the vertebral series of spots united to form a sinuous stripe on the fore part.
21221	145	89	275+155	Humphrygung, S. Andaman	
20857	136	87	570+260	Aberden, Port Blair S. Andaman	
20858	135	74	450+145	Port Blair (C.M.P's Camp)	135-139, 59-89 with 5 longitudinal lines.
21214	138	74	640+245	Wright Myo, S. Andaman	
21214	137	86	360+180	„	
21215	139	89	540+280	„	
21215	137	59	270+175	„	
21220	138	68	550+235	Cowriaghat	

X. piscator piscator (Schneider)

7368	142	92	165+72	Samogaoting, Assam	140-151, 61-92 ; smaller black spots arranged quincancially, ventral edged with black spots may be broken up, 6 to 7 series of spots.
7367	148	68	855+262	„	
4687	151	83	735+255	Haliakandi, S. Cachar	
4688	152	61	515+182	„	
4024	140	37 (damaged)	575+145 (damaged)	Sibsagar, Assam	
4025	151	85	685+255	„	

X. piscator asperrimus (Boulenger)

11393	141	83	145+55	Gallee, Sri Lanka	136-141, 83-85, with two series of district large roundish or rhomboedal spots.
8670	139	85	283+115	Sri Lanka	
7369	141	83	925+268	20 mls. from Gallee, Sri Lanka	
7366	136	85	517+250	Gallee, Sri Lanka	

Reg. No.	Locality	No. of Ventral	No. of caudal	No. of colour bars
8286	Penang, Malay Peninsula	229	32	42+4
8289	Tolly's Nallah Calcutta	235	35	54+6

Distribution.—From the Bay of Bengal and the Seas of South Japan to the coast of Australia and islands of Oceania.

27. *Laticauda colubrina* (Schneider)

1799. *Hydrus colubrinus* Schneider, *Hist. Amphib.*, i, p. 238.

Material.—1 ex., Phonix Bay, Port Blair, S. Andaman, 14.iii. 1969, T. D. Soota.

Remarks.—In two adult specimens from the Car Nicobar, the body above is bluish gray and yellowish below 35 and 36 black bands on the body and 3 or 4 on the tail but in the Andaman specimen which appear to be young, the bluish body colour is absent and with 32 brown bands on the body. In all the three specimens black or brown patch on the head starts between eyes extending backwards which coterminate with the bands behind the eyes and also connects laterally with 1st body head.

Distribution.—Bay of Bengal, Calcutta, Ramri Island off the coast of Arakan, Andaman & Nicobar Islands.

28. *Pelamis platurus* (Linn.)

1766. *Anguis platurus* Linn. *Syst. Nat.* (ed. 12) 1 p. 39.

Material.—1 ex., Coral reef at Otirubora, ca : 18 km. West of Ingoie, Little Andaman, 23. ii. 1961, A. Daniel.

Remarks.—Colour of this species is extremely variable. As many as 7 colour patterns commonly could be seen. Smith (1943, p.476) has given short description of the various colour patterns generally met with. The present specimen confirms to the pattern as shown in No. 6. It is yellow with black dorsal stripe and spots on the sides and belly posteriorly.

For the sake of comparison scale count and measurements of three specimens of different localities and of colour variants with present specimen are mentioned in the table below :

Tailor (1950) recognises three main colour patterns in the specimens

Pelamis platurus (Linn.)

Reg. No.	No. of regular ventrals	No. of irregular ventrals	Caudal	Length of specimen S. to V. + V. to T. in mm.	Scales round the body		Locality
					thickest part	Near head	
14448	389	18	59	230+85	60	52	Puri, Orissa.
21128	310	35	56	545+59	56	48	Tanjore coast Madras
8284	305	24	55	268+37	54	47	Sri Lanka
20920	340	36	52	250+37	56	50	Little Andaman

of Ceylon coast and is willing to accept three species correlating three groups of scale counts. There may be a scope of subspecific distinction within this species but this should be supported by a series of specimens from different localities.

Distribution.—It is most widely distributed of all the sea snakes. It is a common species in the Indo-Australian Seas ; it extends north to Southern Siberia and South to Tasmania. Its eastward range crossed the pacific and established itself on the west coast of Central America and also known from all parts of the coast of East Africa. Recorded also from the Red Sea.

Family 9. VIPERIDAE

29. *Trimeresurus purpureomaculatus andersoni* (Theobald)

1868. *Trimeresurus andersoni* Theobald, *Cat. Rept. Asiat. Soc. Mus.*, p. 75.

Material.—1 ex., Rajatgarh, Baratang, S. Andaman, 19. iii. 1964 ; 1 ex., Cowriaghat, S. Andaman, 8.iv.1964, B. S. Lamba ; 2 ex., (one juv.), Car Nicobar, donated by the Govt. Hospital ; 2 ex., Little Andaman, 14. ii. 1961, A. Daniel ; 1 ♂, Port Blair, S. Andaman, 8.iv.1926, A. Bayley de Castro.

Remarks.—In the specimens under report the scale round the body are 23 excepting one (Reg. No. 20918) in which it is 25, Ventrals 168-181, Caudal 49-71.

The Andaman race *T. p. andersoni* differs from the typical form *T. p. purpureomaculatus* by having 23 to 25 scale round the body and by the absence of green colouration of the head. The colouration of these specimens conform to the colour form as is found in this subspecies. The scale count and measurement of the specimens are mentioned in the chart (see page 278).

Distribution.—Known only from Andaman and Nicobar group of Island.

30. *Trimeresurus labialis* (Fitzinger)

1861. *Bothrophis labialis* Fitzinger, *Sitzb. Akad. wiss. wien.*, 42, p. 411.

Material.—1 ex., Tee-top, Car Nicobar, 1. iii. 1972 ; 1 ex., Parka, c. 5 km. N. E. of Malaca Vill., Car Nicobar, 14. ii. 1972, A. K. Mukherjee.

Remarks.—Colouration of one specimen out of four is uniform dark brown, two are with dark brown spots transversely arranged and

Sl. No.	Reg. No.	Dorsal	Ventral	Caudal	Measurement S. to V. + V to T. in mm.	Locality	Remarks
1.	20918	25	184	23 damaged	810+80 broken	From Jungle 1 mile east Latitora	1 ex.
2.	20856	23	177	62	620+150	Car Nicobar	„
3.	20919	23	176	70	528+135	From the jungle near Bugena 10 mile W. of Kwate-tu-Kwate Little Andaman.	1 ex.
4.	20853	23	168	49	475+85	Malaca village, Car Nicobar	„
5.	21229	23	181	56	335+92	Rajatgarh, Baratang, S. Andaman.	„
6.	20897	23	176	68	383+120	Port Blair, S. Andaman	„
7.	20855	23	174	52	325+60	Malaca Vill. Donated by Govt. Hospital Car Nicobar	1 ex. Juv.
8.	20854	23	170	53	220+39	„	„ „

in the 4th a light streak starting from back of the eye continues along the side of head, neck and body. There are much variations in respect of colouration and scale arrangement in this species.

Distribution.—Known only from Nicobars.

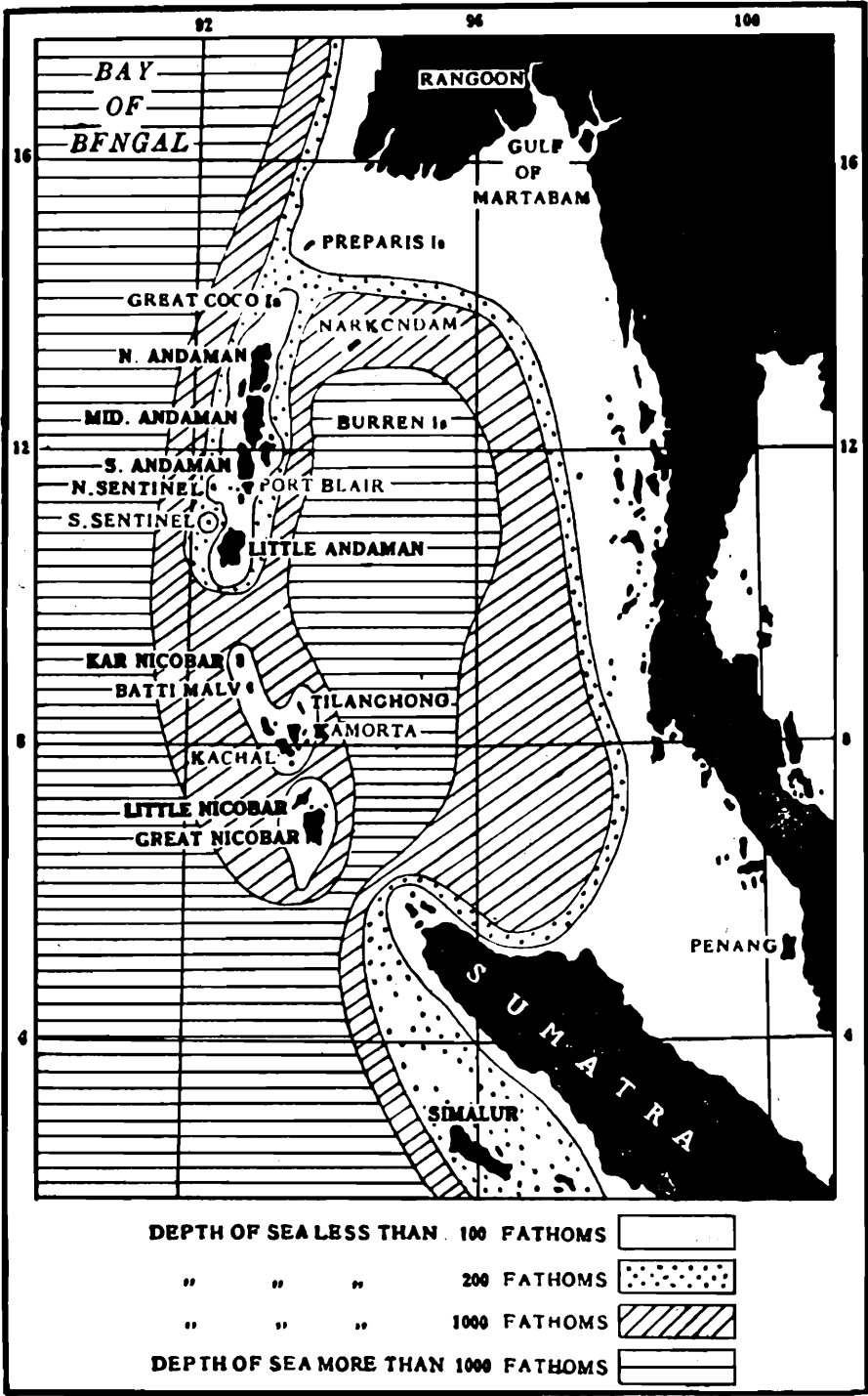
ZOOGEOGRAPHY

Andaman and Nicobar groups of island are separated by 10° channel and the distance between Little Andaman and Car Nicobar is 125 km. This group of islands form a continuous chain of submarine mountains sprawling in crescent between Cape Negrais of Burma and Achin Head of Sumatra, the latter being about 145 km. away from the southern most point of Great Nicobars, while Cape Negrais of Burma is nearly 193 km. away from the Port Blair.

The entire chain is nearly 1126 km. long and covered by evergreen rain forests except where they have been destroyed by men. These islands are situated within the tropical monsoon climate receiving a mean annual rainfall 325 cm. adequately spread over a period of 8 months between May and December ; comparatively drier period is between January and April.

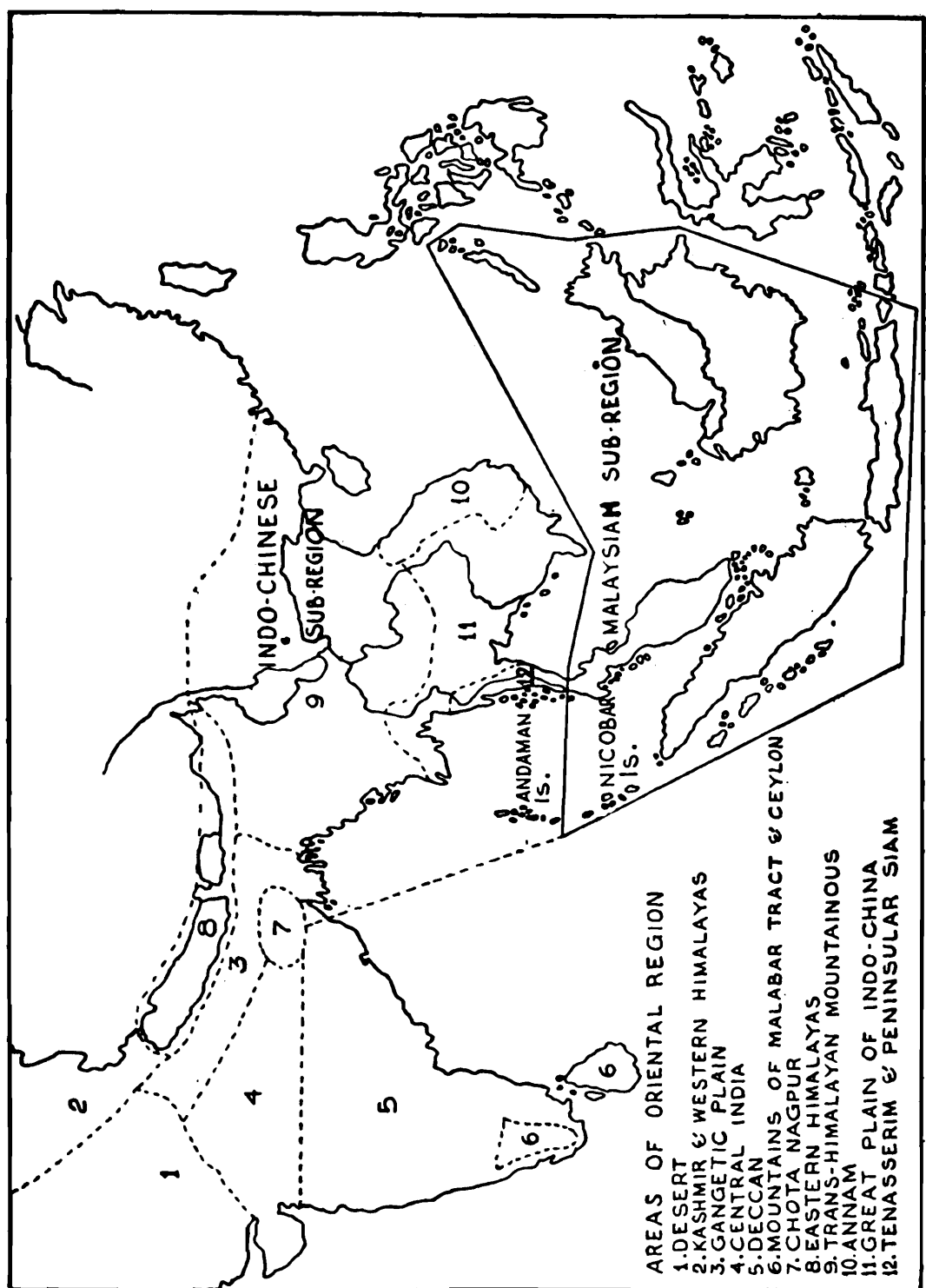
The great mountain chain which a continuation of the Arakan Hills at Burma and links on at southern end with the mountains of Sumatra is supposed to be a part of the Great Alpine-Himalayan system that was gradually thrown up during the Miocene and early Pliocene periods. According to Karunakaran (1962, 1967) the geologically quite young mountain ranges of the Andaman and Nicobar group of island were formed at the expense of a narrow but deep oceanic furrow in upper Mesozoic about 100 million years ago, The end of deposition of the sediment was marked by a tremendous earth movement sometimes in upper Oligocene, about 30 million years ago and thus long mountain ridges, a few above sea level but mostly submarine, developed and thus the embryo of the present day archipelago came into existence. Another very important earth movement had overcome the deposition in this belt and the rocks were thrown into several folds and thrusts by which the present day configuration of these islands (Text-fig. 2) were more clearly established. Since then subsequent upheaval of this belt took place in several strides and these islands have undergone several periods of partial submergence and elevation, but the terrestrial fauna in Miocene or Pliocene was never completely wiped out. This process of geological changes are continuous even in present time. Many a loose shell and sand beach are raised which cap certain hills and hummocks from where the sea had receded in very recent years.

Geographical proximity and the past geological connection with Andamans group to the Burma of Indo-chinese subregion (Text-fig. 3)



Text-fig. 2. Hydrographical map of the sea around the islands of Andaman and Nicobar and near the mainland. (After Boden Kloss)

reflect primarily Indo-chinese elements in its distribution and through Sumatra, Malayan distribution in the Nicobar group of island. But there is no rigid demarcating line about these two types of distribution which has been pointed out by Stoliczka (1870) while commenting on the reptile fauna of Nicobars — “Andaman and Nicobar will show a great similarity to each other ; several species of lizards and snakes are common to both, and the whole fauna greatly resembles the



Text-fig. 3. Map of Oriental Region demarcating the two sub-regions and the areas. (After Boden Kloss & M. A. Smith).

Malayan, gradually passing into Burmese fauna” More or less same view has been expressed by Smith (1931). “The Andaman contain an impoverished Burmese fauna ; that of the Nicobar approximates to the Sumatran type” But while considering the zoogeography of the Ophidian fauna of “British India” Smith (1943) has included Andaman and Nicobar in the Indo-chinese subregion and it has been

shown in the list of Ophidian species occurring in this region that most of the species which occur in Andamans and Nicobar belong both to the Indo-chinese and Malaysia excepting three species i. e., *Ptyas mucosus*, *Naja naja kaouthia* and *Ophiophagus hannah* which are Indo-chinese only in distribution and also absent from Nicobars.

One faunal peculiarity for Nicobar is the predominance of *Calotes* over other reptiles and in respect of Great Nicobar the total absence of *Trimeresurus* though this genus occur in Nicobar and Sumatra islands. Considering the general distribution of reptile in the surrounding countries it may be presumed that the species *Cyclemy dhor* (Gray), *Hemidactylus garnoti* Dum. & Bibr., *Goniocephalus grandis* (Gray), *Natirx chrysarga* (Boie), *Dendrelaphis caudolineatus* (Gray), *Simotes ootolineatus* (Schn.) and *Boiga cynodon* (Boie) may be also available in these islands.

Distribution of lizards in this region in relation with the Indian mainland as mentioned by Smith (1935) which has a close affinity of Indo-chinese and Malayan lizards with East India and South Indian including Andaman and Nicobars excepting the Northern part of the Indian Peninsula is important for zoological distribution of South East Asia.

The *Varanus salvator* occurring in Indo-china, East India, Andamans and Sri Lanka but absent from the Northern India is an example in support of the above mentioned view. The same kind of distribution can be seen in case of *Dendrelaphis ahaetulla*. In both the above mentioned species occurring in Andaman and Nicobars further subspeciation has been reached due to long isolation. The distribution of polytypic Cat snake genus *Boiga* of these region are interesting. *B. Ceylonensis* Gunther has been recognised by Smith (1943) into four forms i. e., *ceylonensis*, *beddomei*, *nuchalis* and *andamanensis* due to there very close similarity though other authors have recognised them as distinct species. In this instance the subspeciation has reached further to bring them into the standard closer to species rank. The *Bungurus andamanensis* which belong to the *B. caeruleus* species complex is an appropriate example. This process of speciation is complete between *Sphenomorphus maculatus* and *S. dussumieri*, the two skinkid lizards originated from the same stalk. Former is distributed in Trivandrum and Ceylon and the latter is Indo-chinese (including East India and Andaman and Nicobars).

Hora & Jayaram (1949) tried to explain the above mentioned distribution in the Indian subcontinent by the Satpura Hypothesis which stipulates that the Malayan fauna and flora distribution took place from Assam Himalayas in the East through Vindhya-Satpura ranges to the Western Ghats in the West of Peninsular India. The overall zoogeographical distribution of this part of South-East Asia can only be explained by taking into consideration that branches of these distribution in early ages started from Chinese and Indo-chinese

region through Burma bifurcating one subbranch came in Indian mainland through Assam, Bengal and Vindhya-Satpura ranges to South India and another from Burma to the Andamans by its land connection which existed at that time. The extreme limit of the branch through Indian mainland reached even upto Sri Lanka which has been expressed very aptly by Annandale (1904) — "It was seen from this list that the Ophidian fauna of the Islands has close affinities with that of Burma and Malaya, while there is possibly less obvious connection with Ceylon" The other main branch from Malaya came to Sumatra and from there to Nicobars uniting ultimately in these islands with the branch that came from Burma.

After reaching the Malayan fauna to Nicobar Islands it mixed up with Indo-chinese fauna coming from the Burma but the branch that came to India from Burma was an extension of Indo-chinese and Malayan fauna in the fauna of Indian subregion as for example *Draco* and *Cylindrophis*.

After the completion of above mentioned distribution the land connection of these islands and with the mainland were severed and due to geographical isolation for long periods we find several new subspecies or species indigenous to Andaman and Nicobar islands. This is well explained when we see that out of 74 species so far enlisted from different islands, 22 are indigenous, even some species are confined only within the limit of that island only.

A careful analysis of reptile fauna of Andaman-Nicobars and Sri Lanka islands shows that apart from Indian relationship, these islands possess one group of reptiles (*Phelsuma* and *Gehyra*) peculiar to Java and Sumatra (*Lepidodactylus*) Therefore, as the available evidence favouring western affinities is very less than the eastern so according to Deraniyagala (1939) the western connection was the first to be interrupted

SUMMARY

This report is on the reptile fauna of Andaman and Nicobar Islands and contains notes on 30 species which were collected by survey parties of Zoological Surves of India during the period of 1930-1976. There is also a note on zoogeographical distribution with a comparative distributional chart of reptiles which are known to occur in the area.

TABLE 1. Species recorded from Andaman, Nicobar and Great Nicobar groups of Islands and their distribution.

Species	Andaman Is.	Nicobar Is.	Great Nico- bar Is.	Sumatra and Adjacent	Indigenous	Distribution outside the area
Order Crocodilia						
Fam. Crocodilidae						
1. <i>Crocodilus porosus</i> Schneider	+		+		No	
Order Testudines						
Sub-order Thecophora						
Fam. Chelonidae						
2. <i>Eretmochelys imbricata squamata</i> Agassiz						Marine
3. <i>Chelonia mydas</i> (L.)						Marine
Fam. Emydidae						
4. <i>Cuora amboinensis</i> (Daudin)	—	+	+	+	No	Indo-chinese and Malaysia
Order Squamata						
Sub-order Sauria						
Fam. Gekkonidae						
5. <i>Cyrtodactylus rubidus</i> (Blyth)	+	—	+	—	Yes	— (closely related with other species of Malayan subregion)
6. <i>Cnemaspes kandiana</i> (Kelaart)	+	—	+	+	No	Sri Lanka, S. India, Malay Archi.
7. <i>Gehyra mutilata</i> (Wiegmann)	+	+	—	+	No	E. Afrika, S. India, Sri Lanka, Indo-chinese.

Table 1. Contd.

8. <i>Hemidactylus frenatus</i> Schlegel	+	+	+	+	No	Indo-chinese, Malaysia, Indo-Australia.
9. <i>Hemiphyllodactylus typus typus</i> Bleeker	—	—	+	+	No	Sri Lanka, E. India Archi, Burma.
10. <i>Gekko gecko</i> (Linnaeus)	+	—	+	—	No	Indo-chinese extending, Malaysia.
11. <i>Gekko smithi</i> Gray	+	—	—	+	No	Malaysia, Burma, India.
12. <i>Lepidodactylus lugubris</i> Dum & Bibr.	+	(?)	+	(?)	No	Sri Lanka, E. India Archi, Malay Penni.
13. <i>Cosymbotus platyrus</i> (Schneider)	—	—	+	—	No	Sri Lanka, Indo-chinese extending Malaysia, E. Indian Archi.
14. <i>Ptychozoon kuhli</i> Stegnerger	—	+	—	+	No	Malaysia.
15. <i>Phelsuma andamanense</i> Blyth	+	+	—	—	Yes	—
Fam. Agamidae						
16. <i>Goniocephalus subcristatus</i> (Blyth)	+	+	—	—	Yes	— (very common)
17. <i>Calotes cristatellus</i> (Kuhl)	—	+	+	+	No	Malayan extending to Indo-chinese, E. India Archi.
18. <i>Calotes jubetus</i> (Dum & Bibr.)	—	+	—	—	No	Java, Philippine.
19. <i>Calotes danieli</i> Tiwari & Biswas	—	—	+	—	Yes	—
20. <i>Calotes versicolor</i> (Daudin)	+	—	—	—	No	Afghanistan, Sri Lanka, Indo-chinese, N. Malay Penni.

Table 1. Contd.

21. <i>Calotes mystaceus</i> (Dum. & Bibr.)	+	+	—	—	No	Indo-chinese
22. <i>Calotes calotes</i> (Linnaeus)	—	+	—	—	No	Sri Lanka, S. India.
23. <i>Calotes andamanensis</i> Boulenger	+	—	—	—	Yes	—
Fam. Scincidae						
24. <i>Mabuya multifasciata</i> (Kuhl)	—	+	—	+	No	Indo-chinese extending to Malaysia, E. India Archi, New Guinea.
25. <i>Mabuya andamanensis</i> Boulenger	+	+	—	—	Yes	—
26. <i>Mabuya rudis</i> Rafinesque	—	—	+	+	No	Borneo
27. <i>Mabuya tytleri</i> (Theobald)	+	—	—	—	Yes	—
28. <i>Mabuya rugifera</i> (Stoliczka)	—	+	—	+	No	Malay Penni., Java, Borneo
29. <i>Dasia nicoberensis</i> Biswas & Sanyal	—	+	—	—	Yes	—
30. <i>Dasia olivacea</i> Gray	+	+	+	+	No	Indo-chinese and Malaysia
31. <i>Sphenomorphus maculatum</i> (Blyth)	+	+	—	+	No	Indo-chinese
32. <i>Sphenomorphus quadrivittatum</i> Peter	—	—	+	+	No	Malaysia, Philippines, Calabes.
33. <i>Leiopisma macrotympanum</i> (Stoliczka)	+	—	—	—	Yes	—
34. <i>Riopa browringi</i> (Gunther)	+	—	—	—	No	Indo-chinese, Malayan, Philippines
Fam. Dibamidae						
35. <i>Dibamus novae-guineae</i> Dum. & Bibr	—	+	+	—	No	Malay Penni. and Archi., New Guinea.

Table 1. Contd.

Fam. Varanidae						[V. salvator]
36. <i>Varanus salvator andamanensis</i> Deraniyagala	+	+	+	+	Yes	(Indo-chinese, E. Indian Archi., N. Australian, Sri Lanka)
Serpentes						
Fam. Typhlopidae						
37. <i>Typhlops braminus</i> (Daudin)	+	+	—	+	No	Oriental Region, Africa, E. India Is. and Is. of Indian Ocean.
38. <i>Typhlops oateri</i> Boulenger	+	—	—	—	Yes	—
39. <i>Typhlops andamanensis</i> Stoliczka	+	—	—	—	Yes	—
Fam. Xenopeltidae						
40. <i>Xenopeltis unicolor</i> Reinwardth	+	—	—	+	No	Malaysian extending to Indo-chinese
Fam. Boidae						
41. <i>Python reticulatus</i> (Schneider)	—	+	+	+	No	Indo-chinese and Malaysia
Fam. Colubridae						
42. <i>Acrochordus grannulatus</i> (Schneider)	—	+	—	—	No	Indo-chinese, Malaysia (Marine)
43. <i>Ptyas mucosus</i> (L.)	+	—	—	—	No	India, Indo-chinese extending to Oriental region and Malay Penni.
44. <i>Oligodon woodmasoni</i> (Sclater)	+	+	—	—	Yes	—
45. <i>Elaphe parasina</i> (Blyth)	+(?)	—	—	—	No	Indo-chinese extending to Malaya Penni.
46. <i>Elaphe flavolineata</i> (Schlegel)	+	+	—	+	No	Malayan reaching, Indo-chinese (Tenasserim)
47. <i>Elaphe oxycephala</i> (Boie)	+	+	—	+	No	Indo-chinese, Malay Penni.

Table 1. Contd.

48. <i>Liopeltis nicobariensis</i> (Stoliczka)	—	+	—	—	Yes	—
49. <i>Dendrelaphis ahaetulla andamanensis</i> (Anderson)	+	—	+	—	Yes	—
50. <i>Dendrelaphis cyanochloris</i> (Wall)	+	+	—	—	No	Indo-chinese
51. <i>Dendrelaphis humayuni</i> Tiwari & Biswas	—	—	+	+(?)	No	(Penang and Malacca) Probably Malaysia.
52. <i>Dendrelaphis tristis</i> (Daudin)	—	—	+	—	No	Sri Lanka, India(excepting Assam, Rajasthan, M. P.)
53. <i>Lycodon tiwarii</i> Biswas & Sanyal	+	+	—	—	Yes	—
54. <i>Lycodon aulicus capucinus</i> Boie	+	—	—	—	Yes	— (<i>L. aulicus</i> , Indo-chinese, Malaysia)
55. <i>Sibynophis bistrigatus</i> (Gunther)	—	+(?)	—	—	No	Burma
56. <i>Xenochrophis nicobarensis</i> Sclater	—	+	—	—	Yes	—
57. <i>X. piscator piscator</i>	+	—	—	—	No	India, Java.
58. <i>X. piscator melanzostus</i> Boie	+	—	—	—	No	India, Java.
59. <i>X. trianguligera</i> (Boie)	—	—	+	+	No	Malaysia extending to Indo-chinese.
60. <i>X. stolata</i> (L.)	+	—	—	—	No	Indo-chinese, Sri Lanka, India up to N.W.F.P. of Pakistan.
61. <i>Chrysopelea paridisi</i> Boie	+	—	—	+(?)	No	Malay Penni., Borneo, Sumatra, Java, Philippine.

Table 1. Contd.

62. <i>Boiga dendrophilus</i> (Boie)	—	—	+	+	No	Malaysian
63. <i>Boiga andamanensis</i> Wall	+	—	—	—	Yes	— (Nr. <i>B. ceylonensis</i> , Sri Lanka, S. India)
64. <i>Boiga ochracea walli</i> Smith	+	+	—	—	No	Burma
65. <i>Cerberus rhynchops</i> (Schneider)	+	+	—	+	No	Indo-chinese, Malaysia, Marine
66. <i>Fordonia leucobalia</i> (Schlegel)	—	+	—	—	No	Indo-chinese, Malaysia, Marine
67. <i>Cantoria volacea</i> Girard	+	—	—	—		Indo-chinese, Malaysia, Marine
Fam. Elapidae						
68. <i>Ophiophagus hannah</i> (Cantor)	+	—	—	+	No	Indo-chinese, Malay Penni. & Archi, Philippine, India.
69. <i>Naja naja kaouthia</i> Lesson	+	—	—	—	No	India, Indo-china
70. <i>Bungarus andamanensis</i> Biswas & Sanyal	+	—	—	—	Yes	— (Previously <i>B. caeruleus</i>) (India and Sri Lanka)
71. <i>Laticauda laticaudata</i> (L.)	—	+	—	?	No	From Bay of Bengal and seas S. of Japan, Coast of Australia, Islands of Oceania, Marine.
72. <i>Laticauda colubrina</i> (Schneider)	+	+	—	?	No	Rare in Indian and Indo-chinese water, common at Singapore, Marine.
73. <i>Trimeresurus contori</i> Blyth	+(?)	+	—	—	Yes	—
74. <i>Trimeresurus purpureomaculatus andersone</i> Theobald	+	+	—	—	Yes	—
75. <i>Trimeresurus albolabris</i> Gray	+	+	—	+	No	North and Central India, Indo-chinese, Malaysia.
76. <i>Trimeresurus labiatis</i> (Fitzinger)	+(?)	+	—	—	Yes	—

REFERENCES

- ANNANDALE, N. 1904. Contribution to oriental Herpetology. I. The lizards of Andamans, with a description of new Geko and note on the reproduced tail of *Ptychozoon homolocephalum* *J. Asiat. Soc. Beng.*, Calcutta, **73** (2) : 12-22.
- ANNANDALE, N. 1905. Addition to the collection of oriental snakes in the Indian Museum. II. Specimens from Andaman and Nicobars. *J. Asiat. Soc. Beng.*, Calcutta, (N.S.), pt. I, pp. 173-176.
- BARBE, REV. P. 1846. Notes of Nicobar Islands. *J. Asiat. Soc. Beng.*, Calcutta, **15** : 344-366.
- BARBOUR, T. 1912. A contribution to the zoogeography of East Indian Islands. *Bull. Mus. comp. Zool.*, Harvard, Cambridge, **44** : 1-168.
- BENNETT, J. W. 1843. "*Ceylon and its capabilities*", p. 274.
- BISWAS, S. and SANYAL, D. P. 1965. A new species of Wolf-Snake of the genus *Lgcodon* Boie [Reptilia : Serpentes : Colubridae] from the Andaman and Nicobar Islands. *Proc. zool. Soc.*, Calcutta, **18** : 137-141.
- BISWAS, S. and SANYAL, D. P. 1977a. Notes on the Reptilia collection from the Great Nicobar Island during the Great Nicobar Expedition 1966. *Rec. zool. Surv. India*, Delhi, **72** : 107-124.
- BISWAS, S. and SANYAL, D. P. 1977b. A new species of skink of the genus *Dasia* Gray, 1889 (Reptilia : Scincidae). *J. Bombay nat. Hist. Soc.*, Bombay, **74** (1) : 133-136.
- BISWAS, S. and SANYAL, D. P. 1978. A new species of Krait of the genus *Bungarus* Daudin, 1803 [Serpentes : Elapidae] from the Andaman Island. *J. Bombay nat. Hist. Soc.*, Bombay, **75** :
- BLYTH, E. 1846. Fauna of Nicobar Islands. *J. Asiat. Soc. Beng.*, Calcutta, **15** : 367.
- BOULENGER, G. A. 1908. Report on the Gunong Tahn Expedition, May to September 1905. III. Report on the Fishes, Batrachians and Reptiles. *J. fed. Malay St. Mus.*, Malay, III, pp. 61-72.
- CANTOR, T. 1847. Catalogue of Reptiles inhabiting the Malayan Peninsula and Islands. *J. Asiat. Soc. Beng.*, Calcutta, **16** : 607-656.

- CONSTABLE, JOHN D. 1949. Reptiles from the Indian peninsular in the Museum of comparative zoology. *Bull. Mus. comp. Zool.*, Harvard, Cambridge, 103 (2) : 59-60.
- DERANIYAGALA, P. E. P. 1939. "*The Tetrapod Reptiles of Ceylon*", Vol. 1, : 32-42.
- DERANIYAGALA, P. E. P. 1960. The water monitor of Andaman Island - a distinct subspecies. *Spolia zeylan.*, Sri Lanka, 29 : 203-24, 2 pls.
- HORA, S. L. 1949. Satpura Hypothesis of the Distribution of the Malayan Fauna and Flora to Peninsula India. *Proc. natn. Inst. Sci. India*, Delhi, 15 (8) : 300-314.
- HORA, S. L. and JAYARAM, K. C. 1949. Remarks on the Distribution of snakes of Peninsular India. *Proc. natn. Inst. Sci. India*, Delhi, 15 (8) : 399-403.
- KARUNAKARAN, C. 1962. Geology of the Andaman and Nicobar Islands - Andaman and Nicobar Information (Port Blair), No. 10 (1962 plan no.), pp. 64-69 and 75.
- KARUNAKARAN, C. 1967. Exhibition on the Great Nicobar Island. Guide compiled by the Geological Survey of India : 1-14.
- MERTENS, ROBERT 1930. Die Amphibien and Reptilien der Inseln Bali, Lombok etc., — *Abh. senckenb. naturforsch. Ges.*, 42 (3), : 115-344.
- MULLER, 1892. Festschr. 75. — *Best. nat. Ges. Basel.* p. 209.
- NICHOLSON, 1893. *An elementary treatise on ophiology* (Higginbotham & Co.) Madras, pp. 188.
- POPE, CLIFFORD, H. 1935. "The Reptiles of China" — *Nat. Hist. of Cent. Asia*, pp. X+604.
- SMITH, M. A. 1926. "*Monograph of sea snakes*", London, p. 130.
- SMITH, M. A. 1935. *Fauna of British India* (Sauria), 11. London, pp. xiii + 440.
- SMITH, M. A. 1940. Contribution to the Herpetology of the Andaman and Nicobars Islands. — *Proc. Linn. Soc. Lond.*, London, Part II.
- SMITH, M. A. 1943. *Fauna of British India* (Serpentes), III, London, pp. xii + 583.

- STOLICZKA, F. 1870. Observation on some Indian and Malayan Amphibia and Reptilia. — *J. Asiat. Soc. Beng.*, Calcutta, **39**(2) : 136-138.
- STOLICZKA, F. 1871. Notes on some Indian and Burmese ophidians. — *J. Asiat. Soc. Beng.*, Calcutta, **40** (2) : 421-445.
- STOLICZKA, F. 1873. Notes on some Andamanese and Nicobarese Reptilia with the description of three new species. — *J. Asiat. Soc. Beng.*, Calcutta, **41** (2) : 162-169.
- Reprinted in miscellaneous papers relating to Indo-China (Ind. series), Vol. 1, pp. 72-87, London, 1887.
- TIWARI, K. K. 1961. The eggs and flight of Geko *Ptychozoon kuhli* Stejneger from Car Nicobar. — *J. Bombay nat. Hist. Soc.*, Bombay, **58** (2) : 523-526.
- TIWARI, K. K. and BISWAS, S. 1973. Two new reptiles from the Great Nicobar Island. — *J. zool. Soc. India*, Calcutta. **25** (1 & 2) : 57-63.
- WALL, F. 1928. *The poisonous snakes of India* (Diouesan Press) Bombay, pp. 173, Text-fig. 40.

ON THE PYRAUSTINAE (LEPIDOPTERA : PYRALIDAE) FROM THE ANDAMAN, NICOBAR AND GREAT NICOBAR ISLANDS, INDIAN OCEAN

By

D. K. MANDAL and D. P. BHATTACHARYA
Zoological Survey of India, Calcutta

(With 1 Table and 8 Plates)

INTRODUCTION

The subfamily Pyraustinae is a very wide and primitive group of mainly tropical insect fauna of certain economic importance in the large microlepidopterous family Pyralidae. It has received so far less attention from the Andaman and Nicobar Islands and practically ever the least from as far south as Great Nicobar in the Indian Ocean. In the wake of the modern concept of general taxonomy, it is imperative to collect a fair number of species from the niches of interest. This helps not only to assess the available morpho-variations, but also to scan their mode of distribution.

Keeping in view, the present work is an attempt to provide a comprehensive account of the southern insular Pyraustinae on the decade's collections made by different party-members including the first author in the Department of Zoological Survey of India. The account deals with a brief note on earlier investigations, general distribution and systematics coupled with keys to taxa and also mention of available host plants of the fauna representing a number of new locality records almost half of that hitherto known from these islands. It is also accompanied by a table providing the systematic index of an overall number of genera and species and their mode of distribution in the southern islands, mainland and Minicoy Island in the Arabian Sea of India, and also different zoo-geographical realms of the world.

EARLIER INVESTIGATION

The pioneering work on the results of entomological exploration including the Pyraustinae from the Andaman and Nicobar Islands barring Great Nicobar proper dates back to Moore (1877). He recorded, amongst other members of both micro-and macrolepidoptera, 29 species of the Pyraustinae and considered them under miscellaneous families of the tribe Pyrales. All these moths were collected mainly from South Andamans by Meldola on the-then Venus-Transit Expedition. Later, 37 more species mainly in the Roepstorff's collections

from both Andamans and Nicobars were received by the Indian Museum till about the year 1882. Thus, the total number of species from these islands was raised to 66 including 2 exclusively Andamanese species, viz., *Rehimena villalis* Swinhoe and *Lamprosema hedychroalis* (Swinhoe), having remained as *Incertae sedis*. All these species were subsequently treated mostly along with the exotic material by Cotes *et al.* (1889), Hampson (1896, 1898, 1899), Klima (1939) and Amsel (1957). Recently, 2 more species, namely, *Terastia meticulosalis* Guenee from Car Nicobar and *Xanthomelaena schematias* (Meyrick) from Great Nicobar, were recorded respectively by Bhattacharya *et al.* (1976) and Bhattacharya (1977). Otherwise, there was so far no other augmentation of the insular fauna in question, though Kapur (1966), Karunakaran (1967), Roonwal *et al.* (1970), Thampi (1972) and Maiti *et al.* (1977) published accounts on the climatology and biotic factors other than the concerned group of the islands. Amongst a total of about 450 species in 70 genera from India, 57 species in 30 genera are hitherto known from Andamans, 14 species in 9 genera from Nicobars and only one species from Great Nicobar. Of these, 8 genera and only 4 species are common between the Andamanese and Nicobarese material.

The available insular host plants are mostly identical with those of the mainland where their extent of damage caused by the continental pests including several Pyraustine ones was studied by Hampson (1896), Lefroy (1906), Fletcher (1920, 1934), Meyrick (1912-1937), Caswell (1962), Metcalf *et al.* (1962), Ayyar (1963), Banerjee (1964), Pruthi (1969), Pradhan (1969), Pande (1973) and Nayar *et al.* (1976). About 20% of the present fauna, recognised as pests, are incorporated in the systematic account.

GENERAL DISTRIBUTION

The Pyraustinae shows interesting patterns of both insular and continental distribution throughout the world. It is the largest and most varied of all the other closely allied subfamilies, viz., Scopariinae, Nymphulinae, Odontiinae, Glaphyrinae and Evergestinae, all of which have their wide but definitive spectra of geographical ranges (Munroe, 1975). The fauna represents about 10% of that in the Temperate Eastern Asia (Munroe *et al.*, 1971) and 20% of that in Sumatra (Roesler *et al.*, 1973).

The areas presently surveyed comprise North, Middle and South Andamans, Car Nicobar and Kamorta of Nicobars and Great Nicobar mostly from the Campbell Bay in the central east upto the vicinity of the Pygmalion Point in the extreme south of the Indian jurisdiction. Topographically, these islands depict a stratified canopy with zonations in latitude and limited elevation. The seasonal aspects relating to the day-length, temperature, precipitation and windiness approach the equatorial parameters particularly at Great Nicobar. Obviously, there occurs a continuous stretch of dense forests, near the entrance

of which in many places prevail the almost impenetrable and dark habitats thicketed with prolific undergrowths. The biotic factors represent the overlapping of the Indo-Malayan and Indo-Chinese elements which are subject to the transitional influence of tropical and subtropical climates.

The major impact of overall climate on the fauna leads to an adaptation antagonistic to that of the alpine and desert elements, as observed by Munroe *et al.* (*loc. cit.*). The forms under study are mostly non-melanic, nocturnal and slender in habits with smooth vestiture, large eyes and trophies, flat or rounded frons, narrow wings and long legs. All these features are related to the warm and wet habitats with rich plant-covers.

Present findings throw some light on the distribution of the consolidated fauna and its correlation with the various locality-data along with those of 40 unseen insular species (*vide* Table) compiled from the upto-date works for continental and other insular areas both in India and abroad. The additional localities, particularly from the Indian mainland, of several species reported specifically by Roonwal *et al.* (1963) and those of a few species of the National Zoological Collections hitherto remaining unrecorded, are also compiled in the present work so as to provide their further range of distribution.

In all, there are 103 species in 45 genera now known from the southern insular areas of India, of which 63 species in 36 genera occur in the present collections. Of these, one genus and 2 species each from North Andaman and Nicobar, 2 species from Middle Andaman, 7 genera and 21 species from South Andamans and 19 genera and 26 species from Great Nicobar respectively constitute new locality-records. Only one species each from North Andaman and Nicobar is common in Great Nicobar. Besides, one genus and 7 species are also included as new for southern islands, whence specimens of these tagged with locality-labels of the said islands in the old collections of the Department were not recorded earlier. Amongst the known elements showing further intra-southern insular extension, one species from South Andaman and another including its genus from Great Nicobar range respectively in Nicobar and South Andaman, while 5 genera and 8 species from South Andaman, 3 genera and 3 species from Nicobar, and 2 genera and 2 species from both these islands are all common in Great Nicobar. 11 species are restricted to the southern islands of India apart from the exotic habitats in the world for majority of them.

As to the distribution of the fauna in the continental and western insular areas of India, 82 species are known from the extra-peninsular and 58 from the peninsular areas of mainland, and only 2, from Minicoy Island in the Arabian Sea. The overall number of material distributed in the North-Eastern Himalayas and either of Southern Eastern and Western Peninsula is more than double of that in the remaining sectors of the extra-peninsular and peninsular areas respec-

tively. Amongst the peninsular elements, the common distribution is exhibited by 44 species in the North-Eastern, 24 in the North-Western and 18 in both the Himalayan sectors. The distribution of 32 species in the extra-peninsular and 9 species in the peninsular areas hitherto remain locally restricted in the mainland. Only 2 species, of which one each is respectively common with the North-Eastern and North-Western Himalayas, and both, with the peninsula, are known from Minicoy Island. Some species are more or less common throughout India, though a few more exhibit the supposedly cosmopolitan distribution in contrast to the insular confinement of only 8 species in some of the major zoo-geographical realms of the world.

The approximate numerical ratio of the fauna from the different global regions including Neotropical : Palaearctic : Ethiopian : Australian : Oriental is as to 2 : 4 : 4 : 5 : 17. The material common with the Hawaiian, Nearctic and Malagasic regions is highly impoverished as compared to the Papuan elements which constitute about half of the bulk excluding 11 unknown species from Australia. Only 2 Holarctic species are common with the material under study. Amongst 43 endemic species in the Oriental region, 16 are known exclusively from the Indo-Chinese and only one, from the Indo-Malayan subregions. On the contrary, 4 species from the former and 20 from the latter subregions are virtually absent. With the present discovery, 4 Indo-Chinese and only one Ethiopian species are established as new records from the Indo-Malayan subregion and the Oriental region respectively (*vide* Table).

REVIEW ON SYSTEMATIC POSITION

Ragonot (1890-1891) erected the subfamily Pyraustinae together with Homophysinae. Hampson (1896, 1898, 1899) considered both these subfamilies and also the family Odontiidae (Guenée, 1854) under the sole name Pyraustinae. Klima (1939) adopted the Hampsonian nomenclature of the subfamily together with the recombination of the Glaphyrinae (Forbes, 1920—1924). Later, Munroe, on the basis of male genital studies, segregated from the Pyraustinae the Odontiine members and ranked them to the subfamily Odontiinae (1958, 1961) and revived the subfamily Glaphyrinae (1964) with the Homophysinae as its synonym.

Only 3 known Odontiine genera and their species, viz., *Noordafessalis* Swinhoe, *Dausara talliusalis* Walker and *Boeotarcha hyalinalis* Hampson and another species, i. e., *B. martinalis* Walker, collected for the first time from Andamans, have been excluded from the present work.

The subfamily Pyraustinae is easily recognised by proboscis well developed, chaetosema absent, forewing with 1A upto tornus and separated from the short 2A, Cu₂ absent, R₂ usually close to the

long stalk of $R_{3,4}$ upto certain distance from origin, R_5 from near antero-discal angle, hindwing with both the anals and Cu_2 upto tornus, normally R_5 anastomosed with $Sc+R_1$ upto certain distance beyond cell, median vein dorsally non-pectinate and M_3 connate or stalked with M_2 arising from near postero-discal angle in both wings.

A key to the genera followed by systematic account particularly of the material at hand with relevant modifications of the Hampsonian system adopted from the authors cited above is given hereunder.

Key to genera

1. Labial palpus upturned with mesial segment hardly triangularly scaled	2	
— Labial palpus porrect with mesial segment usually triangularly scaled	24	
2. Apical segment of labial palpus upturned ...	3	
— Apical segment of labial palpus porrect ...	20	
3. Apical segment of labial palpus naked ...	4	
— Apical segment of labial palpus scaled ...	10	
4. Apical segment of labial palpus long and acuminate	5	
— Apical segment of labial palpus short and blunt	7	
5. Mesial segment of labial palpus reaching vertex	6	
— Mesial segment of labial palpus not reaching vertex		<i>Hymenia</i> Hübner
6. R_5 of forewing curved and approximated to $R_{3,4}$ near origin		<i>Xanthomelaena</i> Hampson
— R_5 of forewing straight and separated from $R_{3,4}$ near origin		<i>Pycnarmon</i> Lederer
7. Maxillary palpus dilated		<i>Eurrhyarodes</i> Snellen
— Maxillary palpus filiform	8	
8. Mesial segment of labial palpus angled and bearing only frontal scales; R_5 of forewing straight and well separated from $R_{3,4}$...		<i>Goniorhynchus</i> Hampson
— Mesial segment of labial palpus not angled and bearing scales not limited in front; R_5 of forewing curved and approximated to $R_{3,4}$...	9	
9. Mesial segment of labial palpus narrowly and		

	evenly scaled	...	...	...	<i>Sylepta</i> Hübner
—	Mesial segment of labial palpus broadly and roughly scaled	...	...	...	<i>Botyodes</i> Guenee
10.	Labial palpus quadrately scaled	...	...	...	11
—	Labial palpus conically scaled	...	...	...	19
11.	Apical segment of labial palpus with a long tuft of hair	...	...	...	<i>Pagyda</i> Walker
—	Apical segment of labial palpus with a short tuft of hair	...	...	...	12
12.	Apical segment of labial palpus short and blunt	...	...	...	13
—	Apical segment of labial palpus long and acuminate	...	...	...	<i>Nosophora</i> Lederer
13.	R_s and $Sc+R_1$ of hindwing anastomosed almost upto apex	...	...	...	14
—	R_s and $Sc+R_1$ of hindwing anastomosed upto well before apex	...	...	...	15
14.	R_1 and R_2 of forewing stalked	...	...	...	<i>Cnaphalocrocis</i> Lederer
—	R_1 and R_2 of forewing free	...	...	...	<i>Marasmia</i> Lederer
15.	Antenna annulated	...	...	...	16
—	Antenna not annulated	...	...	...	17
16.	Antenna longer than forewing of which R_s curved and approximated to $R_{s,4}$	...	...	...	<i>Rhimphalea</i> Lederer
—	Antenna shorter than forewing of which R_s straight and separated from $R_{s,4}$	...	...	...	<i>Syngamia</i> Guenee
17.	Cu_{1a} and M_s of hindwing approximated to each other	...	...	...	<i>Aetholix</i> Lederer
—	Cu_{1a} and M_s of hindwing separated from each other	...	...	...	18
18.	Frons flat and oblique; R_s of forewing curved and approximated to $R_{s,4}$	...	...	...	<i>Samea</i> Guenee
—	Frons rounded; R_s of forewing straight and separated from $R_{s,4}$	...	...	...	<i>Lamprosema</i> Hübner
19.	R_s of forewing curved and approximated to $R_{s,4}$	...	...	...	<i>Phostria</i> Hübner
—	R_s of forewing almost straight and well separated from $R_{s,4}$	...	...	...	<i>Dichocrocis</i> Lederer
20.	Apical segment of labial palpus terminally not down-curved	...	...	...	21
—	Apical segment of labial palpus terminally down-curved	...	...	...	<i>Sameodes</i> Snellen

21. Maxillary palpus filiform ; R_5 straight and well separated from $R_{3,4}$ and M_1 from well below antero-discal angle of forewing ; legs with outer spurs from about 1/2 to 2/3rd length of inner ... 22
 - Maxillary palpus dilated ; R_5 curved and approximated to $R_{3,4}$ and M_1 from antero-discal angle of forewing ; legs with outer spurs less than 1/2 length of inner ... 23
22. Antenna longer than forewing and simple ; M_1 and R_s of hindwing stalked ... *Nausinoe* Hübner
 - Antenna shorter than forewing and annulated ; M_1 and R_s of hindwing free ... *Synclera* Lederer
23. Mesial segment of labial palpus squamous-hirsute ; antenna minutely pubescent and anal tuft of abdomen bifid but not plumose in male ... *Glyphodes* Guenee
 - Mesial segment of labial palpus pilose ; antenna naked and anal tuft of abdomen not bifid but plumose in both sexes ... *Diaphania* Hübner
24. Apical segment of labial palpus long and naked ... 25
 - Apical segment of labial palpus short and concealed by hair ... 26
25. Antenna non-ciliate, being basally grooved and dentate, with shaft proximally swollen and bearing a short comb-like structure ... *Thliptoceras* Warren
 - Antenna throughout ciliated and simple ... *Prophantis* Warren
26. Antenna longer than forewing ... 27
 - Antenna shorter than forewing ... 28
27. Antenna annulated ; M_2 and M_3 of forewing mutually approximated ... *Maruca* Walker
 - Antenna simple ; M_2 and M_3 of forewing mutually separated ... *Tetridia* Warren
28. Maxillary palpus apically dilated with scales 29
 - Maxillary palpus filiform throughout ... 30
29. Legs long and slender ... *Antigastra* Lederer
 - Legs short and stout ... *Pionea* Guenee
30. M_2 and M_3 of hindwing mutually approximated ... 31
 - M_2 and M_3 of hindwing mutually separated ... 34
31. R_s and $Sc+R_1$ of hindwing anastomosed ; forewing short and broad ... 32
 - R_s and $Sc+R_1$ of hindwing not anastomosed ; forewing long and narrow ... *Terastia* Guenee

32.	Tibia fringed with hair ; built stout	...	...	<i>Polygrammodes</i> Guenée
—	Tibia smoothly scaled ; built slender	...	33	
33.	Frons flat and oblique	...	...	<i>Crocidophora</i> Lederer
—	Frons rounded	...	...	<i>Psara</i> Shibuya
34.	Antenna annulated	...	...	<i>Ischnurges</i> Lederer
—	Antenna ciliated	...	...	35
35.	Outer mesial spur as long as the inner one of hind tibia	...	...	<i>Hyalobathra</i> Meyrick
—	Outer mesial spur not more than 2/3rd length of the inner one of hind tibia	...	...	<i>Pyrausta</i> Schrank

SYSTEMATIC ACCOUNT

Genus *Xanthomelaena* Hampson

1896. *Xanthomelaena* Hampson, *Fauna Br. India*, Moths, 4 : 255.
(Type : *Tylostega schematias* Meyrick)

The genus is known from the Oriental and Papuan regions, comprising only one Indian species which shows its distribution locally restricted in the southern islands.

Xanthomelaena schematias (Meyrick)

1894. *Tylostega schematias* Meyrick, *Trans. ent. Soc. Lond.*, p. 458.
1896. *Xanthomelaena schematias*, Hampson, *Fauna Br. India*, Moths, 4 : 255 fig. 153.

Material examined.—One ♀, Humphreygunj, South Andaman, 4. iii. 1964, (B. S. Lamba coll.); one ♀, Casuarina Bay, Great Nicobar, 7. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 18 mm.

Distribution.—India (Great Nicobar Is.) ; Burma ; Indo-Malayan area [Borneo, Pulo Laut, Tambora, Celebes (now, Sulawesi)] ; Papua.

Remarks.—The female specimen from South Andaman shows M_2 and M_3 approximated and not stalked in both pair of wings. The species was recorded by Bhattacharya (1977) from Great Nicobar. Presently, with further record of the species new for south Andaman, it establishes the Indo-Chinese affinities, too.

Genus *Pycnarmon* Lederer

1863. *Pycnarmon* Lederer, *Wien. Ent. Monat.*, 7 : 441.

1863. *Entephria* Lederer, *ibid* : 428.

1939. *Pycnarmon*, Klima, *Lep. Cat.*, 89 : 20.

(Type : *Spilomela jaguaralis* Guenee)

The genus is known throughout the world except the nearctic region. It comprises 11 species in India, of which *Pycnarmon alboflavalis* (Moore) and *P. aeriferalis* (Moore) were earlier known from Andamans. Presently, 2 more species are dealt with.

Key to species

1. Body pure white ; forewing with more than one black costal marking, cellular speck present ; hindwing without apical spot ; both wings with a postdiscal line and no spot ... *meritalis* (Walker)
- Body ochreous ; forewing with a single black costal marking, cellular speck absent ; hindwing with an apical spot ; both wings with a postdiscal spot and no line ... *Pycnarmon* sp.

Pycnarmon meritalis (Walker)

1859. *Zebronia* ? *meritalis* Walker, *List Spec. Lep. Ins. Coll. Brit. Mus.*, 17 : 479.

1896. *Pycnarmon* (*Pycnarmon*) *meritalis*, Hampson, *Fauna Br. India*, Moths 4 : 259.

1898. *Entephria meritalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 620.

1939. *Pycnarmon meritalis*, Klima, *Lep. Cat.*, 89 : 23.

Material examined.—One ♀, Galathea Bay, Great Nicobar, 28. iii. 1966 (*A. Daniel* and *H. K. Bhowmik* coll.). *Wing expanse* : 18 mm.

Distribution.—India (West Bengal, Calcutta ; Sikkim ; Assam) ; Sri Lanka ; Burma ; China ; Taiwan ; Molluccus ; Buru ; Indo-Malayan area [Sumatra (now, Andalas) ; Borneo ; Java ; Celebes ; Sambawa, Ceram ; Aru ; Amboina] ; Australia (Queensland) ; South America (Venezuela).

Remarks.—The species is a new record for Great Nicobar. Although the mainland form, over and above its Malayan affinities, is common with the Indo-Chinese elements, the insular form is hitherto not known from Andamans.

Pycnarmon sp.

Material examined.—One ♀, Cowriaghat, South Andaman, 9. iv. 1964 (B. S. Lamba coll.). *Wing expanse* : 20 mm.

Remarks.—As recognised by the characters given in the key, the species could not be worked out in details on the basis of a sole female specimen.

Genus Hymenia Hübner

1825. *Hymenia*, Hübner, *Verz. bek. Schmett.*, p. 360.

1852. *Zinckenia* Zeller, *Kgl. Vet. Handl. Lep. Micropt. Caffr.*, p. 55.

1939. *Hymenia*, Klima, *Lep. Cat*, 89: 30.

(Type : *Pyalis perspectalis* Hübner)

The genus with its universal distribution is represented by 2 Indian species of which *Hymenia recurvalis* (Fabr.) was earlier known from the Andaman and Nicobar Islands. Both these species are dealt with hereunder.

Key to species

1. Forewing with prediscal line present, discal spot white ; hindwing with discal band broad below costa and tapering to dorsum ... *perspectalis* (Hübner)
- Forewing with prediscal line absent, discal band white and edged black ; hindwing with discal band uniformly broad from below costa to dorsum *recurvalis* (Fabricius)

Hymenia perspectalis (Hübner)

1796. *Pyalis perspectalis* Hübner, *Samml. Eur. Schmett., Pyal.*, p. 18, pl. 16, fig. 101.

1826. *Hymenia perspectalis*, Hübner, *Verz. bek. Schmett.*, p. 361.

1896. *Zinckenia perspectalis*, Hampson, *Fauna Br. India, Moths*, 4 : 262.

1939. *Hymenia perspectalis*, Klima, *Lep. Cat.*, 89 : 33.

Material examined.—One ♀, Rangat, Middle Andaman, 7.i.1973, at light (K. S. Pradhan coll.). *Wing expanse* : 21 mm.

Distribution.—Northern India ; Sri Lanka ; Burma ; Taiwan ; North Vietnam (Tonkin) ; Philippines ; Buru ; Indo-Malayan area (Malacca ; Sumatra ; Java ; Borneo ; Celebes) ; Australia (Queensland) ; Central and South America (Mexico ; Guatemala ; Honduras ; Costa Rico ; Panama ; Columbia ; Venezuela ; Ecuador ; Brazil : Amazon,

Rio de Janeiro ; Bahama ; Haiti ; Dominica ; Jamaica ; Trinidad) ; Hawaii (Tahiti) ; North America (New York ; Illinois ; Texas) ; South Africa ; Malagasy.

Remarks.—The species is a new record for Middle Andaman.

***Hymenia recurvalis* (Fabricius)**

1775. *Phalaena recurvalis* Fabricius, *Syst. Ent.*, p. 407.
 1782. *Phalaena* (*Pyrallis*) *fascialis* Cramer, *Pap. Exot.*, 4 : 236, pl. 398, fig. 0.
 1896. *Zinckenia fascialis*, Hampson, *Fauna Br. India*, Moths, 4 : 262, fig. 158.
 1939. *Hymenia recurvalis*, Klima, *Lep. Cat.*, 89 : 31.

Material examined.—One ♂, Rajendra Nagar, Great Nicobar, 30. xii. 1975 (P. K. Maiti & D. K. Mandal coll.). *Wing expanse* : 20 mm.

Distribution.—India (Bihar, Pusa ; Karnataka, Kurg ; U. P., Dehra Dun ; Minicoy ; Andaman ; Nicobar Is.) ; Sri Lanka ; Southern China ; Taiwan ; North Vietnam (Tonkin) ; Cocos ; Keeling ; Philippines ; Buru ; Indo-Malayan area (Sumatra ; Java ; Borneo ; Mysol) ; Papua ; Bismarck Archipelago ; Solomon ; New Hebrides ; Kermadec ; Samoa ; Fiji ; Laysan Island ; Norfolk Island ; New South Wales ; New Zealand ; Bermuda Island ; Honduras ; Jamaica ; Haiti ; St. Domingo ; Virginia ; Bahama Island ; Venezuela ; Chili ; Christmas Island ; Hawaii ; New York ; Pennsylvania ; U. S. S. R. (Ussuri) ; Andes ; Egypt ; Iraq ; Syria ; Southern Arabia ; Western and Central China ; Korea ; Japan ; Southern Sahara ; Sierra Leone ; Congo ; Kamerun ; Eastern and Southern Africa ; Malagasy ; Coetivy Island ; Chagos Island ; Seychelles ; Amirantes ; Sokotra ; Maldives.

Remarks.—The species, with its almost cosmopolitan distribution in the world, is recorded new for Great Nicobar. It was reported by Roonwal *et al* (1963) from the Indian mainland. It occurs on *Amaranthus viridis*, *Trianthema monogyna*, *Glycine max* and *Beta vulgaris* as leaf-roller and defoliator.

Genus *Eurrhyarodes* Snellen

1880. *Eurrhyarodes* Snellen, *Tijds. v. Ent.*, 23 : 215.
 (Type : *Botys bracteolalis* Zeller)

The genus is known throughout the world except the Hawaiian region. It comprises 3 species in India, none of which is hitherto

reported from the southern insular areas. Presently, only one species is dealt with hereunder.

Eurrhyarodes tricoloralis (Zeller)

1852. *Botys tricoloralis* Zeller, *Kgl. Vet. Akad. Handl. Micropt. Caffr.*, p. 31.

1896. *Eurrhyarodes (Molybdanthe) tricoloralis*, Hampson, *Fauna Br. India*, Moths, 4 : 264.

1939. *Eurrhyarodes tricoloralis*, Klima, *Lep. Cat.*, 89 : 37.

Material examined.—One ♂, Humphreygunj, South Andaman, 4. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 16 mm.

Distribution.—India (Punjab ; U. P., Lucknow ; Tamil Nadu, Nilgiris ; West Bengal, Calcutta) ; Sri Lanka ; Southern China ; Taiwan ; Philippines ; Indo-Malayan area (Sumatra ; Java ; Sula ; Sangir ; Amboina) ; Australia (Queensland ; New South Wales ; Fiji ; Moreton Bay).

Remarks.—The species is a new record for South Andaman.

Genus Aetholix Lederer

1863. *Aetholix* Lederer, *Wien. Ent. Monat.*, 7 : 437.

(Type : *Aediodes flavibasalis* Guenee)

Known from the Oriental and Papuan regions, the genus is represented by two Indian species, of which the one, presently dealt with, is already known from Andaman.

Aetholix flavibasalis (Guenee)

1854. *Aediodes flavibasalis* Guenee, *Delt. & Pyral.*, p. 193.

1863. *Aetholix flavibasalis*, Lederer, *Wien. Ent. Monat.*, 7 : 438, pl. 17, fig. 6.

Material examined.—One ♀, Wrafter's Creak, Baratang, 17. iii., at light, 1 ♀, Rengachang, South Andaman, 7. iv. 1964 (B. S. Lamba coll.) ; 1 ♂, Campbell Bay, Great Nicobar, 3. iii. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : ♂ 18 mm, ♀ 20 mm.

Distribution.—India (Maharashtra, Bombay ; Andamans ; W. Bengal, Kalimpong) ; Sri Lanka ; Southern China ; Indo-Malayan area (Sumatra ; Borneo ; Amboina) ; Papua.

Remarks.—The species, of which the locality from West Bengal was reported by Roonwal *et al.* (1963), is a new record for Great Nicobar.

Genus **Pagyda** Walker

1859. *Pagyda* Walker, *List Spec. Lep. Ins. Coll. Brit. Mus.*, 17 : 487.
(Type : *Pagyda salvalis* Walker)

The genus is known throughout the world except the Malagasic and Hawaiian regions. It comprises 10 species in India, none of which, however, is hitherto reported from the southern islands. Two species, of which *Pagyda salvalis* Walker occurs amidst the unrecorded material of the National Zoological Collections, are dealt with hereunder.

Key to species

1. Forewing with a curved subterminal band ;
both wings with prediscal, discal, postdiscal
and terminal lines wider *salvalis* Walker
- Forewing with a straight subterminal line ;
both wings with all the lines narrower *discolor* Swinhoe

Pagyda salvalis Walker

1859. *Pagyda salvalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 17 : 487.
1896. *Pagyda* (*Pagyda*) *salvalis* Hampson, *Fauna Br. India*, Moths, 4 : 270,
fig. 164.

Material examined.—One ♀, South Andaman, —.—.— (—coll.).
Wing expanse : 22 mm.

Distribution —India (Western and Southern Peninsula ; Sikkim) ; Sri Lanka ; Burma ; S. China ; Tonkin ; Philippines ; Sumatra ; Borneo ; Celebes ; Pulo Laut ; Sangir ; Bismarck Archipelago ; Papua ; Western and Middle China ; South Africa.

Remarks.—Klima (1939) did not include the Japanese locality for the species from which was segregated *Pagyda arbiter* (Butler) having been known from localities including Japan. The latter species was considered as synonym of the former by Hampson (1896, 1898).

Pagyda discolor Swinhoe

1894. *Pagyda discolor* Swinhoe, *Ann. Mag. nat. Hist.*, (6) 14 : 197.
1896. *Pagyda* (*Pagyda*) *discolor*, Hampson, *Fauna Br. India*, Moths, 4 : 271.
1939. *Pagyda discolor*, Klima, *Lep. Cat.*, 89 : 55.

Material examined.—One ♀, Galathea Bay, Great Nicobar, 22.
iii. 1966 (A. Daniel & H. K. Bhowmik coll.) ; 1 ♀, Aberdeen Bay,

South Andaman, 13. xii. 1972 (K. S. Pradhan coll.). *Wing expanse* : 19 mm.

Distribution.—India (Assam, Cherra Punji ; Meghalaya, Khasis ; Nagaland) ; Burma (Eastern Pegu).

Remarks.—The species is a new record for both the South Andaman and Great Nicobar Islands. Remaining hitherto confined in the north-eastern extrapeninsular sector of India, it shows in the insular form certain morpho-variations being distinguished from those in the mainland form by maxillary palpus stouter, thorax without orange stripe, abdomen with only the anal tuft fulvous, forewing with prediscal and discal lines almost straight from black sub-costal specks, hindwing with prediscal line ending near the middle of dorsum and postdiscal line, at tornus. The present females are much smaller than male having wing expanse of 26 mm., as observed by Hampson (1896).

Genus *Cnaphalocrocis* Lederer

1863. *Cnaphalocrocis* Lederer, *Wien. Ent. Monat.*, 7 : 384.

(Type : *Cnaphalocrocis jolinalis* Lederer = *Salbia medinalis* Guenee)

The genus is known to occur in the Holarctic, Malagasic, Oriental, Australian and Papuan regions. The single Indian species, which is not hitherto reported from any of the southern islands, is dealt with hereunder.

Cnaphalocrocis medinalis (Guenee)

1854. *Salbia medinalis* Guenee, *Delt. & Pyral.*, p. 201.

1896. *Cnaphalocrocis medinalis*, Hampson, *Fauna Br. India*, Moths, 4 : 275, fig. 166.

Material examined.—One ♀, Haddo Rest House, Port Blair, South Andaman, 12. iv. 1972 (G. S. Arora coll.) ; 1 ♀, Maya Bandar, North Andaman, 9. i., 4 ♂♂, 1 ♀, Herbertabad, 18. i. 1973 (K. S. Pradhan coll.) ; 1 ♂, Monglutan, South Andaman, 18. xii., 1 ♀, Campbell Bay, Great Nicobar, 25. xii. 1975 (P. K. Maiti & D. K. Mandal coll.). *Wing expanse* : ♂ 16-17 mm., ♀ 17-18 mm.

Distribution.—India (Maharashtra : Khandala, Bombay, Poona, Alibagh ; Southern Tamil Nadu ; West Bengal, Calcutta ; Sikkim ; Assam, Gauhati ; Meghalaya, Khasis) ; Sri Lanka ; Burma ; Southern China ; Taiwan ; North Vietnam (Tonkin) ; Philippines ; Indo-Malayan area (Malacca ; Sumatra ; Java ; Borneo ; Celebes ; Mysol ; Amboina) ; Papua ; Australia (New Hebrides ; New Caledonia ; Samoa ; Bismarck Archipelago) ; North America (Texas) ; U. S. S. R.

(Amur ; Ussuri ; Tjutjuje) ; Northern and Central China ; Korea ; Japan ; Malagasy.

Remarks.—The species is a new record for North and South Andamans and also Great Nicobar. It occurs on *Oryza sativa* as a sporadic pest.

Genus *Marasmia* Lederer

1863. *Marasmia* Lederer, *Wien. Ent. Monat*, 7 : 385.

(Type : *Marasmia venilialis* Walker = *Asopia cicatricosa* Lederer = *Asopia venilialis* Walker)

The genus is distributed throughout the world except the Malagasic and Hawaiian regions. It comprises six Indian species, none of which is hitherto known to occur in any of the southern islands. Only one species is dealt with hereunder.

Marasmia bilinealis Hampson

1891. *Marasmia bilinealis* Hampson, *Ill. Typ. Spec. Het. Brit. Mus.*, 8 : 139, pl. 155, fig. 25.

1896. *Marasmia (Epimima) bilinialis* Hampson, *Fauna Br. India, Moths*, 4 : 277.

1939. *Marasmia bilinealis*, Klima, *Lep. Cat.*, 89 : 64.

Material examined.—One ♂, Campbell Bay, Great Nicobar, 29. xii. 1975 (P. K. Matti & D. K. Mandal coll.). *Wing expanse* : 18 mm.

Distribution.—India (Assam ; Tamil Nadu, Nilgiris) ; Sri Lanka ; Indo-Malayan area (Malacca ; Sumatra ; Java ; Borneo ; Celebes) ; Western China.

Remarks.—The species is a new record for Great Nicobar.

Genus *Rhimphalea* Lederer

1863. *Rhimphalea* Lederer, *Wien. ent. Monat*, 7 : 410.

(Type : *Rhimphalea scelatalis* Lederer)

The genus is distributed in the Oriental and Australo-Papuan regions. It is not known to occur in Peninsular India. Of the two Indian Species, *Rhimphalea trogusalis* (Walker) is reported from Andamans. The other species is dealt with hereunder.

Rhimphalea ochalis (Walker)

1859. *Botys ochalis* Walker, *List Spec. Lep. Ins. Coll. Brit. Mus.*, 18 : 711.

1896. *Rhimphalea ochalis*, Hampson, *Fauna Br. India*, Moths, 4 : 278.

Material examined.—3 ♂♂, Mannarghat, Mt. Harriet Range, South Andaman, 26. iii. 1964 (*B. S. Lamba* coll.); 1 ♂, South Kali-ghat, North Andaman, 28. iii. 1969 (*T. D. Soota* coll.). *Wing expanse* : 26-28 mm.

Distribution.—India (Assam ; Meghalaya, Khasis) ; Java ; Celebes.

Remarks.—The species, which is hitherto locally restricted in the North-eastern Himalayas of India, is a new record for North and South Andamans.

Genus *Syngamia* Guenee

1854. *Syngamia* Guenee, *Delt. & Pyral.*, p. 187.

(Type : *Syngamia florellalis* Guenee = *Phalaena Pyralis florella* Cramer).

The genus is distributed throughout the world except the Hawaiian region. It comprises 7 Indian species, of which *Syngamia abruptalis* (Walker) is reported from Andamans. This and another species are dealt with hereunder.

Key to species

1. Foreleg and abdomen white and without band and ring respectively, latter with anal tuft bright fulvous and without line ; hindwing without anal spot ; both wings without purplish-fuscous tinge *abruptalis* (Walker)
- Foreleg and abdomen with black bands and rings respectively, latter having anal tuft with paired white lines intervened by black ; hindwing with a black anal spot ; both wings with distal half purplish-fuscous *latimarginalis* (Walker)

Syngamia abruptalis (Walker)

1859. *Asopia* ? *abruptalis* Walker, *List Spec. Lep. Ins. Coll. Brit. Mus.*, 17 : 371.

1896. *Syngamia abruptalis*, Hampson, *Fauna Br. India*, Moths, 4 : 279.

1898. *Syngamia* (*Syngamia*) *abruptalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 645.

1939. *Syngamia abruptalis*, Klima, *Lep. Cat.*, 89 : 73.

Material examined.—One ♂, 2 ♀♀, Marine Hill, Port Blair, 15. xii. 1972 (*K. S. Pradhan* coll.) ; 2 ♂♂, Bamboo Flat, South Andaman, 19. xii., 3 ♂♂, 1 ♀, Campbell Bay, 25-26, 29. xii., at

light, 1 ♀, Rajendra Nagar, Great Nicobar, 30. xii. 1975 (P. K. Maiti & D. K. Mandal coll.). *Wing expanse* : ♂ 16-18 mm., ♀ 17-18 mm.

Distribution.—India (H. P. : Kulu, Solan ; U. P., Dehra Dun ; Maharastra : Khandala, Bombay, Poona ; West Bengal, Calcutta ; Bihar, Pusa ; Andamans) ; Sri Lanka ; Burma ; Taiwan ; Java ; Papua ; Australia (Moreton Bay ; Fiji) ; Southern and Eastern Africa (Gold Coast ; Sierra Leone ; North-western Nigeria ; Congo ; Rhodesia : Mashonaland ; Mauritius ; Seychelles ; Sokotra).

Remarks.—The species is a new record for Great Nicobar. It occurs on *Mentha arvensis* and *Oscimum sanctum*.

Syngamia latimarginalis (Walker)

1859. *Asopia latimarginalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 17: 370.

1896. *Syngamia latimarginalis*, Hampson, *Fauna Br. India*, Moths, 4: 279.

1898. *Syngamia* (*Syngamia*) *latimarginalis*, Hampson, *Proc. zool. Soc. Lond.* 1898 : 645.

1939. *Syngamia latimarginalis*, Klima, *Lep. Cat.*, 89 : 73.

Material examined.—One ♂, Humphreygunj, South Andaman, 4. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 16 mm.

Distribution.—India (Maharastra : Khandala, Bombay ; Tamil Nadu, Nilgiris ; Bihar, Pusa ; West Bengal, Calcutta ; Meghalaya, Khasis) ; Sri Lanka ; Burma ; Tonkin ; Taiwan ; Java ; Western and Eastern Africa (Kamerun).

Remarks.—The species is a new record from South Andaman. Unlike the preceding species, it is found in the North-eastern but not in the North-western Himalayan sector of India. It occurs on *Barleria cristata* as leaf-folder.

Genus *Samea* Guenee

1854. *Samea* Guenee, *Delt. & Pyral*, p. 193.

(Type : *Samea ecclesialis* Guenee)

The genus is widely distributed in the world except the Palaearctic, Malagasic and Hawaiian regions. The single Indian species *castoralis* (Walker) was transferred by Klima (1939) from *Pionea* Guenee to *Samea* Guenee. The latter genus was confused by Hampson (1896, 1898) as being exclusively American in distribution. The species is dealt with hereunder.

Samea castoralis (Walker)

1859. *Botys castoralis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, **18** : 693.
 1877. *Samea purpurascens* Moore, *Proc. zool. Soc. Lond.*, 1877 : 615.
 1896. *Pionea castoralis*, Hampson, *Fauna Br. India*, Moths, **4** : 426.
 1899. *Pionea castoralis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 247.
 1939. *Samea castoralis*, Klima, *Lep. Cat.*, **89** : 79.

Material examined.—2 ♂♂, 1 ♀, Humphreygunj, 4. iii., 4 ♂♂, 1 ♀, Wrafter's Creak. Baratang, 17-18. iii., 1 ♂, Wright Myo, 3. iii., 7 ♂♂, 1 ♀, Mannarghat, Mt. Harriet Range, 1-2. iv., 2 ♂♂, Rengachang, 7. iv., 6 ♂♂, Cowriaghat, South Andaman, 8-9. iv. 1964 (B. S. Lamba coll.); 2 ♀♀ Maya Bandar, North Andaman, 9. i. 1973 (K. S. Pradhan coll.). *Wing expanse* : ♂ 20-22 mm, ♀ 18-21 mm.

Distribution.—India (Tamil Nadu, Nilgiris ; Andamans) ; Tonkin ; Sumatra ; Borneo ; Morty ; Papua (Dinan Island) ; Australia.

Remarks.—The species is already known from Andamans and locally restricted in the Southern Peninsular India. The insular form is presently observed to differ from the Indian mainland form by the abdominal white terminal segment not ringed and anal tuft completely fulvous, and subterminal line of both fore- and hindwings, being retracted along Cu_{1b} and reaching a little beyond the middle of dorsum.

Genus Nosophora Lederer

1863. *Nosophora* Lederer, *Wien. ent. Monat.*, **7** : 407.
 (Type : *Nosophora chironalis* Lederer = *Nosophora conjunctalis* Walker)

The genus is distributed throughout the Old World except the Malagasic region. Munroe (1974) observed it to be highly allied with *Goliathodes* described by him from Papua. Amongst 7 Indian species, only *Nosophora althealis* (Walker) is hitherto reported from Andamans. The other species is dealt with hereunder.

Nosophora incommitata (Swinhoe)

1894. *Nagia incommitata* Swinhoe, *Ann. Mag. nat. Hist.*, (6) **14** : 205.
 1896. *Nosophora triguttalis* Warren, *ibid.*, **18** : 173.
 1896. *Nosophora chironalis*, Hampson, *Fauna Br. India*, Moths, **4** : 289.
 1898. *Nosophora chironalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 662.
 1939. *Nosophora incommitata*, Klima, *Lep. Cat.*, **89** : 103.

Material examined.—One ♀, Mannarghat, Wright Myo, South Andaman, 1. iv. 1964 (B. S. Lamba coll.). *Wing expanse* : 22 mm.

Distribution.—India (Meghalaya, Khasis) ; Burma (Tenasserim) ; North Vietnam (Tonkin) ; Indo-Malayan area (Sumatra ; Java).

Remarks.—The species, which is hitherto locally restricted in the North-eastern Himalayas of India, is a new record for South Andaman. The wing expanse of the present female is much smaller than that (30 mm.) recorded by Hampson (1896).

Genus *Phostria* Hübner

1819. *Phostria* Hübner, *Verz. bek. Schmett.*, p. 819.

1854. *Phryganodes* Guenee, *Delt. & Pyral.*, p. 353.

1939. *Phostria*, Klima, *Lep. Cat.*, 89 : 122.

(Type : *Phalaena Pyralis* ? *temira* Cramer)

The genus is known to occur throughout the world except the Nearctic region. Amongst 21 species, *Phostria unitalis* (Guenee), *P. schediusalis* (Walker), *P. longipennis* (Warren), *P. crithonalis* (Walker), *P. eradicalis* (Hampson), *P. radicalis* (Walker), and *P. opalinalis* (Moore) were earlier reported from Andamans, and *P. origoalis* (Walker), from Nicobar. Presently, 3 species are dealt with.

Key to species

1. Body smoky-black, tinged with purple ; abdomen with a paired proximo-lateral tufts ; forewing costa with a post-discal white spot ; both wings with termen excurved at middle and excised towards apex and tornus ... *maculicostalis* (Hampson)
- Body fuscous ; abdomen without proximo-lateral tuft ; forewing costa without post-discal spot ; both wings with termen neither excurved nor excised, but uniform throughout ... 2
2. Wings distally with a prominent purple shot ; discal spot of forewing small ; abdomen with corneous stigmatic valves ... *schediusalis* (Walker)
- Wings distally with slight purple tinge ; discal spot of forewing large ; abdomen without corneous stigmatic valves ... *imbecilis* (Moore)

Phostria schediusalis (Walker)

1859. *Botys schediusalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 683.

1896. *Phryganodes* (*Omiodes*) *schediusalis*, Hampson, *Fauna Br. India, Moths*, 4 : 301.

1898. *Phryganodes* (*Eporidia*) *schediusalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 686.

1939. *Phostria schediusalis*, Klima, *Lep. Cat.*, 89 : 128.

Material examined.—One ♀, Campbell Bay, Great Nicobar, 29. xii. 1975, at light (P. K. Maiti and D. K. Mandal coll.). *Wing expanse* : 26 mm.

Distribution.—India (Sikkim ; Assam ; Meghalaya, Khasis ; Andaman Island) ; Indo-Malayan area (Sumatra ; Borneo).

Remarks.—The species is a new record for Great Nicobar.

Phostria imbecilis (Moore)

1887. *Charema imbecilis* Moore, *Descr. N. Ind. Lep. Ins. Atkinson*, p. 219, pl. 7, fig. 23.

1896. *Phryganodes (Omiodes) imbecilis*, Hampson, *Fauna Br. India, Moths*, 4 : 302.

1939. *Phostria imbecilis*, Klima, *Lep. Cat.*, 89 : 128.

Material examined.—One ♀, South Andaman, —.—.— (—coll.). *Wing expanse* : 36 mm.

Distribution.—India (W. B., Darjeeling ; Sikkim ; Assam, Sib-sagar ; Meghalaya, Khasis) ; South China ; Sumatra.

Remarks.—The species, which is hitherto lying amidst the old named collections of the Department, is a new record for South Andaman.

Phostria maculicostalis (Hampson)

1893. *Coenostola maculicostalis* Hampson, *Ill. Typ. Spec. Het. Br. Mus.*, 9 : 171, pl. 172, fig. 12.

1896. *Phryganodes (Omiodes) maculicostalis*, Hampson, *Fauna Br. India, Moths*, 4 : 302.

1898. *Phryganodes (Eporidia) maculicostalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 685.

1939. *Phostria maculicostalis*, Klima, *Lep. Cat.*, 89 : 127.

Material examined.—One ♂, Humphreygunj, South Andaman, 4. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 26 mm.

Distribution.—India (Nagas) ; Sri Lanka ; Tonkin ; Sumatra ; Papua.

Remarks.—The species, which is hitherto locally restricted in the North-eastern Himalayas of India, is a new record for South Andaman.

Genus *Dichocrocis* Lederer

1863. *Dichocrocis* Lederer, *Wien. ent. Monat.*, 7 : 447.

(Type : *Botys pandamalis* Walker)

The genus has the range of distribution like that of its preceding counterpart. Amongst 26 Indian species, *Dichocrocis plutusalis* (Walker), *D. nilusalis* (Walker) and *D. atrisectalis* Hampson were earlier reported from Andamans and *D. pandamalis* (Walker), from Nicobar. Only the last species is dealt with hereunder.

***Dichocrocis pandamalis* (Walker)**

1859. *Botys pandamalis* Walker, *List Lep. Ins. Coll. Br. Mus.*, 19 : 999.
 1863. *Dichocrocis frenatalis* Lederer, *Wien. ent. Monat.*, 7 : 448, pl. 17, fig. 15.
 1896. *Dichocrocis (Dichocrocis) pandamalis*, Hampson, *Fauna Br. India, Moths*, 4 : 306.
 1939. *Dichocrocis pandamalis*, Klima, *Lep. Cat.*, 89 : 144.

Material examined.—One ♀, Galathea Bay, Great Nicobar, 4. i. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 25 mm.

Distribution.—India (Meghalaya, Khasis ; Nicobar Island) ; Buru ; Indo-Malayan area (Java ; Borneo ; Sambawa ; Pulo Laut).

Remarks.—The species is a new record for Great Nicobar.

***Lamprosema* Hübner**

1823. *Lamprosema* Hübner, *Zutr. z. Sammlg. exot. Schmett.*, 2 : 21.
 1859. *Nacoleia* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 19 : 934.
 1896. *Nacoleia*, Hampson, *Fauna Br. India, Moths*, 4 : 312.
 1939. *Lamprosema*, Klima, *Lep. Cat.*, 89 : 152.

(Type : *Lamprosema lunulalis* Hübner)

The genus is distributed throughout the world. It comprises 42 Indian species, of which *Lamprosema cuprealis* (Moore) was earlier known from Andaman, *L. niphealis* (Walker) and *L. insolitalis* (Walker), from Nicobar and *L. diemenalis* (Guenee), from both these islands. Presently, 3 species are dealt with, in all the specimens of which it has been observed that Rs and M₁ on hind wing are stalked with each other and do not arise freely from the cell, as mentioned by Hampson (1896, 1898).

Key to species

1. Patagial tuft of scales short ; hind tibia with outer mesial spur as minute as the inner ; forewing with cellular annulus, discal spot reniform, postdiscal line not from a costal spot ; hindwing with terminal line crenulate
 *charesalis* (Walker)
- Patagial tuft of scales long ; hind tibia with outer mesial spur half as long as the inner ; forewing without cellular annulus, discal

spot not reniform, postdiscal line from a costal spot ; hindwing with terminal line, when present, not crenulate ... 2

2. Body purplish fuscous ; abdomen orange ; forewing with prediscal line not preceded by band, terminal series of specks present ; hind wing without discal spot ... *cuprealis* (Moore)

- Body fulvous ; abdomen fuscous-white ; forewing with prediscal line preceded by two bands, terminal series of specks absent ; hindwing with a discal spot ... *diemenalis* (Guenee)

Lamprosema cuprealis (Moore)

1877. *Coptobasis cuprealis* Moore, *Proc. zool. Soc. Lond.*, 1877 : 616, pl. 60, fig. 13.
 1896. *Nacoleia (Hedylepta) cuprealis*, Hampson, *Fauna Br. India, Moths*, 4 : 315.
 1939. *Lamprosema cuprealis*, Klima, *Lep. Cat.*, 89 : 163.

Material examined.—One ♂, Pitcher Nullah, Middle Andaman, 4. ii. 1972, at light (A. K. Mukherjee & B. Dutt coll.). *Wing expanse* : 25 mm.

Distribution.—India (Assam ; Meghalaya, Khasis ; Nagaland ; Andaman) ; Northern Burma ; Buru ; Philippines, Luzon.

Lamprosema diemenalis (Guenee)

1854. *Asopia diemenalis* Guenee, *Delt. & Pyral.*, p. 203.
 1896. *Nacoleia (Hedylepta) diemenalis*, Hampson, *Fauna Br. India, Moths*, 4 : 316.
 1939. *Lamprosema diemenalis*, Klima, *Lep. Cat.*, 89 : 162.

Material examined.—One ♀, Dogma River, Great Nicobar, 18. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 18 mm.

Distribution.—India (U. P. : Dehra Dun, Gorakhpur ; Bihar, Pusa ; Andaman and Nicobar Islands,) ; Sri Lanka ; Burma ; Southern China ; North Vietnam (Tonkin) ; Taiwan ; Singapore ; Indo-Malayan area (Malacca ; Sumatra ; Java ; Borneo ; Celebes ; Ceram) ; Papua ;

Australia (Queensland ; Tasmania) ; New Hebrides ; Fiji ; Solomon ; Samoa ; Bismarck Archipelago ; Western China ; Southern Africa ; Maldives.

Remarks.—The species, of which the localities from the Indian mainland were reported by Roonwal *et al* (1963), is a new record for Great Nicobar. It occurs on *Phaseolus mungo* as leaf-roller.

Lamprosema charesalis (Walker)

1859. *Botys charesalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 709.
 1896. *Nacoleia (Blepharomastix) charesalis*, Hampson, *Fauna Br. India, Moths*, 4 : 319.
 1939. *Lamprosema charesalis*, Klima, *Lep. Cat.*, 89 : 166.

Material examined.—One ♂, Wrafter's Creak, Baratang, South Andaman, 19. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 19 mm.

Distribution.—India (M. P., Mhow) ; Sri Lanka ; Southern China ; Taiwan ; Tonkin ; Singapore ; Philippines ; Borneo ; Sambawa ; Papua.

Remarks.—The species, which is hitherto locally restricted in Northern India, is a new record for South Andaman.

Genus Goniorhynchus Hampson

1896. *Goniorhynchus* Hampson, *Fauna Br. India, Moths*, 4 : 322.
 (Type : *Botys ? gratalis* Lederer)

The genus is distributed throughout the Old World except Malagasic and Australian regions. None of the four Indian species was hitherto known from the Southern islands. Presently, one species is dealt with hereunder.

Goniorhynchus plumbeizonalis Hampson

1896. *Goniorhynchus plumbeizonalis* Hampson, *Fauna Br. India, Moths*, 4 : 323, fig. 183.

Material examined.—One ♀, Andaman, —.—.— (—coll.). *Wing expanse* : 18 mm.

Distribution.—India (Meghalaya, Khasis) ; Burma (Tenasserim) ; Philippines (Luzon).

Remarks.—The species is a new record for Andamans. The single specimen was amidst the old named collections of the Department.

Genus Botyodes Guenee

1854. *Botyodes* Guenee, *Delt. & Pyral*, p. 320.
 (Type : *Botyodes asialis* Guenee)

The genus is distributed throughout the Old World except Malagasic region. Amongst 6 Indian species, not a single one is hitherto represented from any of the southern islands. Presently, one species is dealt with hereunder.

Botyodes flavibasalis Moore

1867. *Botyodes flavibasalis* Moore, *Proc. zool. Soc. Lond.*, 1867 : 96.

1896. *Botyodes* (*Endocrossis*) *flavibasalis*, Hampson, *Fauna Br. India*, Moths, 4 : 326.

Material examined.—One ♀, Casuarina Bay, Great Nicobar, 16. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 33 mm.

Distribution.—India (U. P., Dehra Dun ; West Bengal, Calcutta ; Sikkim ; Assam ; Naga Hills) ; Burma ; Tonkin ; Philippines ; Malacca ; Sumatra : Nias ; Papua ; Bismarck Archipelago.

Remarks.—The species, of which the North-western extra peninsular locality was reported by Roonwal *et al* (1963), is a new record for Great Nicobar.

Genus Sylepta Hübner

1825. *Sylepta* Hübner, *Verz. bek. Schmett.*, p. 356.

(Type : *Sylepta amandalis* Hübner = *Phalaena Noctua amando* Cramer)

The genus is distributed throughout the world. Amongst 55 Indian species, *Sylepta scinialis* (Walker), *S. sellalis* (Guenee), *S. derogata* (Fabr.), *S. iopasalis* (Walker), *S. lunalis* (Guenee) and *S. luctuosalis* (Guenee) were earlier known from Andamans. Presently, 5 species are dealt with hereunder.

Key to species

1. Antenna neither excised nor with a tooth of scales at base ; forewing with two cellular annulii	<i>derogata</i> (Fabricius)
— Antenna excised and with a tooth of scales at base ; forewing never with 2 cellular annulii	2
2. Abdomen ringed ; both wings with cilia black-spotted	<i>denticulata</i> (Moore)
— Abdomen not ringed ; both wings with cilia not black-spotted	3
3. Abdomen with white postero-dorsal bands	<i>lunalis</i> (Guenee)
— Abdomen without such bands	4
4. Forewing with a cellular annulus	<i>crotonalis</i> (Walker)
— Forewing with a cellular speck	<i>fraterna</i> (Moore)

Sylepta derogata (Fabr.)

1775. *Phalaena derogata* Fabricius, *Syst. Ent.*, p. 641.

1854. *Sylepta multilinealis* Guenee, *Delt. & Pyral.*, p. 337, pl. 8, fig. 11.
 1896. *Sylepta (Sylepta) multilinealis*, Hampson, *Fauna Br. India*, Moths, 4 : 334.
 1898. *Sylepta (Sylepta) multilinealis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 722.
 1939. *Sylepta derogata*, Klima, *Lep. Cat.*, 89 : 193.

Material examined.—One ♀, Rangat, Middle Andaman, 7. viii. 1973, at light (K. S. Pradhan coll.). *Wing expanse* : 30 mm.

Distribution.—India (U. P. : Dehra Dun, Kanpur ; Maharashtra : Khandala, Bombay, Poona ; Karnataka, Kurg ; Orissa, Puri ; Bengal ; Sikkim ; Assam, Sibsagar ; Meghalaya, Khasis ; Andaman) ; Sri Lanka ; Burma ; Thailand ; Southern China ; Taiwan ; Singapore ; Philippines ; Molluccus ; Buru ; Indo-Malayan area (Malacca ; Sumatra ; Borneo ; Celebes ; Sambawa ; Flores ; Sula ; Ceram ; Key Islands ; Ambonia) ; Papua ; Australia ; Solomon ; New Hebrides ; Palau ; Viti ; Samoa ; Fiji ; Bismarck Archipelago ; South America ; U. S. S. R. (Eastern Siberia ; Amur ; Ussuri) ; Egypt ; Northern, Western and Middle China ; Korea ; Japan ; Southern and Eastern Africa (Sierra Leone ; Gold Coast ; Nigeria ; Sudan ; Belgium Congo ; Uganda ; Eastern Zanzibar ; Tanganyika ; Rhodesia ; Nyassaland ; Seychelles ; Maldives).

Remarks.—The species, of which the north-western extra-peninsular, and Southern and Eastern peninsular localities were reported by Roonwal *et al.* (1963), is not, however, known from Nicobar and Great Nicobar Islands, though the representative elements occur in the Indo-Malayan subregion of the Oriental region. The specimen examined shows R_s and $Sc+R_1$ of hindwing mutually stalked at origin from the discoidal cell and the upper cellular annulus of forewing quite smaller than the lower. The wing expanse is quite variable between 28 and 40 mm., as mentioned by Hampson (1896). The species occurs on *Gossypium* as leaf-roller, and also on *Abelmoschus esculentus* and *Althaea rosea*.

Sylepta denticulata (Moore)

1887. *Pramadea denticulata* Moore, *Descr. N. Ind. Lep. Ins.* Atkinson, p. 211.
 1896. *Sylepta (Pramadea) denticulata*, Hampson, *Fauna Br. India*, Moths, 4 : 338.
 1939. *Sylepta denticulata*, Klima, *Lep. Cat.*, 89 : 198.

Material examined.—One ♂, Andaman, .—.—.— (—coll.). *Wing expanse* : 28 mm.

Distribution.—India (Sikkim ; Assam, Cherra Punji ; Meghalaya : Khasis ; Nagas).

Remarks.—The species, which has hitherto been endemic in the

north-eastern extrapeninsular belt of the Indian mainland, is a new record for the Andaman Island. The expanse of the present specimen is quite smaller than that (34 mm.) recorded by Hampson (1896).

Sylepta lunalis (Guenée)

1854. *Botys lunalis* Guenée, *Delt. & Pyral.*, p. 352.

1896. *Sylepta (Pramadea) lunalis*, Hampson, *Fauna Br. India*, Moths, 4 : 339.

1939. *Sylepta lunalis*, Klima, *Lep. Cat.*, 89 : 199.

Material examined.—One ♂, Rangat, Middle Andaman, 7. viii. 1973, at light (K. S. Pradhan coll.). *Wing expanse* : 29 mm.

Distribution.—India (U. P. : Dehra Dun, Mussoorie ; Maharashtra : Bombay, Poona ; Tamil Nadu, Nilgiris ; Karnataka, Kurg ; West Bengal : Calcutta, Darjeeling ; Meghalaya, Khasis ; Andaman) ; Sri Lanka ; Burma ; Thailand ; Vietnam ; Cambodia ; Laos ; Taiwan ; Philippines ; Malacca ; Sumatra, Nias ; Java ; Borneo ; Celebes ; Lombok ; Sambawa ; Papua ; Hawaii (Christmas Island) ; South America (Venezuela).

Remarks.—The north-western extra-peninsular localities of the species were reported by Roonwal *et al.* (1963). The species shows certain variations including abdomen mesially excised, ventro-laterally swollen with slight tufts of scales and distally tapering, and both wings with postdiscal line reaching the mid-dorsum. It occurs on *Vitis vinifera*.

Sylepta fraterna (Moore)

1885. *Coptobasis fraterna* Moore, *Lep. Ceylon*, 3 : 292, pl. 181, fig. 8.

1896. *Sylepta (Pramadea) fraterna*, Hampson, *Fauna Br. India*, Moths, 4 : 339.

1939. *Sylepta fraterna*, Klima, *Lep. Cat.*, 89 : 199.

Material examined.—One ♀, Great Nicobar, —.—.— (—coll.). *Wing expanse* : 34 mm.

Distribution.—India (Tamil Nadu, Nilgiris ; Sikkim) ; Sri Lanka ; Philippines ; Sumatra ; Java ; Celebes.

Remarks.—The species, of which one specimen amidst the old collections of the Department from Sikkim was not noted in the earlier literature, is a new record for Great Nicobar. The expanse of the present specimen is fairly bigger than that (28 mm) recorded by Hampson (1896).

Sylepta crotonalis (Walker)

1859. *Botys crotonalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 19 : 997.

1896. *Sylepta (Pramadea) crotonalis*, Hampson, *Faunua Br. India*, Moths, 4 : 339.

1939. *Sylepta crotonalis*, Klima, *Lep. Cat.*, 89 : 199.

Material examined.—2 ♀♀, Mannarghat, Wright Myo, South Andaman, 1. iv. 1964 (B. S. Lamba coll.). *Wing expanse* : 34 mm.

Distribution.—India (Tamil Nadu ; Karnataka, Kurg ; Sikkim ; Meghalaya, Khasis) ; Sri Lanka ; Taiwan ; Borneo ; Pulo Laut ; Sangir.

Remarks.—The species, of which the southern peninsular localities were reported by Roonwall *et al.* (1963), is a new record for South Andaman.

Genus *Diaphania* Hübner

1818. *Diaphania* Hübner, *Zutr. Samml. Exot. Schmett.*, 1 : 51.

1896. *Glyphodes*, Hampson, *Fauna Br. India*, Moths, 4 : 345.

1898. *Glyphodes*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 731.

1939. *Diaphania*, Klima, *Lep. Cat.*, 94.

(Type : *Diaphania vitralis* Hübner)

The genus is distributed throughout the world. Amongst 13 Indian species, all of which were treated in *Glyphodes* Guenée by Hampson (1896, 1898). *Diaphania pfeifferae* (Lederer), *D. laticostalis* (Guenée), *D. marinata* (Fabr.), *D. bivitalis* (Guenée), *D. bicolor* (Swainson), *D. actorionalis* (Walker) and *D. indica* (Saunders) were earlier known from Andamans, *D. marginata* (Hampson), from Nicobar and *D. vertumnalis* (Guenée) from both these islands. Presently, 10 species are dealt with hereunder.

Key to species

1. Base of antenna normal	...	...	3
— Base of antenna not normal	...	...	2
2. Base of antenna excised and thickened with a tuft of hairs ; forewing with a ventro-proximal fringe of costal hairs and black discal spot, latter also present on hindwing ; both wings without terminal band ; body bright yellow-green <i>marinata</i> (Fabr.)			
— Base of antenna contorted, not thickened and without tuft of hairs ; forewing without ventro-proximal fringe of costal hairs and with a white discal lunule ; no discal mark on hindwing ; both wings with a silvery-fuscos terminal band ; body pure white	...	...	<i>pfeifferae</i> (Lederer)
3. Hindwing dorsum with ventral tufts of yellow hairs ; both wings with discal specks ; body			

— yellow-green	4
— Hindwing dorsum without ventral tufts of hairs ; both wings without discal speck ; body-colour variable	5
4. Hind tibia with outer mesial and terminal tufts of hairs ; both wings without a terminal series of dark specks and with cilia fuscous ...	<i>vertumnalis</i> (Guenée)
— Hind tibia without tuft of hairs ; both wings with a terminal series of dark specks and cilia fulvous	<i>marginata</i> (Hampson)
5. Abdomen with a terminal brush of spatulate scales ; forewing with costa and dorsum broadly black, leaving a triangular pearly-white hyaline patch ; body black-brown ...	<i>indica</i> (Saunders)
— Abdomen without terminal brush of spatulate scales ; forewing with costa and dorsum not broadly black so as to leave a triangular patch ; body may or may not be black-brown	6
6. Forewing costa with a fulvous proximal fascia ; body glaucous-green	<i>glauculalis</i> (Guenée)
— Forewing costa without fascia ; body never green	7
7. Forewing with two cellular triangular, one discal reniform and one sub-median oval marks ; hindwing with a black cellular speck and a discal oval mark ; both wings with a series of black terminal specks ; body pure white	<i>annulata</i> (Fabricius)
— Forewing with single cellular and discal marks which are neither triangular nor reniform ; sub-median mark absent ; hindwing without cellular speck and discal mark ; both wings without terminal specks ; body never white ..	8
8. Forewing with a white proximal fascia on dorsum, discal speck and postdiscal cornucopia-shaped patch ; hindwing wholly hyaline white with a terminal chestnut band ; both wings with iridescent tinge ; body chestnut-brown	<i>bivitalis</i> (Guenée)
— Forewing without fascia on dorsum, with a discal semi-hyaline band and postdiscal oval-shaped patch ; hindwing basally hyaline white with a terminal black-brown band ; both wings without iridescent tinge ; body black-brown	9
9. Forewing with discal band reaching dorsum, costal spot not continued to subterminal line which is absent ; hindwing with terminal band broad and of uniform width ...	<i>bicolor</i> (Swainson)
— Forewing with discal band not reaching	

dorsum, costal spot continued to a subterminal line which is present ; hindwing with terminal band narrow and tapering posteriorly

actorionalis (Walker)

***Diaphania pfeifferae* (Lederer)**

1863. *Sisyrophora pfeifferae* Lederer, *Wien. Ent. Monat.*, 7 : 399, pl. 13, fig. 13.
 1896. *Glyphodes (Sisyrophora) pfeifferae*, Hampson, *Fauna Br. India, Moths*, 4 : 346.
 1898. *Glyphodes (Sisyrophora) pfeifferae*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 732.
 1939. *Diaphania pfeifferae*, Klima, *Lep. Cat.*, 94.

Material examined.—2 ♀♀, Campbell Bay, 3, 13-iii., 1 ♂, Galathea Bay, 24. xii., 1 ♂, Alexander River, 13. iv., 1 ♂, Casuarina Bay, 16. iv. 1966 (*A. Daniel & H. K. Bhowmik* coll.); 1 ♀, Campbell Bay, Great Nicobar, 31. xii. 1975, at light (*P. K. Maiti & D. K. Mandal* coll.). *Wing expanse* : ♂ 26 mm, ♀ 27-32 mm.

Distribution.—India (West Bengal, Darjeeling ; Sikkim ; Meghalaya, Khasis ; Andamans) ; Burma (Karen Hills) ; Singapore ; Sumatra.

Remarks.—The species is a new record for Great Nicobar. The present males are quite smaller than those having the maximum expanse of 36 mm., as recorded by Hampson (1896).

***Diaphania marinata* (Fabr.)**

1775. *Phalaena marinata* Fabricius, *Syst. Ent.*, 3 : 209.
 1896. *Glyphodes (Pachyarches) psittacalis*, Hampson, *Fauna Br. India, Moths*, 4 : 347.
 1898. *Glyphodes (Pachyarches) marinata*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 733.
 1939. *Diaphania marinata*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Humphreygunj, 4. iii. 1964 (*B. S. Lamba* coll.) ; 1 ♂, 1 ♀, Chidyatapu, South Andaman, 18. i., 6. ii. 1972, at light (*A. K. Mukherjee and B. Dutt* coll.). *Wing expanse* : ♂ 26-28 mm, ♀ 32 mm.

Distribution.—India (Maharashtra, Bombay ; Tamil Nadu, Nilgiris ; West Bengal, Calcutta ; Sikkim ; Assam, Sibsagar ; Andamans) ; Sri Lanka ; Burma ; Malaya ; Borneo ; Celebes ; Fiji.

***Diaphania marginata* (Hampson)**

1893. *Cenocnemis marginata* Hampson, *Ill. Typ. Spec. Lep. Het. Br. Mus.*, 9 : 169, pl. 173, fig. 23.

1896. *Glyphodes (Cenocnemis) marginata*, Hampson, *Fauna Br. India, Moths*, 4 : 348.
1898. *Glyphodes (Cenocnemis) marginata*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 735.
1939. *Diaphania marginata*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Humphreygunj, 4. iii., 1 ♂, Mannar-ghat, 26. iii., 1 ♀, Wright Myo, Mt. Harriet Range, South Andaman, 1. iv. 1964 (B. S. Lamba coll.). *Wing expanse* : ♂ 34-36 mm, ♀ 30 mm.

Distribution.—India (U. P., Dehra Dun ; Kerala, Travancore ; Orissa, Ganjam ; West Bengal, Calcutta ; Sikkim ; Assam, Cachar ; Nicobar Island) ; Sri Lanka ; Solomons.

Remarks.—The species, of which the north-western extra-peninsular locality was reported by Roonwal *et al.* (1963), is a new record for South Andaman. The present specimens, particularly the female, are quite smaller as compared to the wing expanse (40 mm) given by Hampson (1896).

Diaphania vertumnalis (Guenée)

1854. *Margarodes vertumnalis* Guenée, *Delt. & Pyral.*, p. 309.
1896. *Glyphodes (Enchocnemidia) vertumnalis*, Hampson, *Fauna Br. India, Moths*, 4 : 349.
1898. *Glyphodes (Enchocnemidia) vertumnalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 735.
1939. *Diaphania vertumnalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, 1 ♀, Campbell Bay, Great Nicobar, 26. xii. 1975 (P. K. Maiti and D. K. Mandal coll.). *Wing expanse* : ♂ 33 mm, ♀ 40 mm.

Distribution.—India (U. P., Dehra Dun ; M. P. ; Maharastra, Bombay ; Tamil Nadu ; West Bengal, Calcutta ; Sikkim ; Andamans ; Nicobars) ; Sri Lanka ; Burma (Tenasserim) ; Philippines ; Malaya ; Borneo ; Java ; Ceram ; Australia.

Remarks.—The species, of which the north-western extra-peninsular and southern peninsular localities were reported by Roonwal *et al.* (1963), is a new record for Great Nicobar. The expanse of present specimens is smaller than that as mentioned by Hampson (1896). The size-criterion is possibly related to sexual and not individual variations, as categorised by Hampson (*loc. cit*) into two "forms", viz., "small" *vertumnalis* (36 mm.) and "large" *phryneusalis* (40-44mm), which "occur irrespective of locality" The species occurs on *Tabernoemontana coronaria*.

***Diaphania glauculalis* (Guenée)**

1854. *Margarodes glauculalis* Guenée, *Delt. & Pyral.*, p. 306.
 1896. *Glyphodes (Glyphodes) glauculalis*, Hampson, *Fauna Br. India*, Moths, 4 : 350.
 1898. *Glyphodes (Glyphodes) glauculalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 741.
 1939. *Diaphania glauculalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Alexander River, Great Nicobar, 13. iv. 1966 (A. Daniel and H. K. Bhowmik coll.). *Wing expanse* : 40 mm.

Distribution.—India (Maharashtra : Bombay, Poona ; Karnataka : Kurg, Belgaum ; Kerala, Travancore ; Tamil Nadu ; West Bengal, Calcutta ; Sikkim ; Assam : Sibsagar, Dansiri ; Meghalaya, Northern Khasis ; Nagaland) ; Sri Lanka ; Burma ; Malaya ; Sumatra ; Java ; Borneo ; Ternate.

Remarks.—The species is a new record for Great Nicobar. The present specimen differs from the other Malaysian representatives belonging to the form *glauculalis*, Hampson (1896) by the body-colour more blue-green and size lesser by 6-10 mm., from the Indo-Chinese forms *marthesiusalis*, Hampson (*loc. cit.*) and *nereis*, Hampson (*loc. cit.*) by shoulders and collar both greenish blue, fascia fulvous along the entire costal margin and expanse more by 6 mm. Besides, it shows certain minor anomalies in wing venation, too, viz., forewing with M_2 and M_3 a little above the postero-discal angle, R_5 not much closely approximated to $R_{3,4}$ and hindwing with Cu_{1a} a little before postero-discal angle, M_2 and M_3 rather abruptly separated from origin and discocellulars angled mesially.

***Diaphania annulata* (Fabr.)**

1794. *Phalaena annulata* Fabricius, *Ent. Syst.*, 3 (2) : 212.
 1896. *Glyphodes (Glyphodes) celsalis*, Hampson, *Fauna Br. India*, Moths, 4 : 352.
 1898. *Glyphodes (Glyphodes) annulata*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 740.
 1939. *Diaphania annulata*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Dogma River, Great Nicobar, 11. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 26 mm.

Distribution.—India (Maharashtra, Poona ; Tamil Nadu, Nilgiris ; Karnataka, Kurg ; Bihar, Ranchi ; Meghalaya, Khasis) ; Sri Lanka ; Burma (Rangoon) ; Borneo.

Remarks.—The species is a new record for Great Nicobar. It occurs on *Jasminum sambac*.

Diaphania bivitalis (Guenée)

1854. *Glyphodes bivitalis* Guenée, *Delt. & Pyral*, p. 293.
 1896. *Glyphodes (Glyphodes) bivitalis*, Hampson, *Fauna Br. India, Moths*, 4 : 355, fig. 191.
 1898. *Glyphodes (Glyphodes) bivitalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 743, fig. 74.
 1939. *Diaphania bivitalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♀, Campbell Bay, Great Nicobar, 29. xii. 1975 (P. K. Maiti & D. K. Mandal coll.) *Wing expanse* : 34 mm.

Distribution.—India (Maharashtra : Bombay, Alibagh ; Tamil Nadu ; Karnataka, Kurg ; West Bengal, Darjeeling ; Sikkim ; Assam, Sibsagar ; Andaman) ; Sri Lanka ; Burma ; Taiwan ; Borneo ; U. S. A.

Remarks.—The species is a new record for Great Nicobar. It occurs on *Cajanus cajan*, *Artocarpus heterophyllus* and *Ficus oppositifolia*.

Diaphania bicolor (Swainson)

1821. *Botys bicolor* Swainson, *Zool. Illustr.*, (1) 2 : 77, fig. 2.
 1896. *Glyphodes (Glyphodes) bicolor*, Hampson, *Fauna Br. India, Moths*, 4 : 358.
 1898. *Glyphodes (Glyphodes) bicolor*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 742.
 1939. *Diaphania bicolor*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♀, Malaoea Village, Car Nicobar, 3. iii. 1970 (B. K. Tikadar coll.). *Wing expanse* : 26 mm.

Distribution.—India (U. P. : Dehra Dun, Chakrata Range, Haldwani ; Maharashtra : Bombay, Poona ; Kerala, Travancore ; Tamil Nadu ; Bihar, Pusa ; West Bengal, Calcutta ; Sikkim ; Andaman) ; Sri Lanka ; Burma (Mergui, Rangoon) ; Celebes Java ; Australia.

Remarks.—The species, of which north-western extra-peninsular localities were reported by Roonwal *et al.* (1963), is a new record for Car Nicobar.

Diaphania actorionalis (Walker)

1859. *Glyphodes actorionalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 17 : 498.
 1896. *Glyphodes (Glyphodes) actorionalis*, Hampson, *Fauna Br. India, Moths*, 4 : 359.
 1898. *Glyphodes (Glyphodes) actorionalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 742.
 1939. *Diaphania actorionalis*, Klima, *Lep. Cat.*, 94.

Material examined.—2 ♂♂, 1 ♀, Wrafter's Creak, Baratang, 18. iii., 2 ♂♂, Mannarghat, 31. iii., 2 ♂♂, Wright Myo, Mt. Harriet Range, South Andaman, 2. iv. 1964 (*B. S. Lamba* coll.); 1 ♀, Campbell Bay, 3. iii., 1 ♀, Alexander River, 13. iv., 1 ♀, Appiah Bay, Great Nicobar, 14. iv. 1966 (*A. Daniel & H. K. Bhowmik* coll.). *Wing expanse* : ♂ ♀ 30-32 mm.

Distribution.—India (U. P., Dehra Dun ; Maharastra, Bombay ; Karnataka, Kurg ; Sikkim ; Meghalaya, Khasis ; Andamans) ; Sri Lanka ; Malaya ; Celebes.

Remarks.—The species, which was reported from the north-western extra-peninsular India by Roonwal *et al.* (1963), is a new record for Great Nicobar.

Diaphania indica (Saunders)

1851. *Eudiptes india* Saunders, *Trans. ent. Soc. Lond.*, (2) 1 : 163, pl. 12, figs. 5-7.
 1896. *Glyphodes (Phacellura) indica*, Hampson, *Fauna Br. India*, Moths, 4 : 360.
 1898. *Glyphodes (Phacellura) indica*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 738.
 1939. *Diaphania indica*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, 1 ♀, Campbell Bay, Great Nicobar, 3. iii. 1966 (*A. Daniel & H. K. Bhowmik* coll.). *Wing expanse* : ♂ 20 mm., ♀ 25 mm.

Distribution.—India (U. P., Dehra Dun ; Haryana, Ambala ; M. P., Mhow ; Maharastra : Bombay, Poona ; Tamil Nadu, Nilgiris ; Bihar : Ranchi, Pusa ; West Bengal, Calcutta ; Sikkim ; Andamans) ; Sri Lanka ; Burma (Rangoon) ; China ; Taiwan ; Celebes ; Java Australia ; Ethiopian region ; Pakistan (Karachi).

Remarks.—The species, which was reported from the north-western extra-peninsular India by Roonwal *et al.* (1963), is a new record for Great Nicobar. The wing expanse of the present specimens, particularly the male, is rather smaller than that (24-28 mm.) recorded by Hampson (1896). The species occurs on Cucurbitaceous and *Corchorous* species.

Genus Glyphodes Guenée

1854. *Glyphodes* Guenée, *Delt. & Pyral.*, p. 292.
 (Type : *Glyphodes stolalis* Guenée)

The genus is distributed throughout the world. It is represented by 28 Indian species, of which *Glyphodes caesalis* Walker, *G. canthusalis* Walker and *G. picticostalis* Hampson were earlier known from

Andamans, *G. suralis* Lederer, from Nicobar and *G. itysalis* Walker, from both these islands. Presently, 3 species are dealt with.

Key to species

1. Body emerald green ; both wings with discal mark reduced to speck, termen angled at middle and with a series of fulvous spots ... *suralis* Lederer
- Body never green ; both wings with discal mark, when present, not reduced to speck, termen evenly curved and without fulvous spots 2
2. Body pure white ; forewing with a brown fascia on costa and without discal metallic blue line ; both wings without subterminal band and with a series of terminal black specks *nigropunctalis* Bremer
- Body fuscous grey ; forewing with a proximal and mesially interrupted white fascia on dorsum and a discal metallic blue line : both wings with a subterminal lilacine-grey band and a faint terminal line *itysalis* Walker

***Glyphodes suralis* Lederer**

1863. *Glyphodes suralis* Lederer, *Wien Ent. Monat.*, p. 405, pl. 14, fig. 9.
 1896. *Glyphodes (Chloauges) suralis*, Hampson, *Fauna Br. India, Moths*, 4 : 349.
 1898. *Glyphodes (Chloauges) suralis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 738.
 1939. *Glyphodes suralis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♀ Alexander River, Great Nicobar, 13. iv. 1966 (*A. Daniel & H. K. Bhowmik* coll.). *Wing expanse* : 24 mm.

Distribution.—India (Nicobars) ; Amboina ; Solomons ; Gilbert ; Ellice ; Marshall Island.

Remarks.—The species, which is typically insular in origin, is a new record for Great Nicobar. The present specimen is too small as compared to the expanse (30-40 mm.) given by Hampson (1896).

***Glyphodes nigropunctalis* Bremer**

1864. *Glyphodes nigropunctalis* Bremer, *Lep. Ost. - Sib.*, p. 67, pl. 6, fig. 5.
 1896. *Glyphodes (Glyphodes) nigropunctalis*, Hampson, *Fauna Br. India, Moths*, 4 : 352.
 1898. *Glyphodes (Glyphodes) nigropunctalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 739.

Material examined.—One ♀, Wrafter's Creak, Baratang, South

Andaman, 17. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 28 mm.

Distribution.—India (H. P., Simla ; Maharastra, Bombay ; Tamil Nadu, Nilgiris ; Sikkim ; Assam, Sibsagar ; Nagaland) ; Sri Lanka ; Pakistan ; Siberia ; Japan.

Remarks.—The species is a new record for South Andaman. The present specimen is quite smaller as compared to the wing expanse (32-36 mm.) given by Hampson (1896).

Glyphodes itysalis Walker

- 1859. *Glyphodes itysalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 17 : 501
- 1896. *Glyphodes (Glyphodes) itysalis*, Hampson, *Fauna Br. India, Moths*, 4 : 354.
- 1898. *Glyphodes (Glyphodes) itysalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 743.
- 1939. *Glyphodes itysalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Humphreygunj, South Andaman, 3. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 30 mm.

Distribution.—India (Maharastra : Khandala, Bombay ; Tamil Nadu, Nilgiris ; Assam, Sibsagar ; Andamans ; Nicobars) ; Sri Lanka ; Burma ; Taiwan ; Sumatra ; Borneo ; Java.

Remarks.—The expanse of the present specimen is larger than that (24-26 mm.) given by Hampson (1896).

Genus Synclera Lederer

- 1863. *Synclera Lederer*, *Wien. ent. Monat.*, 7 : 444 (nec syn. of *Pagyda*, Hampson, 1896, 1898 ; Klima, 1939).
- (Type : *Eudiotis traducalis* Zeller)

The genus is distributed throughout the world except the Malagasy and Hawaiian regions. Amongst 3 Indian species, none is hitherto known from the southern islands. According to Munroe (1956), it is close to *Glyphodes* Guenée and allies and bears no relation with *Pagyda* Walker with which it was erroneously synonymised by Hampson (1896, 1898). The similar confusion was also followed by Klima (1939). One species is dealt with hereunder.

***Synclera traducalis* (Zeller)**

- 1852. *Eudiotis traducalis* Zeller, *Kgl. Vet. Akad. Handl. Lep. Micropt. Caffr.*, p. 54.
- 1863. *Synclera traducalis*, Lederer, *Wien, ent. Monat.*, 7 : 444.
- 1896. *Pagyda (Synclera) traducalis*, Hampson, *Fauna Br. India, Moths*, 4 : 272.

1898. *Paygda (Synclera) traducalis*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 636.
 1939. *Pagyda traducalis*, Klima, *Lep. Cat.*, 89 : 33.
 1956. *Synclera traducalis*, Munroe, *Rev. Fr. Ent.*, 23 (2) : 122.

Material examined.—One ♀, Campbell Bay, 9. iii., 1 ♀, Galathea Bay, Great Nicobar, 24. iii. 1966 (A. Daniel & H. K. Bhowmik coll.) ; 1 ♂, Kamorta, Nicobar, 22. iii. 1970 (B. K. Tikadar coll.) ; 1 ♀, Car Nicobar, 14. ii. 1972, at light (A. K. Mukherjee & B. Dutt coll.).
Wing expanse : ♂ 26 mm., ♀ 20-24 mm.

Distribution.—India (Delhi Cant. ; Maharashtra, Bombay ; Bihar, Pusa ; West Bengal, Calcutta ; Assam ; Sikkim) ; Sri Lanka ; Burma ; Philippines ; Sumatra ; Java ; Celebes ; Amboina ; Papua ; Bismarck Archipelago ; Central and South America (Haiti ; Bahama ; Mexico ; Guatemala ; Costa Rica ; Panama ; Ecuador) ; North America (Florida) ; Syria ; Palestine (Cyrenica) ; U. A. R. (Aden) ; Eastern and Southern Africa (Congo ; Kilimanjaro ; Kaffernland).

Remarks.—The species, of which the northern peninsular locality was recorded by Roonwal *et al.* (1963), is a new record for both Car and Great Nicobar Islands.

Genus *Nausinoe* Hübner

1825. *Nausinoe* Hübner, *Verz. bek. Schmett.*, p. 362 (non descr.).
 1896. *Lepyrodes*, Hampson, *Fauna Br. India*, Moths, 4 : 367.
 1898. *Lepyrodes*, Hampson, *Proc. zool. Soc. Lond.*, 1898 : 753.
 1939. *Nausinoe*, Klima, *Lep. Cat.*, 94.
 (Type : *Nausinoe neptalis* Hübner)

The genus is distributed in the Ethiopian, Oriental and Australian regions. Of the 2 Indian species, none is hitherto known from any of the southern insular groups of India. Presently, one species is dealt with hereunder.

Nausinoe geometralis (Guenée)

1854. *Lepyrodes geometralis* Guenée, *Delt. & Pyral*, p. 278, pl 8, fig. 6.
 1896. *Lepyrodes (Lepyrodes) geometralis*, Hampson, *Fauna Br. India*, Moths, 4 : 368.
 1898. *Lepyrodes (Lepyrodes) geometralis*, *Proc. zool. Soc. Lond.*, 1898 : 754.
 1939. *Nausinoe geometralis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Aberdeen Bay, South Andaman, 13. xii. 1972 (K. S. Pradhan coll.). *Wing expanse* : 22 mm.

Distribution.—India (U. P., Dehra Dun ; Maharashtra : Bombay, Poona ; Kerala, Vellyani ; Tamil Nadu : Nilgiris, Assirghar ; Bihar : Pusa, Barakar ; West Bengal, Calcutta ; Assam, Sibsagar) ; Sri

Lanka ; Burma ; China ; Taiwan ; Java ; Australia ; Western Africa ; Pakistan (Karachi).

Remarks.—The species is a new record for South Andaman. It occurs on *Jasminum sambac*.

Genus *Sameodes* Snellen

1880. *Sameodes* Snellen, *Tijd. v. Ent.*, 23 : 217.

(Type : *Botys cancellalis* Zeller)

The genus is distributed throughout the world except Hawaiian region. Amongst 5 Indian species, none is hitherto reported from any of the southern insular groups of India. Presently, one species is dealt with hereunder.

Sameodes cancellalis (Zeller)

1852. *Botys cancellalis* Zeller, *K. Vet. -A. K. Handl.*, p. 34.

1896. *Sameodes* (*Sameodes*) *cancellalis*, Hampson, *Fauna Br. India*, Moths, 4 : 375.

1899. *Sameodes* (*Sameodes*) *cancellalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 174.

Material examined.—One ♂, 2 ♀♀, Wright Myo, Mt. Harriet Range, South Andaman, 29. iii., 2. iv. 1964 (*B. S. Lamba* coll.). *Wing expanse* : ♂ ♀ 20-21 mm.

Distribution.—India (North-eastern extra-peninsular area ; Tamil Nadu ; Bihar, Pusa) ; Sri Lanka ; Burma ; Java ; Australia ; Africa.

Remarks.—The species is a new record for South Andaman. The southern and eastern peninsular localities were reported by Roonwal *et al.* (1963).

Genus *Thliptoceras* Warren

1890. *Thliptoceras* Warren (in Swinhoe), *Trans. ent. Soc. Lond.*, p. 274.

[Type : *Thliptoceras variabilis* Warren = *Hapalia cascalis* (now *cascale*) Swinhoe]

The genus is distributed throughout the Old World except Malagasic and Papuan regions. Amongst the 5 Indian species, none is hitherto known from the southern islands. Presently, one species is dealt with hereunder.

Thliptoceras cascale (Swinhoe)

1890. *Hapalia cascalis* Swinhoe, *Trans. ent. Soc. Lond.*, p. 271, pl. 8, fig. 18.

1896. *Thliptoceras* (*Thliptoceras*) *cascale*, Hampson, *Fauna Br. India*, Moths, 4 : 377.
 1899. *Thliptoceras* (*Thliptoceras*) *cascale*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 179. fig. 22.
 1967. *Thliptoceras cascale*, Munroe, *Can. Ent.*, 99 : 722. [Lectotype, ♂, designated in B. M. (N. H.)].

Material examined.—One ♀, Cowriaghat, South Andaman, 9. iv. 1964 (B. S. Lamba coll.). *Wing expanse* : 20 mm.

Distribution.—India (H. P., Dharmasala ; Maharashtra, Bombay ; Tamil Nadu, Nilgiris ; Sikkim) ; Sri Lanka Burma (Rangoon) ; Japan.

Remarks.—The species is a new record for South Andaman.

Genus *Prophantis* Warren

1896. *Prophantis* Warren, *Ann. Mag. nat. Hist.*, (6) 18 : 113,
 (Type : *Botys octoguttalis* Felder)

The genus was originally erected as “nom. nov.” by Warren (1896) to incorporate some species earlier belonging to *Archernis* Meyrick. Subsequently, it was treated by Hampson (1896, 1899) as one of the subgenera of the genus *Thliptoceras* Warren. Later, it was synonymised with *Ischnurges* Lederer by Shibuya (1928) and finally, has been considered as a valid genus by Munroe (1967). None of the foregoing workers could, however hint at any particular external character for its ready recognition. The antennal feature in male, as mentioned by Hampson (*loc. cit.*) at the subgeneric level, seems to be a salient one in the genus *Prophantis* Warren, which occurs mainly in the Oriental and occasionally also in a few other regions including Australian and Ethiopian. Amongst several described and many undescribed species (*vide* Munroe, *loc. cit.*), only one is dealt with hereunder.

Prophantis octoguttale (Felder)

1874. *Botys octoguttalis* Felder, *Reis. Nov. Lep.*, 4 : pl. 135, fig. 38.
 1896. *Thliptoceras* (*Prophantis*) *octoguttale*, Hampson, *Fauna Br. India*, Moths, 4 : 378.
 1967. *Prophantis octoguttale*, Munroe, *Can. Ent.*, 99 (7) : 722.

Material examined.—One ♂, Andaman, (—coll.). *Wing expanse* : 20 mm.

Distribution.—India (Tamil Nadu, Nilgiris ; Sikkim ; Assam, Sibsagar) ; Sri Lanka ; Borneo ; Amboina ; Australia ; Southern Africa (Natal.).

Remarks.—The species, lying hitherto unrecorded amidst the old

collections of the Department, is recorded new for the Andaman Island.

Genus *Terastia* Guenée

1854. *Terastia* Guenée, *Delt. & Pyral.*, p. 211.
(Type : *Terastia meticulosalis* Guenée)

The genus is distributed in the Ethiopian, Oriental and Neotropical regions. Of the two Indian species, *Terastia meticulosalis* Guenée, coupled with the distribution, locality-data and morphological annotation, was already recorded from Car Nicobar by Bhattacharya *et al.* (1976). The species occurs on *Erythrina* sp. as stem-borer.

Genus *Ischnurges* Lederer

1863. *Ischnurges* Lederer, *Wien. ent. Monat.*, p. 418.
(Type : *Ischnurges illustralis* Lederer)

The genus is distributed in the Ethiopian, Oriental, Papuan, Australian and Neotropical regions. Of the three Indian species, none is hitherto reported from any of the southern insular groups of India. Presently, one species is dealt with hereunder.

Ischnurges graciosalis (Walker)

1859. *Samea graciosalis* Walker, *List Lep. Ins. Coll. Br. Mus.*, 17 : 357.
1896. *Ischnurges graciosalis*, Hampson, *Fauna Br. India*, Moths, 4 : 383, fig. 208.

Material examined.—One ♀, Dogma River, Great Nicobar, 11. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 24 mm.

Distribution.—India (Kerala, Travancore ; Tamil Nadu, Nilgiris ; West Bengal, Darjeeling ; Sikkim) ; Sri Lanka ; Borneo ; Pulo Laut ; Northern China.

Remarks.—The species is a new record for Great Nicobar.

Genus *Hyalobathra* Meyrick

1885. *Hyalobathra* Meyrick, *Trans. ent. Soc. Lond.*, p. 445.
1896. *Isocentris*, Hampson, *Fauna Br. India*, Moths, 4 : 385.
1899. *Hyalobathra*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 189.
(Type : *Hyalobathra archeleuca* Meyrick)

The genus is distributed in the Palaearctic, Ethiopian, Oriental, Australian and Neotropical regions. Of the eight Indian species, none

is hitherto reported from the southern islands. Presently, one species is dealt with hereunder.

***Hyalobathra filalis* (Guenée)**

1854. *Asopia filalis* Guenée, *Delt. & Pyral.*, p. 204.

1896. *Isocentris filalis*, Hampson, *Fauna Br. India*, Moths, 4 : 385, fig. 209.

1899. *Hyalobathra (Isocentris) filalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 189.

Material examined.—4 ♀ ♀, Campbell Bay, 3, 13, 16-iii., 1. v., 2 ♀ ♀, Galathea Bay, Great Nicobar, 22, 24-iii. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 19-22 mm.

Distribution.—India (Maharashtra, Bombay ; Karnataka, Karwar ; Tamil Nadu, Coimbatore ; Bihar, Pusa ; Assam, Sibsagar) ; Bangladesh (Sylhet) ; Sri Lanka ; Burma ; Taiwan ; Java ; Celebes ; Australia ; Neotropical region ; Mauritius.

Remarks.—The species is a new record for Great Nicobar.

Genus *Crocidophora* Lederer

1863. *Crocidophora* Lederer, *Wien. ent. Monat.*, 386.

(Type : *Crocidophora tuberculalis* Lederer)

The genus is distributed in the Holarctic, Ethiopian, Oriental and Australian regions. Out of 21 Indian species, only *Crocidophora limbolalis* Moore was earlier known from Andamans. Presently, one more species is added from the insular area.

***Crocidophora ptyophora* Hampson**

1896. *Crocidophora (Crocidophora) ptyophora* Hampson, *Fauna Br. India*, Moths, 4 : 389, fig. 210.

Material examined.—One ♀, South Andaman, —.—.—. (—coll.). *Wing expanse* : 30 mm.

Distribution.—India (West Bengal, Darjeeling ; Sikkim) ; Burma (Tenasserim).

Remarks.—The species, which remained hitherto endemic in the north-eastern extra-peninsular belt of the Indian mainland, is a new record for South Andaman.

Genus *Maruca* Walker

1859. *Maruca* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 540.

(Type : *Hydrocampa aquatilis* Boisduval = *Crochiphora testulalis* Hübner)

The genus is distributed throughout the world except Nearctic region. Of the two Indian species, *Maruca testulalis* (Geyer) was earlier known from Andamans. The same species is dealt with hereunder.

***Maruca testulalis* (Geyer)**

1832. *Crochiphora testulalis* Geyer, *Hubn. Samml. Exot. Schmett.*, 4 (4) : 12 (non descr.).

1896. *Maruca testulalis*, Hampson *Fauna Br. India*, Moths, 4 : 393, fig. 211.

1899. *Maruca testulalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 194, fig. 104.

Material examined.—One ♂, Wrafter's creak, South Andaman, 11 iii. 1964 (B. S. Lamba coll.); 1 ♂, Rangat, Middle Andaman, 5. i. 1973, at light (K. S. Pradhan coll.). *Wing expanse* : 22-24 mm.

Distribution.—India (H. P., Kulu ; U. P. : Dehra Dun, Mussoorie ; Haryana, Ambala ; Maharashtra : Khandala, Poona ; Karnataka, Kurg ; Tamil Nadu, Nilgiris ; Orissa, Sambalpure ; Bihar, Pusa ; West Bengal, Calcutta. Darjeeling ; Sikkim ; Assam : Sibsagar, Cinomara, Dansiri ; Meghalaya, Khasis ; Andamans) ; Sri Lanka ; Burma (Rangoon) ; Celebes ; Borneo ; Australia ; South America ; Japan ; Southern Africa.

Remarks.—The present specimens are fairly smaller in expanse than that (26-30 mm.) recorded by Hampson (1896). The species occurs on *Vigna unguiculata* and developing seeds of *Phaseolus aureus* and *P. mungo*.

Genus *Tetridia* Warren

1890. *Tetridia* Warren, *Ann. Mag. Nat. Hist.*, (6) 6 : 477.
(Type : *Botys caletoralis* Walker)

The genus is hitherto known to be endemic in the Oriental region. The single Indian species is dealt with hereunder.

***Tetridia caletoralis* (Walker)**

1859. *Botys caletoralis*, Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 651.

1896. *Tetridia caletoralis*, Hampson, *Fauna Br. India*, Moths, 4 : 395, fig. 213.

Material examined.—2 ♀ ♀, Humphreygunj, 4. iii., 1 ♀, Wrafter's Creak, Baratang, South Andaman, 17. iii. 1964 (B. S. Lamba coll.). *Wing expanse* : 32-34 mm.

Distribution.—India (Bihar, Pusa ; Sikkim ; Assam, Sibsagar ; Meghalaya, Khasis ; Andamans) ; Bangladesh (Sylhet) ; Sri Lanka ; Burma (Tenasserim) ; Indo-Malayan area (Borneo ; Celebes).

Remarks.—The eastern peninsular locality of the species from

India was reported by Roonwal *et al* (1963).

Genus **Polygrammodes** Guenée

1854. *Polygrammodes* Guenée, *Delt. & Pyral.*, p. 318.
 1896. *Pachynoa*, Hampson, *Fauna Br. India*, Moths, 4 : 396.
 1899. *Polygrammodes*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 196.
 (Type : *Polygrammodes runicalis* Guenée)

The genus is distributed throughout the world except Palaearctic, Papuan and Hawaiian regions. Amongst 6 Indian species, *Polygrammodes thoosalis* (Walker), *P. sabelialis* (Guenée) and *P. pectinicornalis* (Guenée) were earlier known from Andamans. Presently, the last species is dealt with hereunder.

Polygrammodes pectinicornalis (Guenée)

1854. *Botys pectinicornalis* Guenée, *Delt. & Pyral.*, p. 326.
 1896. *Pachynoa* (*Pitacanda*) *pectinicornalis*, Hampson, *Fauna Br. India*, Moths, 4 : 398.
 1899. *Polygrammodes* (*Pachynoa*) *pectinicornalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 197.

Material examined.—One ♂, 1 ♀, South Andaman, —.—.—
 (—coll.). *Wing expanse* : ♂ 26 mm., ♀ 31 mm.

Distribution.—India (Gujarat, Cutch ; Maharastra : Bombay, Poona ; West Bengal ; Andamans).

Remarks.—The expanse of the specimens is smaller than that (34 mm.) given by Hampson (1896).

Genus **Psara** Snellen

1875. *Psara* Snellen, *Sijdschr. Ent.*, 18 : 239.
 1884. *Pachyzancla* Meyrick, *Trans. Ent. Soc. Lond.*, p. 315.
 1929. *Psara*, Shibuya, *J. Fac. Kgr. Hokkaido Imp. Univ. Tapporo*, 25 : 205.
 (Type : *Psara pallicaudalis* Snellen)

The genus is distributed throughout the world. Of the twelve Indian species, *Psara licarsisalis* (Walker), *P. phaeopteralis* (Guenée) and *P. stultalis* (Walker) were know from Andamans. Presently, all these three species are dealt with.

Key to species

1. Mesial femur dilated with ventral scales ;
 patagium without long tuft of scaly hairs ;
 3rd abdominal segment without black spot ;
 forewing without dorso-basal speck ; hind-

wing without discal spot ; both wings without lines ... 2

- Mesial femur not dilated with scales ; pterogaster with long tuft of scaly hairs extending beyond metathorax ; 3rd abdominal segment with paired black spots ; forewing with a dorso-basal speck ; hind wing with a large discal spot ; both wings with lines ... *stultalis* (Walker)
- 2. Body not purple ; foreleg with tibio-femoral joint roughly hairy ; forewing ventro-proximally fringed with black costal hairs and with discal lunule ... *licarsisalis* (Walker)
- Body tinged with purple ; foreleg without hairs ; forewing without costal fringe of hairs and with discal spot ... *phaeopteralis* (Guenée)

Psara licarsisalis (Walker)

1859. *Botys licarsisalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 686.
 1896. *Pachyzancla licarsisalis*, Hampson, *Fauna Br. India*, Moths, 4 : 402, fig. 218.
 1899. *Pachyzancla licarsisalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 202, fig. 111.
 1939. *Psara licarsisalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♀, Wright Myo, Mt. Harriet Range, 2. iv. 1964 (B. S. Lamba coll.) ; 1 ♂, 1 ♀, Aberdeen Bay, South Andaman, 13. xii. 1972, 2 ♀ ♀, Rangat, Middle Andaman, 8. i. 1973, at light (K. S. Pradhan coll.). *Wing expanse* : ♂ 24 mm, ♀ 24-26 mm.

Distribution.—India (H. P., Solan ; U. P. : Dehra Dun, Mussorie, Mirzapur ; M. P., Mhow ; Maharastra : Mahabaleswar, Bombay, Poona ; Tamil Nadu, Nilgiris ; Bihar, Ranchi ; West Bengal : Calcutta, Kurseong ; Sikkim ; Andamans) ; Sri Lanka ; Malacca : Borneo ; Java ; Australia ; Syria ; Japan ; China ; Pakistan (Chitral ; Karachi).

Remarks.—The species occurs on *Anisomeles ovata* as leaf-roller.

Psara phaeopteralis (Guenée)

1854. *Botys phaeopteralis* Guenée, *Delt. & Pyral.*, p. 349.
 1896. *Pachyzancla (Acharana) phaeopteralis*, Hampson, *Fauna Br. India*, Moths, 4 : 402.
 1899. *Pachyzancla (Acharana) phaeopteralis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 202.
 1939. *Psara phaeopteralis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♂, Manpur, South Andaman, 18. i. 1973, at light (K. S. Pradhan coll.). *Wing expanse* : 24 mm.

Distribution.—India (H. P., Solan ; U. P. : Dehra Dun, Mirzapur ; M. P., Mhow ; Maharashtra : Mahabaleswar, Bombay, Poona ; Tamil Nadu, Nilgiris ; Bihar, Pusa ; West Bengal, Calcutta ; Sikkim ; Andamans) ; Sri Lanka ; Burma (Rangoon ; Mergui) ; Java ; Solomons ; America (Raio-de-Janeiro) ; U.A.R. (Southern Yemen : Aden) ; Africa (Mauritius) ; Pakistan (Chitral ; Karachi).

Remarks.—The present specimen is on the dwarf side of the range of wing expanse (22-30 mm.) as given by Hampson (1896). The species occurs on *Anisomeles ovata* as leaf-roller and also several alternate hosts including *Panicum miliaceum*, *Oryza sativa*, *Triticum vulgare* and *Saccharum officinarum*.

***Psara stultalis* (Walker)**

1859. *Botys stultalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 669.
 1896. *Pachyzancla* (*Pachyzancla*) *stultalis*, Hampson, *Fauna Br. India*, Moths, 4 : 405.
 1899. *Pachyzancla* (*Rhectocraspeda*) *stultalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 204.
 1939. *Psara stultalis*, Klima, *Lep. Cat.*, 94.

Material examined.—One ♀, Campbell Bay, Great Nicobar, 25. xii. 1975 (P. K. Maiti & D. K. Mandal coll.). *Wing expanse* : 26 mm.

Distribution.—India (H. P., Kulu ; U. P., Dehra Dun ; M. P., Mhow ; Maharashtra : Bombay, Poona ; Karnataka, Coorg ; Tamil Nadu ; West Bengal : Calcutta, Kurseong ; Andamans) ; Sri Lanka ; Burma (Rangoon) ; Sumatra ; Java ; Borneo ; Celebes ; Australia ; Pakistan (Karachi).

Remarks.—The species, of which the southern peninsular locality in India was reported by Roonwal *et al* (1963), is a new record for Great Nicobar. The present specimen shows inclination to the giant size of range of wing expanse (22-28 mm.) as given by Hampson (1896).

Genus *Antigastra* Lederer

1863. *Antigastra* Lederer, *Wien. ent. Monat.*, p. 419.
 (Type : *Botys catalaunalis* Duponchel)

The genus is distributed in the Palaearctic, Ethiopian, Malagasic, Oriental and Neotropical regions. The single Indian species is presently dealt with.

***Antigastra catalaunalis* (Duponchel)**

1830. *Botys catalaunalis* Duponchel, *Hist. Nat. Lep. Fr.*, 8 : 330, pl. 232, fig. 8.
 1896. *Antigastra catalaunalis*, Hampson, *Fauna Br. India*, Moths, 4 : 412, fig. 224.

Material examined.—One ♀, Chidiyatapu, South Andaman, 15. i. 1972, at light (A. K. Mukherjee & B. Dutt coll.). *Wing expanse* : 20 mm.

Distribution.—India (U.P., Dehra Dun ; M. P. : Mhow, Gwalior ; Maharashtra : Khandala, Bombay, Poona ; West Bengal) ; Sri Lanka ; Burma ; Mexico ; Europe ; Syria ; Aden ; Eastern and Western Africa ; Pakistan (Karachi).

Remarks.—The species is a new record for South Andaman. It is a serious pest of oilseeds, occurring specifically on *Sesamum indicum* as leaf- and pod-borers.

Genus *Pionea* Guenée

1954. *Pionea* Guenée, *Delt. & Pyral.*, p. 367.

(Type : *Phalaena forficalis* Linn.)

The genus is distributed throughout the world except the Papuan region. Amongst 20 Indian species, only *Pionea aureolalis* (Lederer) was earlier known from the Andamans. Presently, 2 species are dealt with.

Key to species

1. Body bright straw-yellow ; frons with lateral white lines ; abdomen ringed with white ; forewing with costa white, discal lunule obsolete, subterminal line without tooth on Cu_{1b} ; hindwing with indistinct lines ... *albicostalis* Swinhoe
- Body orange-yellow ; frons without lateral lines ; abdomen not ringed ; forewing with costa of body colour, discal line distinct, subterminal line with an internal tooth on Cu_{1b} ; hind wing with distinct lines ... *aureolalis* (Lederer)

Pionea albicostalis Swinhoe

1890. *Pionea albicostalis* Swinhoe, *Trans. ent. Soc. Lond.*, p. 271.

1896. *Pionea* (*Udea*) *albicostalis*, Hampson, *Fauna Br. India*, Moths, 4 : 424.

1899. *Pionea* (*Pionea*) *albicostalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 246.

Material examined.—One ♂, Magar Nullah, Campbell Bay, Great Nicobar, 27. xii. 1975 (P. K. Maiti & D. K. Mandal coll). *Wing expanse* : 21 mm.

Distribution.—India (Punjab ; Kerala, Vellyani ; Tamil Nadu, Nilgiris) ; Burma (Rangoon).

Remarks.—The species is a new record for Great Nicobar.

Pionea aureolalis (Lederer)

1863. *Botys aureolalis* Lederer, *Wien. ent. Monat.*, 7 : 473.

1896. *Pionea (Udea) aureolalis*, Hampson, *Fauna Br. India*, Moths, 4 : 424.

1899. *Pionea (Pionea) aureolalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 246.

Material examined.—One ♀, Alexander River, Great Nicobar, 13. iv. 1966 (A. Daniel & H. K. Bhowmik coll.). *Wing expanse* : 29 mm.

Distribution.—India (H. P., Dharmsala ; Maharashtra : Bombay, Palghar Range ; Karnataka, Kurg ; West Bengal : Kurseon, Bagdogra ; Sikkim ; Assam, Sibsagar Meghalaya, Khasis ; Andamans); Sri Lanka ; Burma.

Remarks.—The species, of which the Indian peninsular localities were reported by Roonwal *et al* (1963), is a new record for Great Nicobar.

Genus Pyrausta Schrank

1802. *Pyrausta* Schrank, *Fauna Boica.*, 2 (2) : 163.

(Type : *Phalaena Geometra cingulata* Linn.)

The genus is distributed throughout the world. Amongst 44 Indian species, only *Pyrausta sikkima* (Moore) was known earlier from Andamans. Presently, 2 species are dealt with hereunder.

Key to species

1. Body not tinged with orange ; forewing with costal fuscous streaks, cellular spot and discal lunule ; both wings with lines ... *damoalis* (Walker)
- Body tinged with orange ; forewing without costal streaks, cellular spot and discal lunule ; both wings with bands ... *tetraplagalis* Hampson

Pyrausta damoalis (Walker)

1859. *Botys damoalis* Walker, *List Spec. Lep. Ins. Coll. Br. Mus.*, 18 : 656.

1896. *Pyrausta (Pyrausta) damoalis*, Hampson, *Fauna Br. India*, Moths, 4 : 436.

1899. *Pyrausta damoalis*, Hampson, *Proc. zool. Soc. Lond.*, 1899 : 259.

Material examined.—One ♀, Pitcher Nullah, Middle Andaman, 4. ii. 1972 (A. K. Mukherjee & B. Dutt coll.). *Wing expanse* : 26 mm.

Distribution.—India (H. P., Dharmsala ; West Bengal, Darjeeling ; Sikkim) ; Burma (Rangoon) ; China ; Japan.

Remarks.—The species is a new record for Middle Andaman.

***Pyrausta tetraplagalis* Hampson**

1899. *Pyrausta tetraplagalis* Hampson, *Proc. zool. Soc. Lond.*, 1899 : 268. pl. 50, fig. 25.

Material examined.—One ♂, 14. iii. 1966 (A. Daniel & H. K. Bhowmik coll.) ; 1 ♂, 1 ♀, Campbell Bay, Great Nicobar, 28. xii. 1975, at light (P. K. Maiti & D. K. Mandal coll.). *Wing expanse* : ♂ ♀ 13 mm.

Distribution.—South Africa (Salisbury : Mashonaland).

Remarks.—The species is a new record for Great Nicobar and also for the whole of Oriental region.

SUMMARY

The paper incorporates a systematic account coupled with a review on earlier investigation and general distribution of the Pyraustinae from the Andaman, Nicobar and Great Nicobar Islands of the Indian Ocean. 103 indexed species, including 40 unseen ones compiled from the literature, are appended in one table of distribution showing their intra-southern insular, other Indian and global ranges. Sixty-three species in thirty-five genera are actually dealt with in the given account along with their keys and available host plants. Fifty-one species constitute new locality records either exclusively or partly for all these islands together, of which 4 Andamanese and a single Great Nicobarese species are also recorded new for the Indo-Malayan subregion and whole of the Oriental region respectively. The study is based on different collections from recent surveys including the one made by the first author at these islands and also on some earlier insular material lying hitherto unrecorded amidst the National Zoological Collections of the Department.

RESUME

L'article s'agit à un compte systématique accouplé d'une revue de l'investigation précédente et de la bio-géographie des Pyraustinae des îles d'Andaman, de Nicobar et de Grand Nicobar de l'Océan Indien. Les 103 espèces rangées à l'index, y compris les 40 unes invues mais amassees de la littérature, sont incluses dans un tableau montrant leur spectre de répartition dans ces îles du sud, les autres parts de l'Inde et du monde. A présent, les 63 espèces comprises en 35 genres se concernent du compte rendu accompagné de leurs clés et de leurs plantes-hotes procurables. Les 51 espèces forment soit exclusivement soit partiellement de nouveaux dossiers de localités de ces îles tout ensemble ; parmi celles-ci, les 4 espèces des îles d'Andaman et l'une seule de Grand Nicobar représentent aussi de nouvelles récoltes pour la subrégion Indo-Malayenne et pour toute la région Orientale respectivement. Le problème est opéré sur les diverses collections des surveillances récentes, de l'une desquelles le premier

auteur s'est mélangé aux îles surmentionnées, et aussi sur de vieux matériaux dans les collections Nationales de Zoologie du Département, la répartition insulaire desquels n'a pas été encore signalée dans une publication quelconque.

ACKNOWLEDGEMENTS

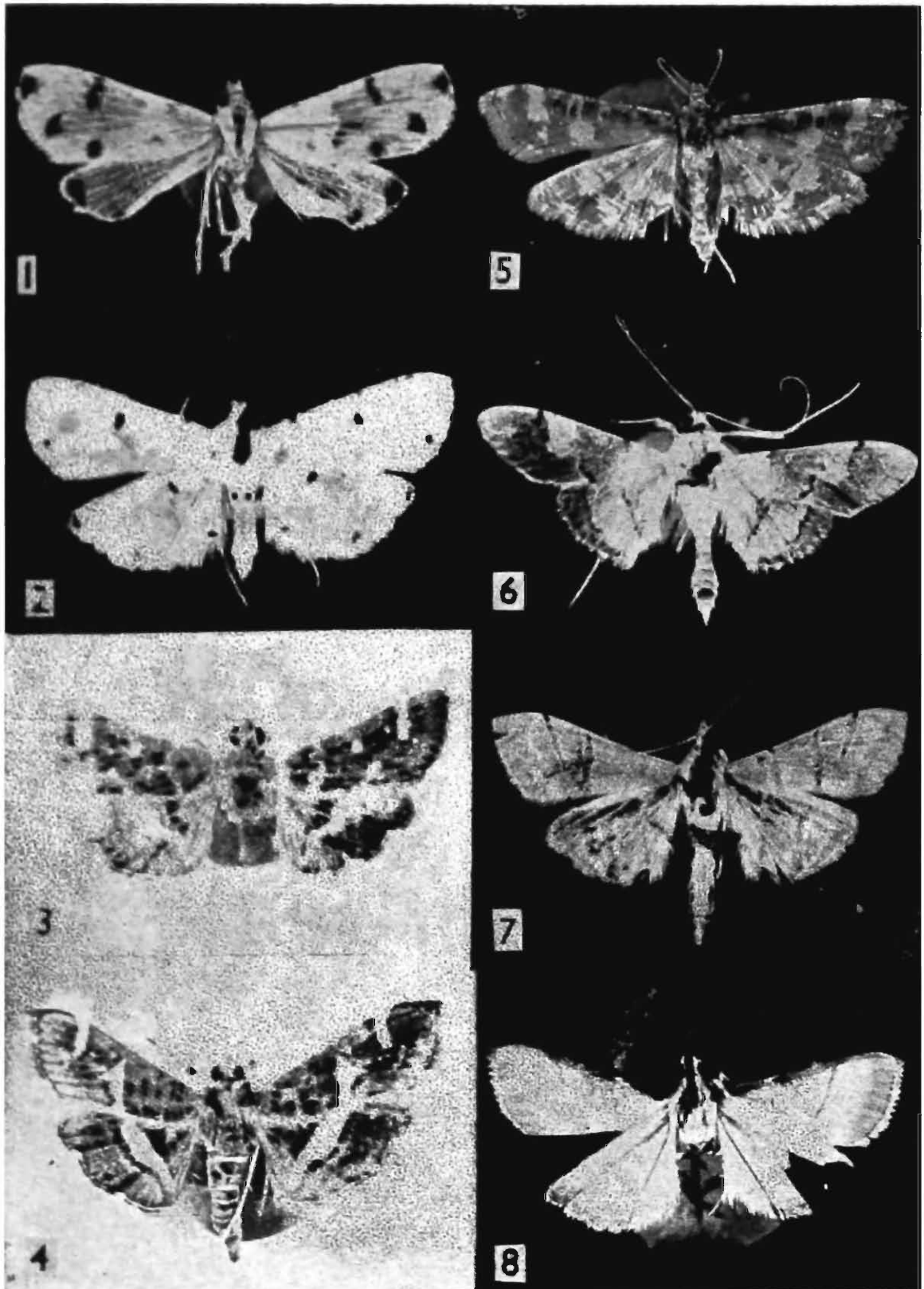
The authors are highly grateful to the Director, Zoological Survey of India, for critically going through the manuscript and also for his constant encouragement in the work. They are also thankful to Shri I. J. Gupta, Assistant Zoologist, Lepidoptera Section, for other numerous courtesies.

REFERENCES

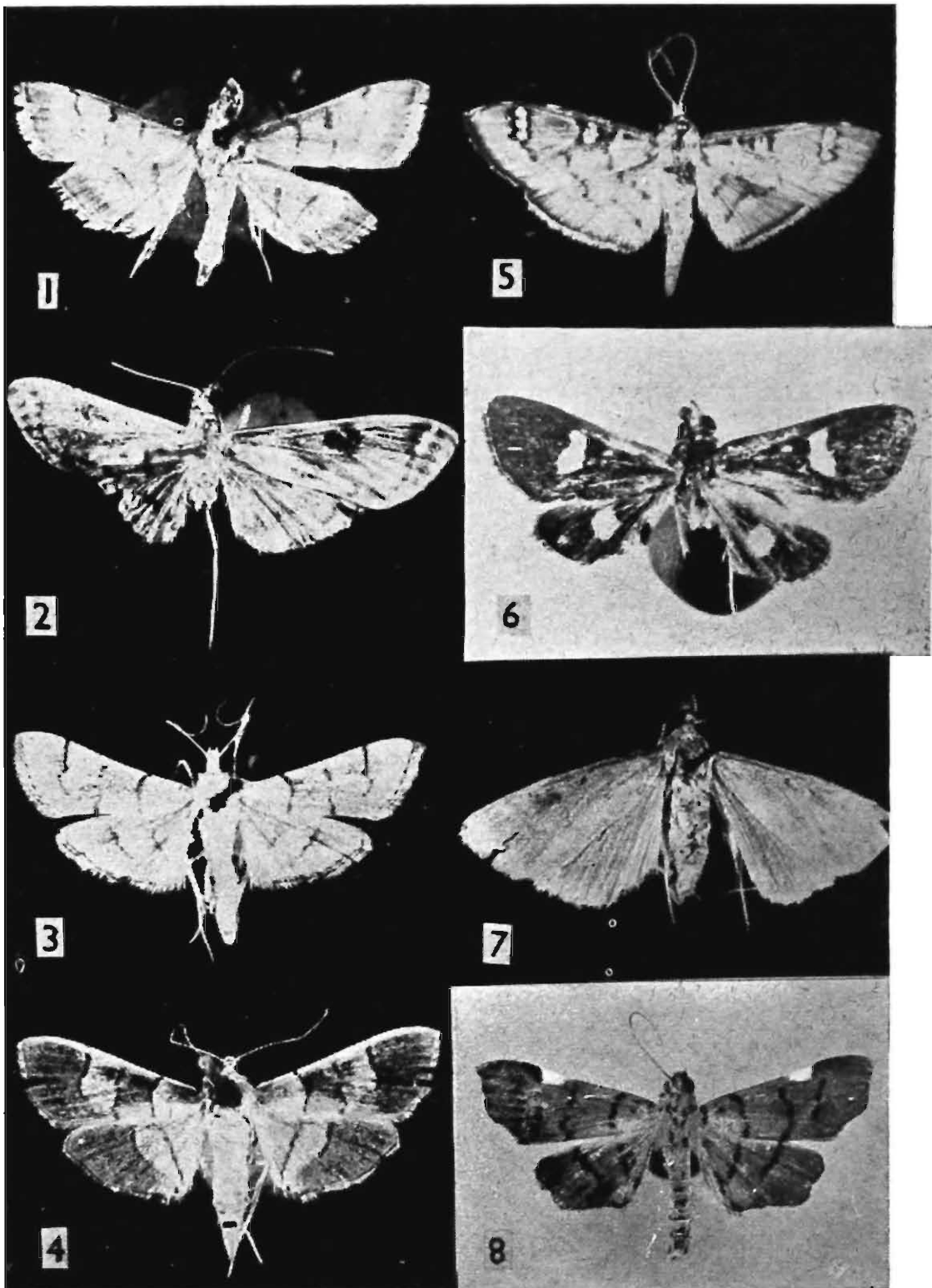
- AMSEL, H. G., 1957. An index to "A Revision of the moths of the subfamily Pyraustinae and family Pyralidae" by Sir George Hampson published in "*Proc. zool. Soc. Lond.*, 1898, pp. 590-761 ; 1899, pp. 172-291" *Proc. zool. Soc. Lond.*, 129 : 541-577.
- AYYAR, T. V. R., 1963. *A Handbook of Economic Entomology for South India*, (ed. 2) : 528 pp., 80 pls., Madras.
- BANERJEE, S. N., 1964. Paddy pests. *Ent. India* (1938-1963), 92-98 pp.
- BHATTACHARYA, D. P. & MANDAL, D. K., 1976. A new record of *Terastia meticulosalis* Guenée (Lepidoptera : Pyralidae) from the Car Nicobar Island. *Newsl. zool. Surv. India*, 2 (1) : 23-24.
- BHATTACHARYA, D. P., 1977. On *Xanthomelaena schematias* (Meyrick) [Lepidoptera : Pyralide] —a new record from Great Nicobar Island, India. *Newsl. zool. Surv. India*, 3 (5) : 258.
- CASWELL, G. H., 1962. *Agricultural Entomology in the Tropics*, 152 pp.
- FLETCHER, T. B., 1920. Life-histories of Indian Micro-Lepidoptera i-ix. *Mem. Dep. Agric. India (Ent. Ser.)*, 6 : 1-217, 58 pls.
- FLETCHER, T. B., 1934. Life-histories of Indian Micro-Lepidoptera. *Imp. Council Agric. Res. Sci. Monog.*, (2) 4 : 85 pp., 77 pls.
- FORBES, W. T. M. 1920. Notes on the Crambinae (Lepidoptera). *J. N. Y. ent. Soc.*, 28 : 214-227.
- FORBES, W. T. M., 1924. The Lepidoptera of New York and neighbouring states. *Cornell Univ. Agric. Exp. Sta. Mem.*, 68 : 729, 439 figs.
- GUENEE, A., 1854. Histoire naturelle des insectes. Species général des lépidoptères. Tome huitieme. *Delt. et. Pyral.*, Paris.

- HAMPSON, G. F., 1896.** *The fauna of British India, Moths*, 4 : xxviii+594 pp., 287 figs., London.
- HAMPSON, G. F., 1898.** A revision of the moths of the subfamily Pyraustinae and family Pyralidae. Part I. *Proc. zool. Soc. Lond.*, 1898 : 590-761, pls. 49, 50.
- HAMPSON, G. F., 1899.** A revision of the moths of the subfamily Pyraustinae and family Pyralidae. Part II. *Proc. zool. Soc. Lond.* 1899 : 172-291.
- KAPUR, A. P., 1966.** The Coccinellidae (Coleoptera) of the Andamans. *Proc. Nat. Inst. Sci. India*, 32 B (3 & 4) : 148-189.
- KARUNAKARAN, C., 1967.** *Exhibition on the Great Nicobar Islands. Guide compiled by the Geological Survey of India*, 14 pp.
- KLIMA, A., 1939.** *Lepidopterorum catalogus*, 89 : 1-224 ; 94 : 225-384. The Hague.
- LEFROY, H. M. 1906.** *Indian Insect Pests*, 318 pp., Calcutta.
- MAITI, P. K. & MANDAL, D. K., 1977.** Some highlights on the entomological exploration of the Great Nicobar Island, Indian Ocean. *Newsl. zool. Surv. India*, 3 (2) : 66-68.
- METCALF, C. L. & FLINT, W. B., 1962.** *Destructive and useful insects, their habits and control*, (ed. 4) : 1087 pp., McGraw Hill Book Co. Inc.
- MEYRICK, E., 1912-1937.** *Exotic Microlepidoptera*, 1-5. London.
- MOORE, F., 1877.** Lepidopterous fauna of the Andaman and Nicobar Islands. *Proc. zool. Soc. Lond.*, 1877 : 580-632.
- MUNROE, E., 1956.** Pyralides récoltés a L'île de la Guadeloupe par M. L. Berland [Lepid.], (1). *Rev. Fr. Ent.*, 23 (2) : 121-127.
- MUNROE, E., 1958.** The geographic distribution of the Scopariinae. *Proc. 10th Int. Congr. Ent.*, 1 : 831-837.
- MUNROE, E., 1961.** Synopsis of the North American Odontiinae, with descriptions of new genera and species (Lepidoptera : Pyralidae). *Canad. Ent.*, Suppl. 24 : 93, figs. 246.
- MUNROE, E., 1967.** A new species of *Thliptoceras* from Thailand, with notes on generic and specific synonymy and placement and with designations of lectotypes (Lep. : Pyral.). *Canad. Ent.*, 99 (7) : 721-727.

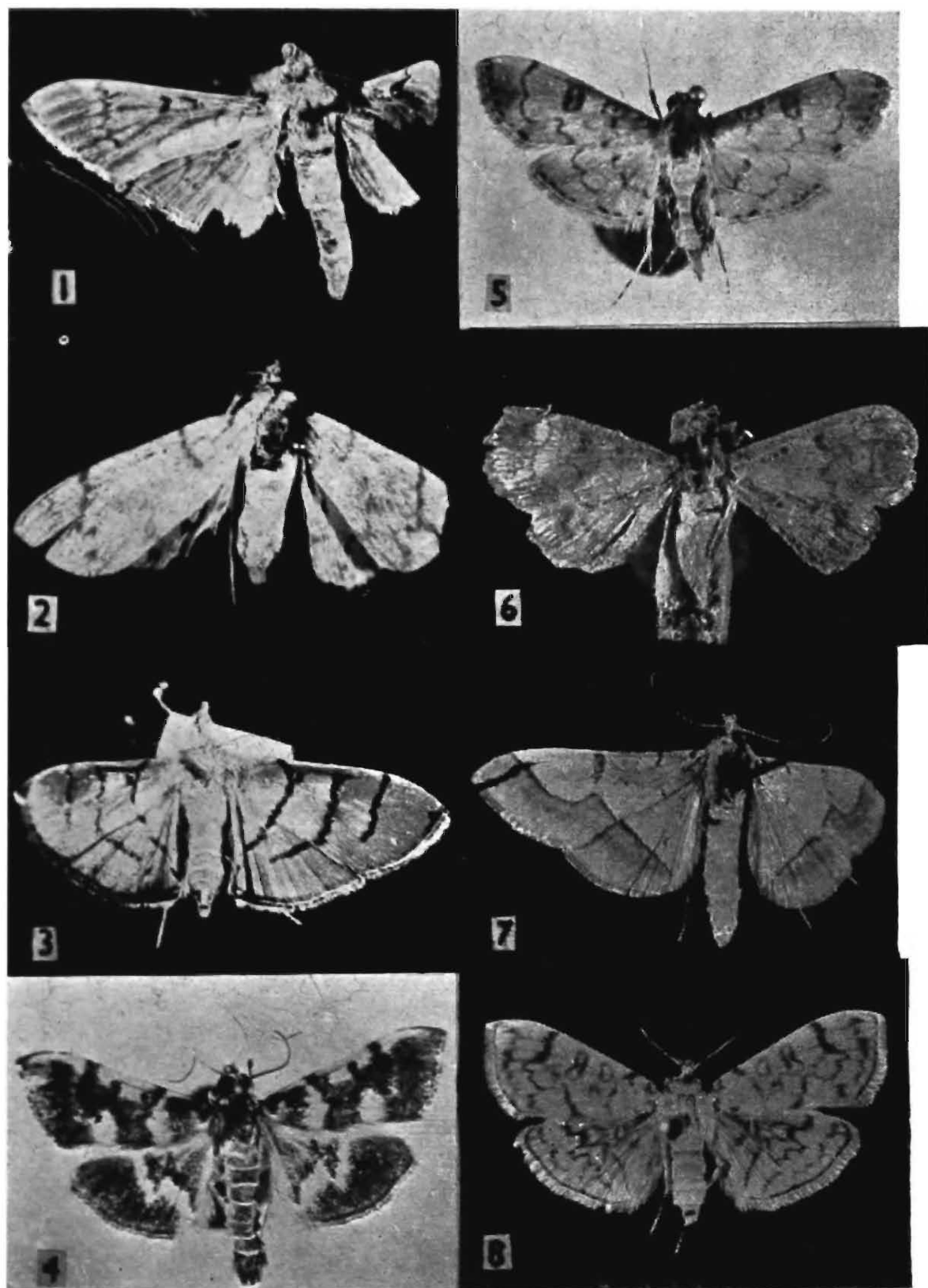
- MUNROE, E., 1975. Biogeography of North American Odontiinae (Lepidoptera : Pyralidae). *Canad. Ent.*, **107** : 129-154, 1 tab., 34 figs., maps.
- MUNROE, E. & MUTUURA, A., 1971. Geographical distribution of Pyraustinae (Lepidoptera : Pyralidae) of Temperate East Asia. *Trans. Lep. Soc. Japan*, **22** : 1-6, 6 figs.
- NAYAR, K. K., ANANTHAKRISHNAN, T. N. & DAVID, B. V., 1976. *General and Applied Entomology*, 602 pp.
- PANDE, Y. D., 1973. Some observations on the bionomics of *Hymenia recurvalis* F. (Lep., Pyralidae) feeding on *Trianthema monogyna* and *Amaranthus viridis* in India. *Z. Angew. Entomol.*, **74** (4) : 362-366.
- PRADHAN, S., 1969. *Insect Pests of Crops*, 280 pp. New Delhi.
- PRUTHI, H. S., 1969. *Text Book on Agricultural Entomology*, 977 pp. New Delhi (I. C. A. R.).
- RAGONOT, E. L., 1890. Essai sur la classification des Pyralites. *Ann. Soc. ent. Fr.*, (6) **10** : 435-546.
- ROESLER, R. U. & PETER, V. K., 1973. Contribution on Sumatra Insect Fauna : Results of entomological investigation trip ; I. Trip report and landscape description: *Beitr. Naturkd. Forsch. Suedwestdtsch.*, **32** : 97-121, illus.
- ROONWAL, M. L., MATHUR, R. N., BHASIN, G. D., CHATTERJEE, P. N., SFN-SARMA, P. K., SINGH, B., CHANDRA, A., THAPA, R. S., & KRISHNAN, K., 1963. A systematic catalogue of the main identified Entomological Collection at F.R.I., Dehra Dun. *Indian Forest Leaflet*, No. 121 (4) : 189-540.
- ROONWAL, M. L. & BOSE, G., 1970. Taxonomy and Zoogeography of the Termite Fauna of Andaman and Nicobar Islands, Indian Ocean. *Rec. zool. Surv. India*, **62** (3 & 4) : 109-170, 9 tabs., 15 figs. 2 pls., 2 maps.
- SHIBUYA, J., 1928. The systematic study on the Formosan Pyralidae. *J. Fac. Agric. Hokkaido (imp.) Univ.*, **22** : 252.
- SWINHOE, C. & COTES, E. C., 1889. *A catalogue of the moths of India (Pyrales)*, **5** : 591-670, Calcutta.
- THAMPI, C. J., 1972. Soils of Andaman and Nicobar Islands. in T. M. Alexander, *Soils of India, F. A. I., New Delhi*, x+296 pp., tables, maps.
- WARREN, W. 1896. New species of Pyralidae from the Khasia Hills. *Ann. Mag. nat. Hist.*, (6) **18** : 107-119.



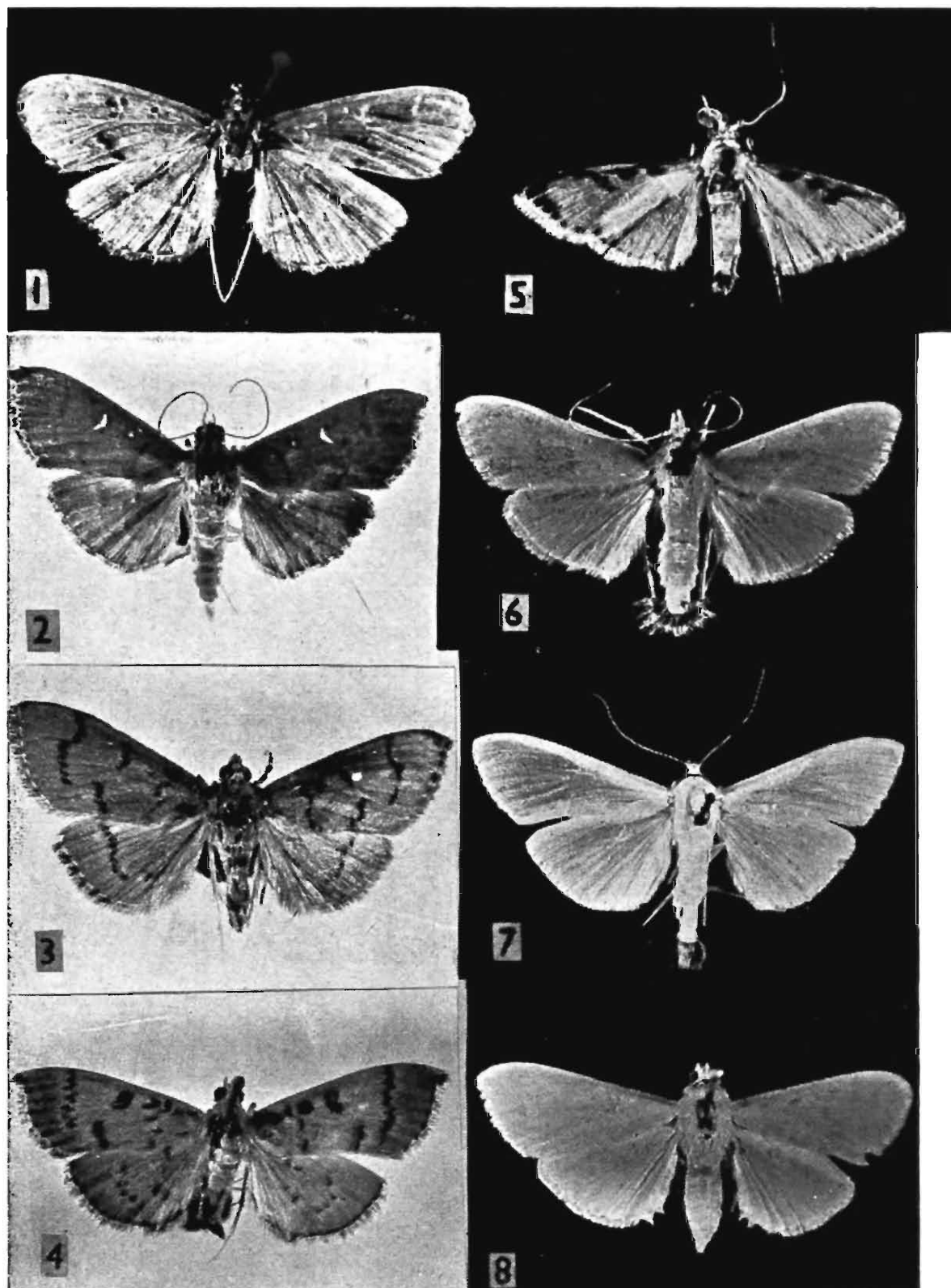
1. *Xanthomelaena schematias* (Meyrick), 2. *Pynarmon meritalis* (Walker),
3. *Hymenia perspectalis* (Hübner), 4. *Hymenia recurvalis* (Fabricius),
5. *Eurhypoarodes tricoloralis* (Zeller), 6. *Aetholix flavibasalis* (Guenée),
7. *Pagyda salvalis* (Walker), 8. *Cnaphalocrocis medinalis* (Guenée).



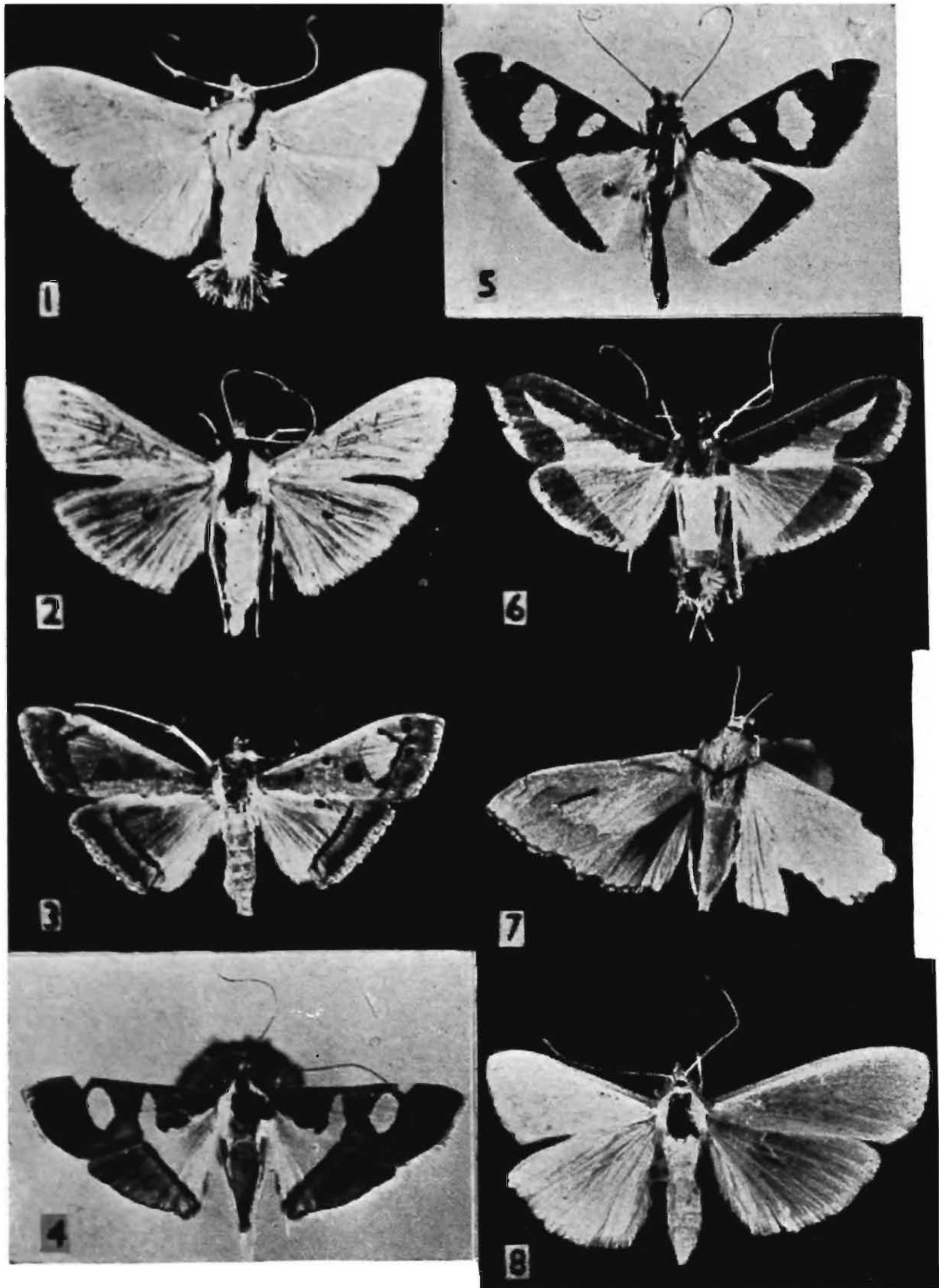
1. *Marasmia bilinealis* Hampson, 2. *Rhimphalea ochalis* (Walker), 3. *Syngamia abruptalis* (Walker), 4. *Syngamia latimarginalis* (Walker), 5. *Samea castoralis* (Walker), 6. *Nosophora incommitata* Swinhoe, 7. *Phostria schediusalis* (Walker), 8. *Phostria maculicostalis* (Hampson).



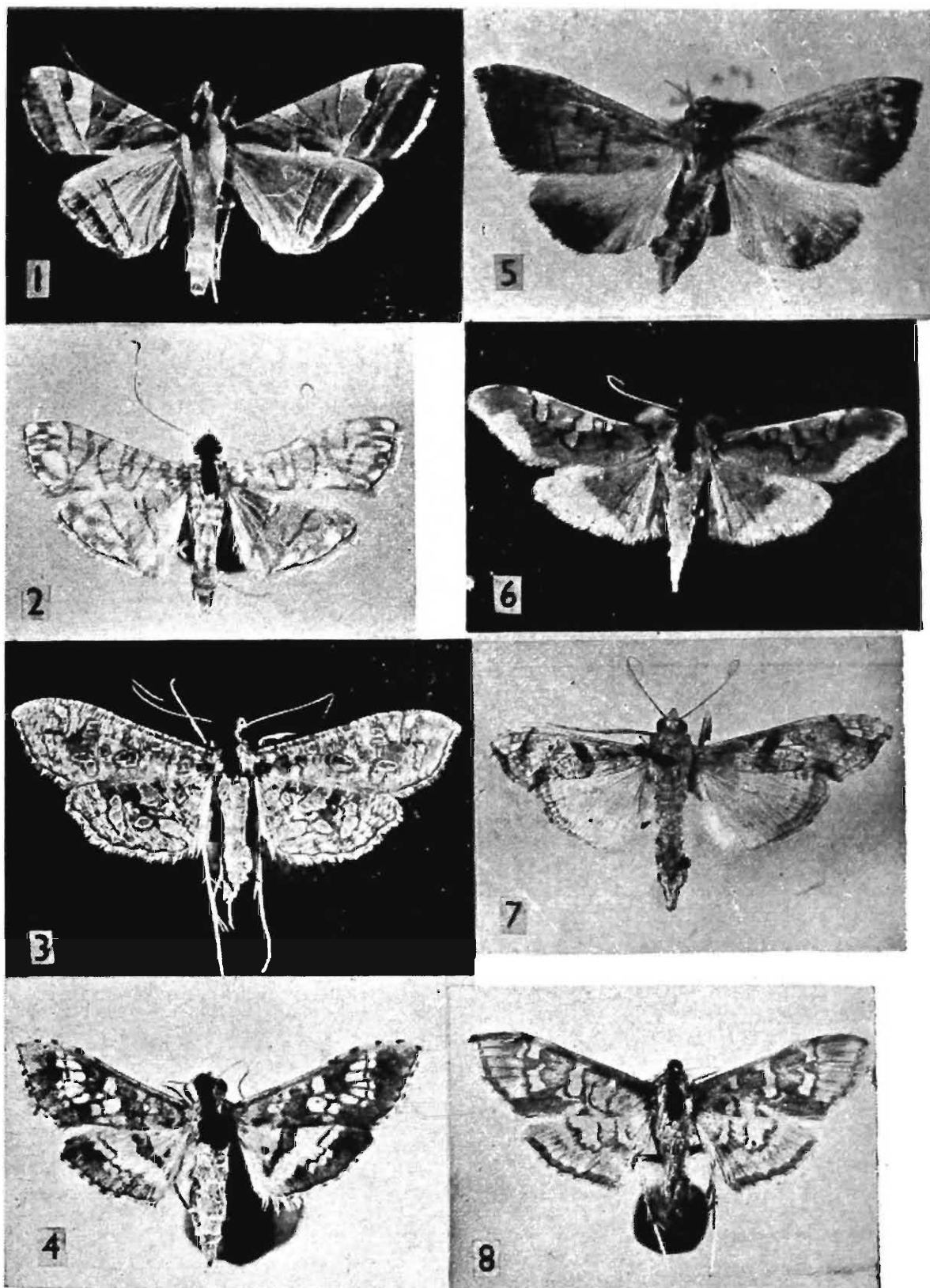
1. *Phostria imbecilis* (Moore), 2. *Dichocrocis pandamalis* (Walker), 3. *Lamprosema cuprealis* (Moore), 4. *Lamprosema diemenalis* (Guenée), 5. *Lamprosema charesalis* (Walker), 6. *Goniorthynchus plumbeizonalis* Hampson, 7. *Botyodes flavibasalis* Moore, 8. *Sylepta derogata* (Fabricius)



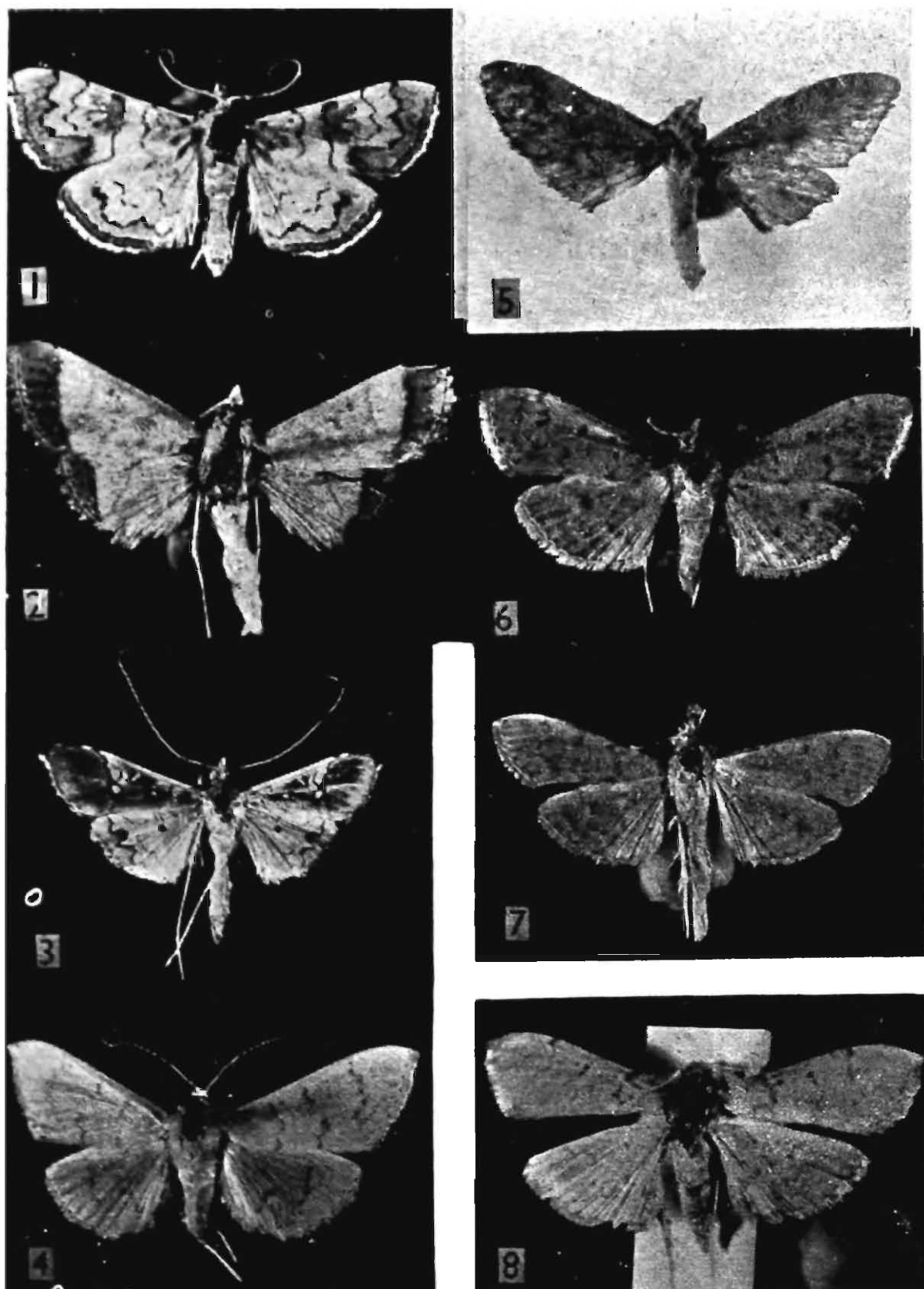
1. *Sylepta denticulata* (Moore), 2. *Sylepta lunalis* (Guenée), 3. *Sylepta fraterna* (Moore), 4. *Sylepta crotonalis* (Walker), 5. *Diaphania pfeifferae* (Lederer), 6. *Diaphania marinata* (Fabricius), 7. *Diaphania marginata* (Hampson), 8. *Diaphania vertumnalis* (Guenée),



1. *Diaphania glaculalis* (Guenée), *Diaphania annulata* (Fabricius), 3. *Diaphania bivitalis* (Guenée), 4. *Diaphania bicolor* (Swainson), 5. *Diaphania actorionalis* (Walker), 6. *Diaphania indica* (Saunders), 7. *Glyphodes suralis* Lederer, 8. *Glyphodes nigropunctalis* Bremer.



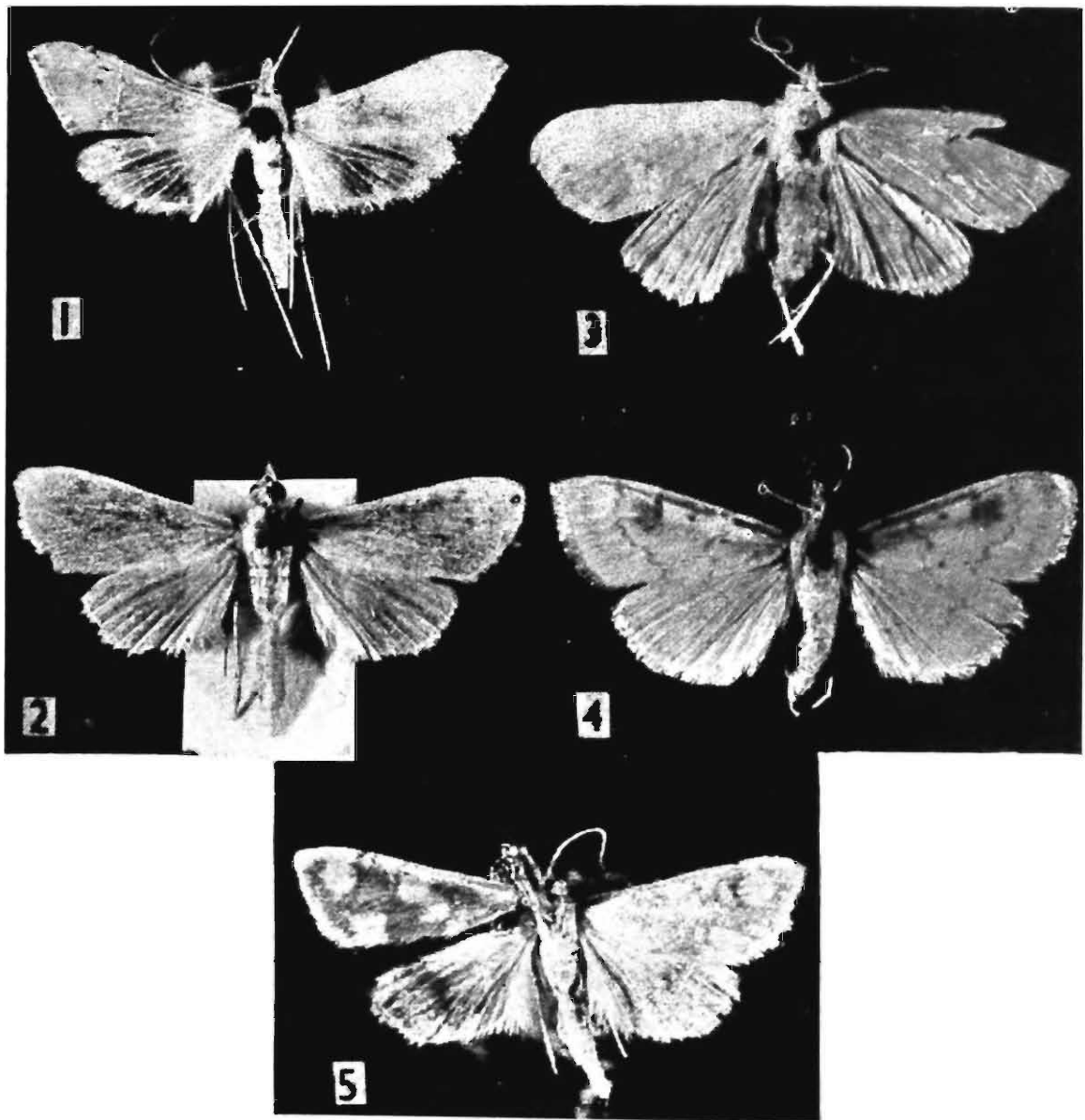
1. *Glyphodes itysalis* Walker, 2. *Synclera traducalis* (Zeller), 3. *Nausinoe geometralis* (Guenée), 4. *Sameodes cancellalis* (Zeller), 5. *Thliptoceras cascade* (Swinhoe), 6. *Propiantis octoguttale* (Felder), 7. *Terastia meticulosalis* Guenée, 8. *Ischnurges gratiosalis* (Walker).



1. *Hyalobathra filalis* (Guenée), 2. *Crocidophora ptyophora* Hampson, 3. *Maruca testulalis* Geyer, 4. *Tetridia caletoralis* (Walker), 5. *Polygrammodes pectinicornalis* (Guenée), 6. *Psara licarsisalis* (Walker), 7. *Psara phaeopteralis* (Guenée), 8. *Psara stultalis* (Walker).

MANDAL & BHATTACHARYA

PLATE XIII



1. *Antigastra catalaunalis* Duponchel, 2. *Pionea albicostalis* Swinhoe, 3. *Pionea aureolalis* Lederer, 4. *Pyrausta damoalis* (Walker), 5. *Pyrausta tetraplagalis* Hampson.

Table 1 Contd.	I	II	III	IV	V	VI	VII	VIII
+ 85. <i>anastomosalis</i> (Guenée)		*					*	
XXXVII. Genus <i>Ischnurges</i> Lederer								
86. <i>gratiosalis</i> (Walker)							*	
XXXVIII. Genus <i>Hyalobathra</i> Meyrick								
87. <i>filalis</i> (Guenée)			*				*	
XXXVIX. Genus <i>Crocidophora</i> Lederer								
88. <i>ptyophora</i> Hampson							*	
+ 89. <i>limbolalis</i> (Moore)								
XL. Genus <i>Maruca</i> Walker								
90. <i>testulalis</i> Geyer		*	*			*	*	*
XLI. Genus <i>Tetridia</i> Warren								
91. <i>caletoralis</i> (Walker)							*	
XLII. Genus <i>Polygrammodes</i>								
+ 92. <i>thoosalis</i> (Walker)							*	
+ 93. <i>sabelialis</i> (Guenée)			*			*		
94. <i>pectinicornalis</i> (Guenée)								
XLIII. Genus <i>Psara</i> Snellen								
95. <i>licarsisalis</i> (Walker)		*				*	*	*
96. <i>phaeopteralis</i> (Guenée)		*	*			*	*	*
97. <i>stultalis</i> (Walker)						*	*	*
XLIV. Genus <i>Antigastra</i> Lederer								
98. <i>catalaunalis</i> Duponchel		*	*			*		*
XLV. Genus <i>Ptonea</i> Guenée								
99. <i>alibicostalis</i> Swinhoe								*
100. <i>aureolalis</i> Lederer						*	*	
XLVI. Genus <i>Phyrausta</i> Schrank								
+ 101. <i>sikkima</i> (Moore)						*	*	
102. <i>damoalis</i> (Walker)		*				*	*	
103. <i>tetraplagalis</i> Hampson			*					

[illegible]

Major Areas of India and their correlation with Zoogeographic Region of the World

X₁—from North and Middle Andamans respectively ; +—Material not available, hence excluded from

*

O R I E N T A L

CHINESE
REGION
A

INDO-MALAYAN
SUBREGION
INDIA

Peninsula

(Western)	(Southern)	(Eastern)	Andaman Islands	ELSEWHERE	Nicobar Island	Gt. Nicobar Island	ELSEWHERE	PAPUAN	AUSTRALIAN	NEOTROPICAL	HAWAIIAN
IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
			Z								
			Z	*		*	*	*			
			Z	*							
		*	*	*			*		*	*	
			*	*			*				
			Z								
			✓*	✓*							
			Z ⁺	*		Z	*			*	
	*	*	*	*	*		*	*	*	*	*
		*	Z ⁺	*		Z	*	*	*	*	*
	*	*	Z	*			*		*		
			Z	*			*		*		
*			Z	*		Z	*	*			
*	*		Z	*			*	*	*		
			Z	*			*		*		
*	*	*	Z ⁺	*		Z	*	*	*		
	*			*		Z	*	*			
			*	*			*	*			
			Z ⁺	*			*				

*

Table 1 Contd.

	I	II	III	IV	V	VI	VII	VIII
XI. Genus <i>Syngamia</i> Guenée								
17. <i>abruptalis</i> (Walker)			*			*		
18. <i>latimarginalis</i> (Walker)			*				*	
XII. Genus <i>Samea</i> Guenée								
19. <i>castoralis</i> (Walker)								
+ XIII. Genus <i>Bocchoris</i> Moore								
+ 20. <i>adipalis</i> (Lederer)		*					*	
XIV. Genus <i>Nosophora</i> Lederer								
+ 21. <i>althealis</i> (Walker)							*	
22. <i>incomitata</i> Swinhoe							*	
+ XV. Genus <i>Caprinia</i> Walker								
+ 23. <i>conchylalis</i> (Guenée)							*	
+ XVI. Genus <i>Filodes</i> Guenée								
+ 24. <i>fulvidorsalis</i> (Geyer)				*			*	
+ 25. <i>mirificalis</i> (Lederer)							*	
+ XVII Genus <i>Tyspanodes</i> Warren								
+ 26. <i>linealis</i> Moore						*	*	
XVIII. Genus <i>Phostria</i> Hübner								
+ 27. <i>crithonalis</i> (Walker)		*					*	
+ 28. <i>eradicalis</i> (Hampson)								
+ 29. <i>radicalis</i> (Walker)								
+ 30. <i>opalinalis</i> (Moore)							*	
+ 31. <i>origoalis</i> (Walker)								
+ 32. <i>unitalis</i> (Guenée)							*	
33. <i>schediusalis</i> (Walker)							*	
34. <i>maculicostalis</i> (Hampson)							*	
35. <i>imbecilis</i> (Moore)							*	
+ 36. <i>longipennis</i> (Warren)							*	
XIX. Genus <i>Dichocrocis</i> Lederer								
37. <i>pandamalis</i> (Walker)							*	
+ 38. <i>atrisectalis</i> Hampson								
+ 39. <i>nilusalis</i> (Walker)		*					*	
XX. Genus <i>Lamprosema</i> Hübner								
+ 40. <i>niphealis</i> (Walker)			*		*		*	
41. <i>cuprealis</i> (Moore)							*	
42. <i>diemanalis</i> (Guenée)		*	*			*		*
+ 43. <i>insolitalis</i> (Walker)								
44. <i>chaesalis</i> (Walker)			✓*					✓*
?+ 45. <i>hedychroalis</i> (Swinhoe)								
XXI. Genus <i>Goniorhynchus</i> Hampson								
46. <i>plumbeizonalis</i> Hampson							✓*	
XXII. Genus <i>Botyodes</i> Guenée								
47. <i>flavibasalis</i> Moore						*	*	
XXIII. Genus <i>Sylepta</i> Hübner								
+ 48. <i>scinialis</i> (Walker)						*	*	
+ 49. <i>sellalis</i> (Guenée)		*					*	
50. <i>derogata</i> (Fabricius)		*	*			*	*	

IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
						$\mathbb{N}$					
*		*	*	*		$\mathbb{N}$	*	*	*		
*	*	*	$\mathbb{N}$	*			*				
	*		*	*			*	*	*		
			*	*			*	*			
			*	*			*	*			
			$\mathbb{N}$	*			*	*			
				*			*				
*	*		*	*			*		*		
			*	*	*		*		*		
			*	*							
			*	*		$\mathbb{N}$	*				
			*	*			*				
			*	*			*	$\sqrt{*}$			
			$\sqrt{*}$	$\sqrt{*}$			*				
			*	*	$\sqrt{*}$		$\sqrt{*}$		$\sqrt{*}$		
			*	*		$\mathbb{N}$	*	*			
			*	*			*		*		
			$\mathbb{N}$	*			*		*		
			$\mathbb{N}$	*			*				
			*	*			*				
			$\sqrt{*}$	$\sqrt{*}$	*	$\mathbb{N}$	*				
	*		*	*			*				
*		*	*	*	*		*	*			
		*	*	*	*	$\mathbb{N}$	*	*	*		
			$\sqrt{\mathbb{N}}$	$\sqrt{*}$			$\sqrt{*}$	$\sqrt{*}$			
			*	*							
			$\mathbb{N}$				$\sqrt{*}$				
			$\sqrt{\mathbb{N}}$	$\sqrt{*}$		$\mathbb{N}$	*		*	*	
		*		*		$\mathbb{N}$	*	*			
		*	*	*			*	*			
*	*	*	*	*			*	*	*		

TABLE 1. Systematic Index and Distribution of Pyraustinae from the Southern Ins

N.B. : [*—Known distribution ; N—New record ; ✓—Typically insular in origin ; +, ++—Known Systematic Account ; ?—Species *incertae sedis*]

	INDO SUBTROPICAL INDIA							
	Himalayas							
	NEARCTIC	PALAEARCTIC	ETHIOPIAN	MALAGASY	Minicoy Island	(North-Western)	(North-Eastern)	(Northern)
	I	II	III	IV	V	VI	VII	VIII
I. Genus <i>Xanthomelaena</i> Hampson								
1. <i>schematias</i> (Meyrick)								
II. Genus <i>Pycnarmon</i> Lederer								
+ 2. <i>alboflavalis</i> (Moore)							*	
3. <i>meritalis</i> (Walker)							*	
+ 4. <i>aeriferalis</i> (Moore)		*					*	
5. sp.								
+ III. Genus <i>Rehimena</i> Walker								
?+ 6. <i>villalis</i> Swinhoe								
IV. Genus <i>Hymenia</i> Hübner								
7. <i>perspectalis</i> (Hübner)	*		*	*				*
8. <i>recurvalis</i> (Fabricius)		*	*	*	*	*		
V. Genus <i>Eurrhynchos</i> Snellen								
9. <i>tricoloralis</i> (Zeller)								*
VI. Genus <i>Aetholix</i> Lederer								
10. <i>flavibasalis</i> (Guenée)							*	
VII. Genus <i>Pagyda</i> Walker								
11. <i>salvalis</i> Walker		*	*				*	
12. <i>discolor</i> Swinhoe							*	
VIII. Genus <i>Cnaphalocrocis</i> Lederer								
13. <i>medinalis</i> (Guenée)	*	*		*			*	
IX. Genus <i>Marasmia</i> Lederer								
14. <i>billnealis</i> Hampson		*					*	
X. Genus <i>Rhimphalea</i> Lederer								
+ 15. <i>irogusalis</i> (Walker)						*	*	
16. <i>ochalis</i> (Walker)							*	

ular Areas of India and their correlation with Zoogeographic Region of the World

from North and Middle Andamans respectively ; +—Material not available, hence excluded from

O R I E N T A L											
INDO-CHINESE REGION A					INDO-MALAYAN SUBREGION INDIA						
Peninsula											
(Western)	(Southern)	(Eastern)	Andaman Islands	ELSEWHERE	Nicobar Island	Gt. Nicobar Island	ELSEWHERE	PAPUAN	AUSTRALIAN	NEOTROPICAL	HAWAIIAN
IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
			N								
			N	*		*	*	*			
			*	*		N					
		*	*	*		N	*		*	*	
			N	*			*				
			✓*	✓*							
			N ₊ +	*		N	*		*	*	
	*	*	*	*	*	N	*	*	*	*	*
	*	*	N	*		N	*	*	*	*	*
		*	N	*		N	*	*	*	*	*
*			*	*		N	*	*	*	*	*
*	*		N	*		N	*	*	*	*	*
*	*	*	N	*		N	*	*	*	*	*
	*		N ₊	*		N	*	*	*	*	*
				*		N	*	*	*	*	*
			*	*			*	*	*	*	*
			N ₊	*			*	*	*	*	*

Table 1 Contd.

	I	II	III	IV	V	VI	VII	VIII
XI. Genus <i>Syngamia</i> Guenée								
17. <i>abruptalis</i> (Walker)			*			*		
18. <i>latimarginalis</i> (Walker)			*				*	
XII. Genus <i>Samea</i> Guenée								
19. <i>castoralis</i> (Walker)								
+ XIII. Genus <i>Bocchoris</i> Moore								
+ 20. <i>adipalis</i> (Lederer)		*					*	
XIV. Genus <i>Nosophora</i> Lederer								
+ 21. <i>althealis</i> (Walker)							*	
22. <i>incomitata</i> Swinhoe							*	
+ XV. Genus <i>Caprinia</i> Walker								
+ 23. <i>conchylalis</i> (Guenée)							*	
+ XVI. Genus <i>Filodes</i> Guenée								
+ 24. <i>fulvidorsalis</i> (Geyer)				*			*	
+ 25. <i>mirificalis</i> (Lederer)							*	
+ XVII Genus <i>Tyspanodes</i> Warren								
+ 26. <i>linealis</i> Moore						*	*	
XVIII. Genus <i>Phostria</i> Hübner								
+ 27. <i>crithonalis</i> (Walker)		*					*	
+ 28. <i>eradicalis</i> (Hampson)								
+ 29. <i>radicalis</i> (Walker)								
+ 30. <i>opalinalis</i> (Moore)							*	
+ 31. <i>origoalis</i> (Walker)								
+ 32. <i>unitalis</i> (Guenée)							*	
33. <i>schediusalis</i> (Walker)							*	
34. <i>maculicostalis</i> (Hampson)							*	
35. <i>imbecilis</i> (Moore)							*	
+ 36. <i>longipennis</i> (Warren)							*	
XIX. Genus <i>Dichocrocis</i> Lederer								
37. <i>pandamalis</i> (Walker)							*	
+ 38. <i>atrisectalis</i> Hampson								
+ 39. <i>nilusalis</i> (Walker)		*					*	
XX. Genus <i>Lamprosema</i> Hübner								
+ 40. <i>niphealis</i> (Walker)			*		*		*	
41. <i>cuprealis</i> (Moore)							*	
42. <i>diemanalis</i> (Guenée)		*	*			*		*
+ 43. <i>insolitalls</i> (Walker)								
44. <i>chaesalis</i> (Walker)			✓*					✓*
?+ 45. <i>hedychroalis</i> (Swinhoe)								
XXI. Genus <i>Goniorhynchus</i> Hampson								
46. <i>plumbeizonalis</i> Hampson							✓*	
XXII. Genus <i>Botyodes</i> Guenée								
47. <i>flavibasalis</i> Moore						*	*	
XXIII. Genus <i>Sylepta</i> Hübner								
+ 48. <i>scinisalis</i> (Walker)						*	*	
+ 49. <i>sellalis</i> (Guenée)		*					*	
50. <i>derogata</i> (Fabricius)		*	*			*	*	

IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
						N					
*		*	*	*		N	*	*	*		
*	*	*	N	*			*				
	*		*	*			*	*	*		
			*	*			*	*			
			*	*			*	*			
			N	*			*	*			
				*			*				
*	*		*	*			*		*		
			*	*	*		*		*		
			*	*							
			*	*		N					
			*	*			*				
			*	*							
			√*	√*			*	√*			
			*	*	√*						
			*	*			√*		√*		
			*	*		N	*	*			
			N	*			*	*			
			N	*							
			*	*		N	*				
			√*	√*	*						
	*		*	*			*				
		*		*	*	N	*				
*		*	*	*	*		*				
		*	*	*	*		*	*	*		
			N	√*			√*	√*			
			*	*							
			N	√*			√*				
			√N	√*		N	√*				
		*		*		N	*	*	*		
			*	*		N	*	*			
*	*	*	*	*			*	*	*	*	

Table 1 Contd.

	I	II	III	IV	V	VI	VII	VIII
+ 51. <i>iopasalis</i> (Walker)		*					*	
52. <i>denticulata</i> (Moore)							*	
53. <i>lunalis</i> (Guenée)		*				*	*	
54. <i>fraterna</i> (Moore)								
55. <i>crotonalis</i> (Walker)							*	
+ 56. <i>luctuosalis</i> (Guenée)		*				*	*	
+ XXIV. Genus <i>Haritala</i> Moore								
+ 57. <i>plutusalis</i> (Walker)							*	
+ XXV. Genus <i>Lygropia</i> Lederer								
+ 58. <i>obrinusalis</i> (Walker)						*		*
+ 59. <i>amyntusalis</i> (Walker)							*	
XXVI. Genus <i>Diaphania</i> Hübner								
60. <i>pfeifferae</i> (Lederer)							*	
+ 61. <i>laticostalis</i> (Guenée)							*	
62. <i>marinata</i> (Fabricius)							*	
63. <i>marginata</i> (Hampson)						*	*	
64. <i>vertumnalis</i> (Guenée)			*			*	*	*
65. <i>glaculalis</i> (Guenée)							*	
66. <i>annulata</i> (Fabricius)							*	
67. <i>bivitralis</i> (Guenée)	*						*	
68. <i>bicolor</i> (Swainson)			*			*	*	
69. <i>actorionalis</i> (Walker)						*	*	
70. <i>indica</i> (Saunders)			*			*	*	*
+ XXVII. Genus <i>Agathodes</i> Guenée								
+ 71. <i>osteptalis</i> (Geyer)						*	*	
XXVIII. Genus <i>Glyphodes</i> Guenée								
72. <i>suralis</i> Lederer								
73. <i>nigropunctalis</i> Bremer		*				*	*	
74. <i>itysalis</i> Walker							*	
+ 75. <i>caesalis</i> Walker							*	
+ 76. <i>canthusalis</i> Walker							*	
+ 77. <i>picticostalis</i> Hampson								
XXIX. Genus <i>Synclera</i> Lederer								
78. <i>traducalis</i> (Zeller)	*	*	*				*	*
XXX. Genus <i>Nausinoe</i> Hübner								
79. <i>geometralis</i> (Guenée)			*			*	*	
+ XXXI. Genus <i>Leucinodes</i> Guenée								
+ 80. <i>orbonalis</i> Guenée			*			*	*	
XXXII. Genus <i>Sameodes</i> Snellen								
81. <i>cancellalis</i> (Zeller)			*				*	
XXXIII. Genus <i>Thliptoceras</i> Warren								
82. <i>cascale</i> (Swinhoe)		*				*	*	
XXXIV. Genus <i>Prophantis</i> Warren			*				*	
83. <i>octoguttale</i> (Felder)								
XXXV. Genus <i>Terastia</i> Guenée								
84. <i>meticulosalis</i> Guenée								
+ XXXVI. Genus <i>omphisa</i> Moore		*					*	

IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
	*		*	*			*				
	*			*		N	*				
						N	*				
						N					
*	*	*		*		N	*		*	*	
			N	*							
		*	*	*							
*	*	*	*	*			*		*	*	
		*	*	*			*				
			*	*			*				
			*	*			*				
*		*	*	*							
*	*	*	*	*		N					
*	*	*	*	*			*		*		
*	*	*	*	*			*		*	*	
*	*	*	*	*		N	*		*		
			N	*							
*		*	N	*						*	
	*			*		N					
*	*	*	*	*		N					
			*	*		N					
			N ⁺⁺	*							
				*		N					

ON A COLLECTION OF THYSANOPTERA (INSECTA) FROM ANDAMAN ISLAND

By

S. SEN

Zoological Survey of India, Calcutta,

(With 2 Text-figures)

So far there is practically no report of Thysanoptera of Andaman Islands. Only one species on record from the Islands is *Dinothrips sumatrensis* (Bagnall) by Moulton (1929). With a view to gain knowledge on the Thysanoptera fauna of Andaman Islands a preliminary survey was undertaken during the period 30. iii. 79 to 6. iv. 79 by Dr. T N. Ananthakrishnan & S. Sen. The present paper is based on the collections made during the survey and comprise of 29 species of which 2 are new to science and one new record from India.

SYSTEMATIC ACCOUNT
Order THYSANOPTERA
Suborder TEREBRANTIA
Family THIRIPIDAE
Subfamily THIRIPINAE
Tribe THIRIPINI
Subtribe ANAPHOTHIRIPINA

Rhamphothrips aureus (Ananthakrishnan)

1954. *Perisothrips aureus* Ananthakrishnan, *J. zool. Soc. India*, 6 (2) : 159.

1978. *Rhamphotrips aureus* : Bhatti, *Oriental Ins.*, 12 (3) : 286.

Material examined.—1 ♀, 2 ♂ Port Blair, III. 78 (Dr. T N. Ananthakrishnan coll.). [Z. S. I. Reg. Nos. 381-383/H17].

Distribution.—India : Tamil Nadu ; Maharashtra.

Subtribe THIRIPINA
Frankliniella schultzei (Trybom)

1910. *Physopus schultzei* Trybom, *Denksch. med. naturw. Ges. Jena*, 16 : 151.

1948. *Frankliniella schultzei* : Moulton, *Rev. de Ent.*, 19 (1-2) : 100.

1923. *Frankliniella dampfi* Priesner, *Ent. Mitt.*, 12 : 64.

1968. *Frankliniella schultzei* : Mound, *Bull. Br. Mus. (Nat. Hist.) Ent. Suppl.* 11 : 39.

Material examined.—1 ♀ Bamboo flat S. Andaman ex. unknown fl. 5. iv. 79. [Z. S. I. Reg. No. 384/H17].

Distribution.—All over India : Ghana ; Uganda ; U. K. ; South Australia.

Megalurothrips distalis (Karny)

1913. *Taeniothrips distalis* Karny, *Arch. Naturg.*, 79A : 122.

1969. *Megalurothrips distalis* : Bhatti, *Oriental Ins.*, 3 (3) : 240.

Material examined.—2 ♀ ♀ Zoo Garden, Port Blair, S. Andaman ex. Mango inflorescence, 1. iv. 79. ; 1 ♀ Garacharma, S. Andaman ex. dry twigs 1. iv. 79 ; 1 ♀ Tourist Home, Port Blair, S. Andaman ex. *Amaranthus viridis* fl. 3. iv. 79 [Z. S. I. Reg. Nos. 385-388/H17].

Distribution.—All over India. Japan to Australia & South Asia.

Thrips hawaiiensis (Morgan)

1913. *Euthrips hawaiiensis* Morgan, *Proc. U. S. natn. Mus.*, 46 : 3.

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

1945. *Thrips albipes* : Shumsher, *Ind. J. Ent.*, 7 : 170.

1963. *Thrips hawaiiensis* : Ananthakrishnan, *Treubia*, 26 (2) : 86.

1968. *Thrips hawaiiensis* : Gentile & Bailey, *Univ. Calif. Publ. Ent.* 51 : 68.

1969. *Thrips hawaiiensis* : Bhatti, *Oriental Ins.*, 3 (4) : 379.

Material examined.—7 ♀ ♀ Tourist Home, Port Blair, S. Andaman, ex. *Amaranthus viridis* fl. 3. iv. 79 ; 1 ♀ Sippighat, S. Andaman, ex. grass 4. iv. 79 ; 1 ♀ Tourist Home, Port Blair, S. Andaman ex. Marigold & Rose fl. 3. iv. 79 ; 2 ♀ ♀ Garacharma, S. Andaman 30. iii. 79 ; 11 ♀ ♀ Rangachang, 5. iv. 79 ; 2 ♀ ♀ Tourist Home, Port Blair, S. Andaman, ex. Goldmohor fl. 3. iv. 79 ; 2 ♀ ♀ Dhanikhari, S. Andaman, ex. bamboo, 1. iv. 79 ; 3 ♀ ♀ Tourist Home, Port Blair, ex. *Vinca rosea* fl. 3. iv. 79 ; 1 ♀ Bamboo flat, S. Andaman, ex. *Dilbargia siso* fl., 4. iv. 79 ; 5 ♀ ♀ Tourist Home, Port Blair, 3. iv. 79 ; 3 ♀ ♀ Tourist Home, Port Blair, ex. *Hibiscus* sp. ; 1 ♀ Dhanikhari, S. Andaman, ex. bamboo 1. iv. 79 ; 2 ♀ ♀ Chriathapu, S. Andaman, ex. unknown fl. 5. iv. 79 ; 3 ♀ ♀ Zoo Garden, Port Blair, S. Andaman, ex. Mango inflorescence, 1. iv. 79 ; 1 ♀ Chriathapu, S. Andaman, ex. unknown fl. 5. iv. 79 ; 3 ♀ ♀ Garacharma, S. Andama, ex. dry twigs 1. iv. 79 ; 3 ♀ ♀ Sippighat, S. Andaman, 4. iv. 79 ; 1 ♀ Tourist Home, Port Blair 3. iv. 79 [Z. S. I. Reg. Nos. 389-440/H17].

Distribution.—All over India. : Asia & U. K.

Thrips parvus Schmutz

1913. *Thrips parvus* Schmutz, *Sitz. Akad. Wiss. Wien*, 122 : 1004.

1968. *Thrips parvus* : Gentile & Bailey, *Univ. Calif. Publ. Ent.*, 51 : 74.

Material examined.—9 ♀♀ Codiacaud, S. Andaman, ex. Liliaceae fl. 5. iv. 79 ; 1 ♀ Rangachang, S. Andaman, ex. Cotton 5. iv. 79 [Z. S. I. Reg. Nos. 441-450/H17].

Distribution.—India : Coimbatore ; Sumatra ; Java ; Sri Lanka.

Subfamily PANCHAETOTHRIPINAE

Astrothrips parvilimbus Stannard & Mitri

1962. *Astrothrips parvilimbus* Stannard & Mitri, *Trans. Amer. ent. soc.*, 88 : 197-199.

1975. *Astrothrips parvilimbus* : Wilson, *Mem. Amer. Ent. Inst.*, 23 : 52-53.

Material examined.—4 ♀♀ Tourist Home, Port Blair, ex. *Courtaralia* sp., 3. iv. 79 ; 1 ♀ Garacharma, S. Andaman, ex. wild plant 30. iii. 79 ; 1 ♀ Codiacaud, S. Andaman, ex. bamboo 5. iv. 79 ; 1 ♀ Tourist Home, Port Blair, ex. *Hibiscus* sp. 3. iv. 79. [Z. S. I. Reg. Nos. 451-457/H17]

Distribution.—South India.

Heliothrips haemorrhoidalis (Bouche)

1833. *Thrips haemorrhoidalis* Bouche, *Nat. Schadl. Garten Ins.* : 42.

1838. *Heliothrips haemorrhoidalis* : Burmeister, *Handbuch der Ent.*, 2 (part 2, sec. 1) : 412.

1975. *Heliothrips haemorrhoidalis* : Wilson, *Mem. Amer. Ent. Inst.*, 23 : 146.

Material examined.—1 ♀ Dilanipur, Port Blair, ex. Cashew 30. iii. 79. [Z. S. I. Reg. No. 458/H17].

Distribution.—South India : Germany ; U. K. ; North America ; Surinam ; Brazil ; Sri Lanka.

Retithrips syriacus (Mayet)

1890. *Heliothrips syriacus* Mayet, *Les insectes de la vigne* : 451.

1930. *Retithrips syriacus* : Bodenheimer, *Monogr. zur. Angew. Ent.*, 10 : 168.

1910. *Retithrips aegyptiacus* Marchal, *Bull. Soc. ent. d. Egypta* : 7.

1975. *Retithrips syriacus* : Willson, *Mem. Amer. Ent. Inst.*, 23 : 214-218.

Material examined.—1 ♂ Bamboo flat, S. Andaman, ex. Bamboo, 4. iv. 79 ; 3 ♀♀ Monglutan, S. Andaman, ex. *Jatropha curcus*, 1. iv. 79 ; 3 ♂♂ Tourist Home, Port Blair, ex. Goldmohor fl., 3. iv. 79 ; 1 ♀, 2 ♂♂ Tourist Home, Port Blair, ex. Goldmohor fl., 3. iv. 79 ; 4 ♂♂ Tourist Home, Port Blair, ex. *Vinca rosea* fl., 3. iv. 79 ; 2 ♂♂ Tourist Home, Port Blair, ex. *Hibiscus* sp. 3. iv. 79 ;

1 ♀ Ranghachang, S. Andaman, 5. iv. 79 ; 3 ♂ ♂ Tourist Home, Port Blair, ex. marigold & rose fl. 3. iv. 79. [Z. S. I. Reg. Nos. 459-476/H17]

Distribution.—All over India : Brazil ; Syria ; Egypt ; Lybia.

Rhipiphorothrips cruentatus Hood

1919. *Rhipiphorothrips cruentatus* Hood, *Insec. Inscit Menstr*, 7 : 94.

1975. *Rhipiphorothrips cruentatus* : Wilson, *Mem. Amer. Ent. Inst.*, 23 : 222.

Material examined.—1 ♀ Dhanikhari Ghat Area, S. Andaman ex. dry fern 1. iv. 79. [Z. S. I. Reg. No. 477/H17]

Distribution.—India : South India ; M. P. : Sri Lanka ; Pakistan, Afghanistan.

Selenothrips rubrocinctus (Giard)

1901. *Physothrips rubrocinctus* Giard, *Bull. Soc. Ent. France*, 15 : 263.

1908. *Heliothrips rubrocinctus* : Franklin, *Proc. U. S. natn. Mus.* 33 : 719-723.

1913. *Selenothrips rubrocinctus* : Hood, *Insec. Inscit. Menstr.*, 1 (12) : 150.

1975. *Selenothrips rubrocinctus* : Wilson, *Mem. Amer. Ent. Inst.*, 23 : 230.

Material examined.—1 ♀ Humfrygunj, S. Andaman ex. bamboo 1. iv. 79 ; 3 ♀ ♀ Tourist Home, Port Blair, ex. *Eugenia* sp. 3. iv. 79. [Z. S. I. Reg. Nos. 478-481/H17]

Distribution.—India : Kerala ; W. Bengal. Sri Lanka ; North America ; West Indies ; Hawaii Is. ; Mauritius ; Uganda ; Mexico.

Suborder TUBULIFERA

Family PHLAEOTHIRIPIDAE

Subfamily UROTHIRIPINAE

Baenothrips asper (Bournier)

1963. *Transithrips asper* Bournier, *Publ. Culf. Co. Diam. Angola*, 63 : 81.

1966. *Transithrips asper* : Ananthakrishnah, *Bull. Ent.*, 7 : 11.

1972. *Baenothrips asper* : Mound, *Aust. J. Zool.*, 20 : 92.

1973. *Baenothrips asper* : Ananthakrishnan, *Occl. Publ. 2 Ent. Res. Unit. Loyola College, Madras* : 71.

Material examined.—1 ♀ Dhanikhari, S. Andaman, ex. dry fern 1. iv. 79. [Z. S. I. Reg. No. 482/H17]

Distribution.—South & North-Eastern India.

Subfamily PHLAEOTHIRIPINAE

Aleurodothrips fasciapennis (Franklin)

1908. *Cryptothrips fasciapennis* Franklin, *Proc. U.S. natn. Mus.*, 33 : 727.

1909. *Aleurodothrips fasciapennis* Franklin, *Ent. News*, 20 (5) : 228.

Material examined.—1 ♀ Bamboo flat, S. Andaman, ex. Bamboo 4. iv. 79 ; 1 ♀, 1 ♂ Dhanikhari, S. Andaman ex. bamboo, 1. iv 79 ; 1 ♀ Mongluton, S. Andaman ex. bamboo leaf 1. iv. 79. [Z. S. I. Reg. Nos. 483-486/H17]

Distribution.—India : Kerala : Barbados Is. ; Belgium.

***Androthrips flavitibia* Moulton**

1932. *Androthrips flavitibia* Moulton, *Indian For. Rec.*, 19 (1) : 1.

Material examined.—2 ♂ ♂ Port Blair, III. 78. (Dr. T N. Ananthakrishnan coll.). [Z. S. I. Reg. Nos. 487-488/H17]

Distribution.—India : U. P.

***Dolichothrips nesius* Stannard**

1961. *Dolichothrips nesius* Stannard, *Proc. Hawaii ent. Soc.*, 17 : 457.

Material examined.—2 ♀ ♀, 2 ♂ ♂ Port Blair, III. 78 (Dr. T N. Ananthakrishnan coll.). [Z. S. I. Reg. Nos. 489-492/H17]

Distribution.—India. Sri Lanka ; Guam.

***Gigantothrips tibialis* Bagnall**

1921. *Gigantothrips tibialis* Bagnall, *Ann. Mag. nat. Hist.*, (9) 7 : 364.

1968. *Gigantothrips tibialis* : Mound, *Bull. Br. Mus. (Nat. Hist.) Ent. Suppl.*, 11 : 105.

Material examined.—3 ♀ ♀, 1 ♂ Ross Island, S. Andaman, ex. *Ficus* gall - 31. iii. 79. [Z. S. I. Reg. Nos. 493-496/H17].

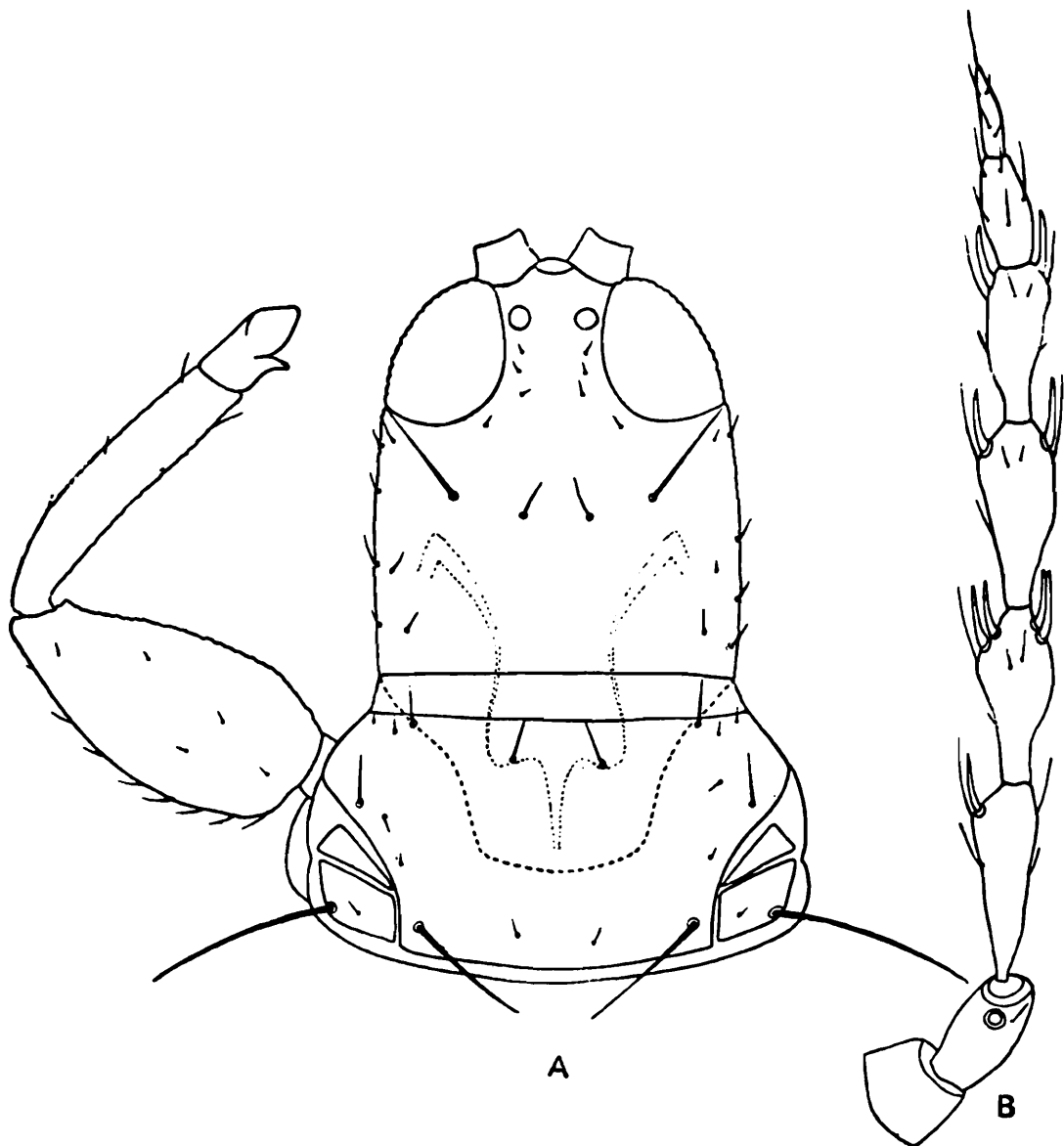
Distribution.—India : Tamil Nadu, Karnataka, U. P., W. Bengal, Sri Lanka.

***Gynaikothrips rossi* sp. nov.**

(Text-fig. 1)

Female (Macropterous) : General body colour brown, terminal abdominal segments and tube darker ; antennal segment 1 brown, 2 brown at base yellow distally, 3-8 faint yellow ; all femora brown, foretibiae yellow with brownish shade in basal half, mid - and hind tibiae brown in basal three fourth yellow distally, all tarsi yellow ; forewings faint yellow to clear. All setae hyaline and blunt to pointed.

Head little longer than broad, 244*-254 long, 190 wide across eyes, 210-214 across cheeks and 214-218 across base; cheeks crenulate with 4-7 moderately stout spines, surface strongly reticulate with several scattered setae 12-20 long. Eyes moderately large 92-96 long, 58 wide; all ocelli 24 wide, median ocelli overhanging, paired ones placed much above the middle of eyes almost near the inner tip of eyes. Postoculars 2 pairs, much smaller than eyes and the outer stouter, outer 50-58 and inner 24-32 long respectively, placed 32 below the posterior margin of eyes. Antennal segments I-8 length (width): I: 38 (38); II: 42-46 (32); III: 80-88 (28); IV: 72-76 (32-36); V: 72-76 (32); VI: 66-76 (28-32); VII: 46 (24); VIII: 36 (12); sense cones on 3-6 moderately thick 24-26 long. Mouthcone short and broad 80-92 long, 134-154 wide at base, 124 at apex; maxillary stylets retracted mesad.



Text-fig. 1. *Gynaikothrips rossi* sp. nov. ♀ ; A. head & prothorax, B. antenna.

* All measurements are in microns, unless otherwise specified.

Prothorax 142-164 long, 220-228 wide at anterior margin, 254-288 at posterior margin. Pronotal chaetotaxy :- anteroangulars 38-42, anteromarginals 24, midlaterals 24-28, posteroangulars 68-88 and epimerals 114 long respectively; epimeral suture complete. Outer-margin of forefemora spiny, inner margin strongly corrugated, base of foretibiae narrow and concave; forefemora 190-206 long, 84-88 wide, foretarsal tooth very minute 12 long. Pterothorax 316-342 long, 400-420 wide across meso- and 380-400 across metathorax; sides of metathorax with 2-3 thorny setae. Forewings broad, 901-935 long, 84 wide at base, 76 at middle and 54-58 at apex with 15-20 double fringes; basal wing setae B_s stouter, 38-42, 58-76 and 70-80 long respectively. Mesopraesternum well developed with a median crest.

Abdomen 368-380 wide at base, 298-314 at middle, 240-264 across segment VIII and 176-180 across segment IX. B_1 - B_8 of segment IX : 262-266, 228-246 and 284-288 long respectively. Tube 292-324 long; anal setae 228 long.
Total body length : 2.43-2.58 mm.

Male (Macropterous) : Colouration as in female. Head 228-232 long, 180 wide across eyes, 200-204 across cheeks and 196-200 across base. Eyes 80-88 long, 58-62 wide; postoculars-outer 50 and inner 38 long respectively. Antennal segments 1-8 length (width) : I : 38 (36-38); II : 42 (28); III : 76-84 (24); IV : 72 (28-32); V : 72 (28-32); VI : 62-66 (28); VII : 42 (20); VIII : 36-38 (12). Mouthcone 68-80 long, 122-138 wide at base, 96 at apex.

Prothorax 134-148 long, 202-218 wide at anterior margin, 274 at posterior margin. Pronotal chaetotaxy - anteroangulars 36-38, anteromarginals 20-24, posteroangulars 54, epimerals 62-76, long respectively. Forefemora 172-186 long, 76 wide, foretarsal tooth 12 long. Pterothorax 286-304 long, 362-380 wide at meso- and 346-372 at metathorax. Forewings 833-850 long, 72 wide at base and middle and 64 at apex with 14-16 double fringes basal wing setae 36, 50 & 50 long respectively.

Abdomen 304-346 wide at base, 248-296 at middle, 184-190 across segment VIII and 147-152 across segment IX. B_1 - B_8 of segment IX : 172-220, 46 and 228-248 long respectively, Tube 252-256 long, anal setae 210 long.

Total body length :- 1.9-2.21 mm.

Type specimen.—*Holotype* ♀ (Z. S. I. Reg. No. 497/H17) *allotype* ♂ (Z. S. I. Reg. No. 498/H17). *paratypes* 10 ♀ ♀, 1 ♂ (Z. S. I. Reg. Nos. 499-509/H17) India : Andaman Is. Ross Is., S. Andamans, ex. *Ficus* sp., gall, 31. iii. 79 (Dr. T. N. Ananthakrishnan & S. Sen coll.) deposited in the National Zoological Collections, Zoological Survey of India, Calcutta.

The new species comes close to *G. bengalensis* Ananthakrishnan

but it is a distinct species differs in the possession of comparatively shorter head, outer postoculars much shorter than eyes, antennal colouration. Outer margin of forefemora spiny and inner margin strongly corrugated ; base of foretibiae narrow and concave ; sides of metathorax with 2-3 thorny setae ; epimeral much longer than postero-angulars ; basal wing setae B_3 stouter are some of the unique features of the new species.

Haplothrips ganglbaueri Schmutz

1913. *Haplothrips ganglbaueri* Schmutz, *Sitz. Akad. Wiss. Wien*, **122** : 1034.

1976. *Haplothrips ganglbaueri* Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, **34** (4) : 249.

Material examined.—1 ♀ Bamboo flat, S. Andaman ex. bamboo, 4. iv. 79 ; 2 ♀ ♀ Rangachang, S. Andaman ex. tall grass - 5. iv. 79. 2 ♀ ♀ Sippighat, S. Andaman, ex. grass 4. iv. 79 ; 4 ♀ ♀ Culicut Basti, S. Andaman ex. grass 5. iv. 79 ; 1 ♀ Codiacaud, S. Andaman ex. bamboo 1 iv. 79 ; 3 ♀ ♀ Rangachang, S. Andaman ex. tall grass 5. iv. 79 ; 1 ♀ Tourist Home, Port Blair ex. Marigold & Rose fl., 3. iv. 79 ; 1 ♀ Tourist Home, Port Blair, 3. iv. 79. 7 ♀ ♀ Sippighat, S. Andaman, ex. grass 4. iv. 79 ; 1 ♀ Tourist Home, Port Blair, ex. *Amaranthus viridis* fl. 3. iv. 79 ; 1 ♀ Dhanikhari, S. Andaman, ex. Bamboo 1. iv. 79. [Z. S. I. Reg. Nos. 510-533/H17]

Distribution.—All over India. : Sri Lanka ; Java ; Philippines.

Haplothrips gowdeyi (Franklin)

1908. *Anthothrips gowdeyi* Franklin, *Proc. U.S. natn. Mus*, **33** : 724.

1921. *Haplothrips gowdeyi* : Watson, *Fla. Ent.*, **4** : 38.

1913. *Haplothrips soror* Schmutz, *Sitz. Akad. Wiss. Wien*, **122** : 1036.

1976. *Haplothrips gowdeyi* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, **34** (4) : 251.

Material examined.—1 ♀ Tourist Home, Port Blair, ex. marigold fl. [Z. S. I. Reg. No. 534/H17]

Distribution.—India : South India : Rajasthan ; West Bengal. Barbados ; Sri Lanka.

Haplothrips tenuipennis Bagnall

1918. *Haplothrips tenuipennis* Bagnall, *Ann. Mag. nat. Hist.*, (9) **1** : 210.

1976. *Haplothrips tenuipennis* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, **34** (4) : 254.

Material examined.—4 ♀ ♀, 2 ♂ ♂ Zoo Garden, Port Blair, ex. Mango inflorescence, 1. iv. 79 ; 1 ♀ Rangachang, S. Andaman 5. iv. 79 ; 2 ♀ ♀, 1 ♂ Garacharma, S. Andaman, ex. dry twigs 1. iv. 79 ; 5 ♀ ♀ Sippighat, S. Andaman, ex. mango inflorescence 4. iv. 79 ; 2 ♀ ♀ Sippighat, S. Andaman, 4. iv. 79 ; 10 ♀ ♀ Tourist

Home, Port Blair, ex. *Amaranthus viridis* fl. 1. iv. 79 ; 2 ♀ ♀, 1 ♂
Zoo Garden, Port Blair, ex. Mango inflorescence 1. iv. 79 ; 1 ♀
Rangachang, S. Andaman 1 ♀ Bamboo flat, S. Andaman, ex. *Dil-
bargia sisso*, 4. iv. 79. [Z. S. I. Reg. Nos. 535-566/H17]

Distribution.—India : W. Bengal ; M. P. ; Maharashtra ; Assam ;
Rajasthan ; Delhi. Java.

Karnyothrips melaleucus (Bagnall)

- 1911. *Hindsiana melaleuca* Bagnall, *Ent. Mon. Mag.*, 47 : 61.
- 1927. *Karnyothrips melaleuca* : Hood, *Pan Pacif. Ent.*, 3 : 176.
- 1947. *Watsoniella melaleuca* : Bailey, *Florida Ent.*, 30 : 22.
- 1968. *Karnyothrips melaleucus* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent., Suppl.*
11 : 128.
- 1976. *Karnyothrips melaleucus* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, 34
(4) : 263.

Material examined.—1 ♀ Dolligunj, S. Andaman, ex. dry twigs,
1. iv. 79 ; 3 ♀ ♀ Saithankhari, S. Andaman, ex. bamboo, 4. iv. 79 ;
1 ♀ Dhanikhari, S. Andaman, ex. bamboo 1. iv. 79 ; 2 ♀ ♀
Humfrygunj, S. Andaman, ex. bamboo 1. iv. 79. [Z. S. I. Reg. Nos.
567-573/H17]

Distribution.—India : South India. Denmark ; Vietnam ; China ;
North America ; Hawaii Is. ; South Africa ; Egypt.

Mesothrips jordani Zimmerman

- 1900. *Mesothrips jordani* Zimmerman, *Bull. Inst. Bot. Buit.*, 7 : 16.
- 1976. *Mesothrips jordani* ; Ananthakrishnan, *Oriental Ins.*, 10 (2) : 191.

Material examined.—2 ♀ ♀ Ross Islands, S. Andaman, ex. *Ficus*
galls, 31. iii. 79. [Z. S. I. Reg. No. 574-575/H17]

Distribution.—India : Tamil Nadu ; N. E. India ; W. Bengal.
Java ; Malaya ; Hongkong.

Podothrips bicolor Seshadri & Ananthakrishnan

- 1954. *Podothrips bicolor* Seshadri & Ananthakrishnan, *Indian J. Ent.*, 16 (3) :
221.
- 1974. *Podothrips bicolor* : Ritchie, *J. Ent. (B)*, 43 (2) : 271.

Material examined.—1 ♀ Bamboo flat, S. Andaman. ex. bamboo,
4. iv. 79 ; 3 ♀ ♀, 2 ♂ ♂ Dilanipur, S. Andaman, ex. bamboo leaves
30. iii. 79 ; 1 ♂ Rangachang, S. Andaman, 5. iv. 79 ; 1 ♂ Prothra-
pur, S. Andaman, ex. *Anacardium occidentale* 4. iv. 79. [Z. S. I. Reg.
Nos. 576-583/H17]

Distribution.—South India : Singapore.

Podothrips odonaspicola (Kurosawa)

1937. *Haplothrips (Hindsiana) odonaspicola* Kurosawa, *Kontyu*, **11** (3) : 266.

1974. *Podothrips odonaspicola* : Ritchie, *J. Ent. (B)*, **43** (2) : 277.

This species is recorded for the first time from India, hitherto, known only from Japan and is distinguished by bicolourous body ; forewings with 2-4 double fringes ; antennal segment 1 brown, 2 brown at base ; forefemora brown in basal half.

Material examined.—3 ♀ ♀, 1 ♂ Dhanikhari, S. Andaman, ex. bamboo 1. iv. 79 ; 1 ♂ Garacharama, S. Andaman, ex. dry twigs 1. iv. 79 ; 1 ♀ Chiriathapu, S. Andaman, ex. unknown fl. 5. iv. 79. [Z. S. I. Reg. Nos. 584-589/H17]

Distribution.—Japan.

Praepodothrips priesneri Ananthakrishnan

1955. *Praepodothrips priesneri* Ananthakrishnan, *Ann. Mag. nat. Hist.*, (12) **8** : 608.

1976. *Praepodothrips priesneri* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, **34** (4) : 268.

Material examined.—3 ♀ ♀, 1 ♂ Humfrygunj, S. Andaman, ex. bamboo 1. iv. 79. [Z. S. I. Reg. Nos. 590-593/H17]

Distribution.—Madras.

Stigmothrips okajimai Muraleedharan & Sen

1979. *Stigmothrips okajimai* Muraleedharan & Sen, *Rec. zool. Surv. India* [In Press]

Material examined.—2 ♀ ♀ Dhanikhari, S. Andaman, ex. dry fern, 1. iv. 79. [Z. S. I. Reg. Nos. 594-595/H17]

Distribution.—North-Eastern India.

Xylaplothrips pictipes (Bagnall)

1919. *Haplothrips pictipes* Bagnall, *Ann. Mag. nat. Hist.*, (9) **4** : 273.

1968. *Neoheegeria pictipes* : Mound, *Bull. Br. Mus. (Nat. Hist.) Ent. Suppl.* **11** : 139.

1969. *Haplothrips (Xylaplothrips) pictipes* : Ananthakrishnan, *Indian Thysanoptera* : 139.

1976. *Xylaplothrips pictipes* : Pitkin, *Bull. Br. Mus. (Nat. Hist.) Ent.*, **34** (4) : 274.

Material examined.—2 ♀ ♀ Prothrapur, S. Andaman, ex. *Anacardium occidentale* 4. iv. 79 [Z. S. I. Reg. Nos. 596-597/H17]

Distribution.—South India.

Subfamily IDOLOTHRIPINAE

Neosmerinthothrips fructuum Schmutz

1913. *Neosmerinthothrips fructuum* Schmutz, *Sber. Akad. Wiss. Wien*, 122 : 1052.
 1925. *Oedemothrips ceylonicus* Karny, *Bull. ent. Res.*, 16 : 137.
 1974. *Neosmerinthothrips fructuum* : Mound, *Bull. Br. Mus. (Nat. Hist) Ent.*, 31 (5) : 152.

Material examined.—3 ♀♀ Garacharma, S. Andaman, ex. dry twigs 1. iv. 79 ; 1 ♀ Sippighat, S. Andaman, ex. bushes 4. iv. 79 ; 5 ♀♀, 6 ♂♂ (5 brachypterous). Garacharma, ex. dry twigs 1. iv. 79 ; 2 ♀♀, 1 ♂ Dolligunj, S. Andaman, ex. dry twigs 1. iv. 79 ; 1 ♀, 1 ♂ Dolligunj, S. Andaman, ex. unknown plant 1. iv. 79. [Z. S. I. Reg. Nos. 598-617/H17]

Distribution.—India : Kerala ; Karnataka ; M. P. & West Bengal. Sri Lanka.

Polyphemothrips andamanensis sp. nov.

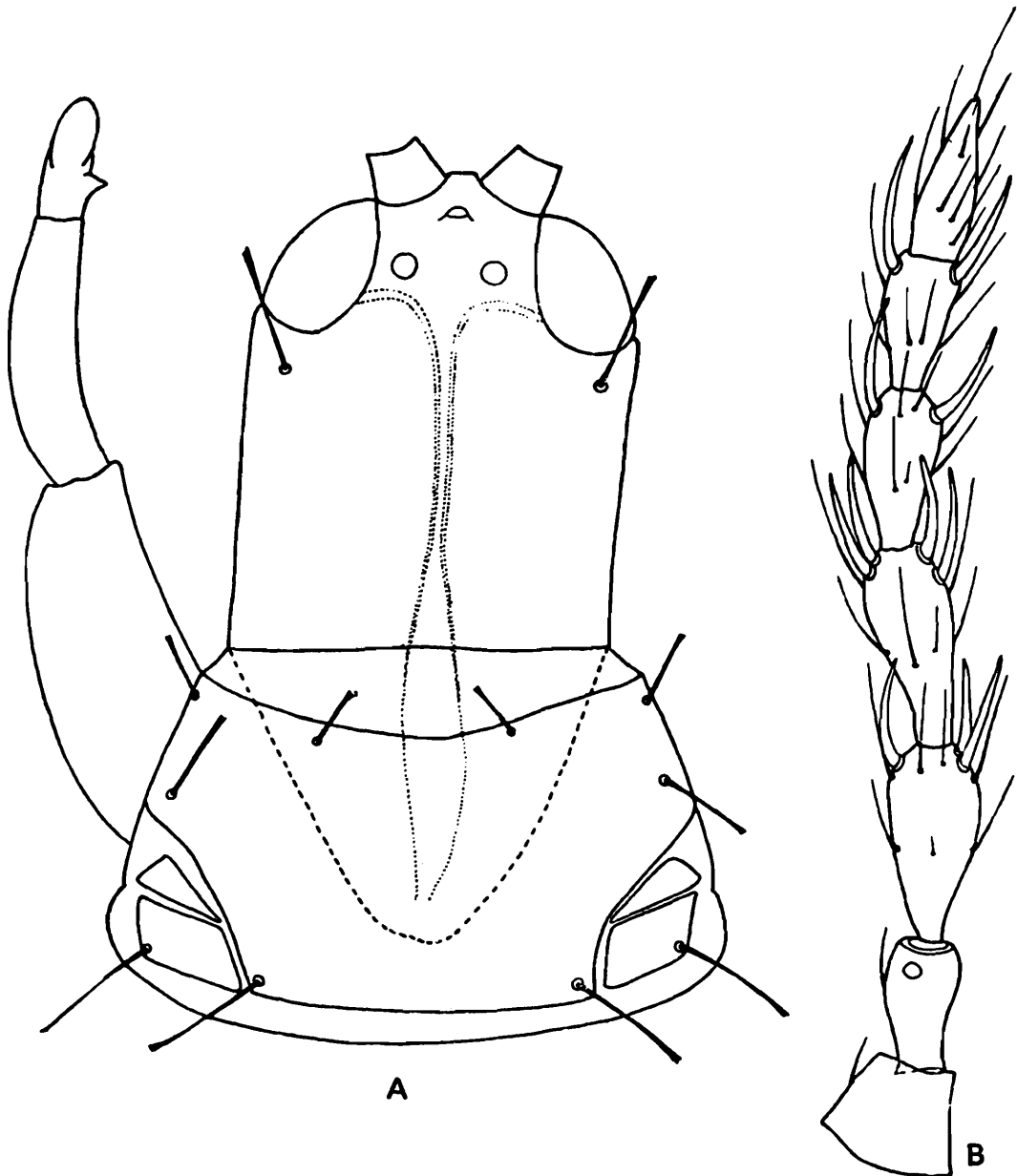
(Text-fig.2)

Female (Macropterous) : General body colour bright yellow ; head in patches, entire prothorax and sides of abdomen with red pigmentation ; tube brown ; antennal segments 1-4 light brown, 5 & 6 yellow in basal half and brown distally, 7 dark brown ; forefemora and foretibiae yellow with brownish shade ; mid - and hindfemora brown except at extreme apex, mid - and hindtibiae yellow, all tarsi yellow foretarsi darker ; forewings light grey with a median streak. All body setae hyaline and blunt at apex.

Head little longer than broad 266-276 long, 222-228 broad across eyes, 244-256 across cheeks, 240-248 across base ; cheeks smooth bulged below eyes with 3-4 small spines. Eyes 76 long, 54-68 wide ; all ocelli 32 wide, median ocellus placed below the base of antennae. Postoculars knobbed about as long as eyes 72-76 long. Antennal segments 1-7 length (width) : I : 38-42 (46-50) ; II : 58 - 68 (32-34) : III : 80-84 (38) ; IV : 76-84 (38) ; V : 62-70 (36) ; VI : 58 (32) ; VII : 70 (28-30) ; sense cones on 3-6 very long and moderately thick 72-76 long. Mouthcone very long, pointed 172-184 long, 202-212 wide at base, 76-84 at apex ; maxillary stylets retracted occluded, meeting at middle.

Prothorax shorter than head 184-190 long, 270-278 wide at anterior margin, 342-348 at posterior margin. Pronotal chaetotaxy - anteroangulars 38, anteromarginals 36, midlaterals 46-58, posteroangulars 64-70, epimerals 66-76 long respectively ; epimeral suture complete. Forefemora 228 long, 76-100 wide, foretarsal tooth 16-20

long. Pterothorax 304-324 long, 344-358 wide across meso - and 312-328 across metathorax, Forewings broad 935-952 long, 70-76 wide with 11-13 double fringes; basal wing setae 42, 58 & 58-66 long respectively.



Text-fig. 2. *Polyphemothrips andamanensis* sp. nov. ♀ ; A. head & prothorax, B. antenna.

Abdomen 324-360 wide at base, 342-348 at middle, 286-304 across segment VIII and 172-180 across segment IX. Pelta pyramyd shaped with a basal wing. B_1 - B_3 of segment IX : 190, 152 & 210 long respectively. Tube convex at middle, apex narrow 202-210 long, anal setae 172-184 long.

Total body length : 2. 16-2. 38 mm.

Type specimen.—*Holotype* ♀ (Z. S. I. Reg. No. 618/H17) and

Type-specimen : *Holotype* ♀ (Z. S. I. Reg. No. 618/H17) and *paratype* 1 ♀ (Z. S. I. Reg. No. 619/H17) India : Andaman Is. Garacharma, S. Andaman, ex. dry twigs, 30. iii. 79 (Dr. T. N. Ananthakrishnan & S. Sen coll.) deposited in the National Zoological Collection of Zoological Survey of India, Calcutta.

The new species comes close to *P. indicus* Ananthakrishnan but it is an unique and distinct species and can easily be distinguished by body colouration ; head and antennal shape ; longer and more pointed mouthcone ; comparatively shorter postoculars about as long as eyes.

***Rhaebothrips lativentris* Karny**

1913. *Rhaecothrips lativentris* Karny, *H. Sater's Formose - Ausbete Suppl. Entomol.*, 2 : 129.
1971. *Rhaecothrips latientris* : Sakimura, *Pacific Ins.*, 13 (2) : 393.
1973. *Rhaebothrips lativentris* : Ananthakrishna, *Occl. Publ. 2 Ent. Res. Unit. Loyola College, Madras* : 127 - 128.

Material examined.—1 ♀, 4 ♂♂ Dolligunj, S. Andamans, ex. dry twigs, 1. iv. 79 ; 1 ♀, 1 ♂ Prothrapur, S. Andaman, ex. bamboo 5. iv. 79 ; 3 ♀♀ Garacharma, S. Andaman, ex. dry twigs - 30. iii. 79 ; 1 ♂ Dhanikhari, S. Andamans, ex. dry fern 1. iv. 79 ; 1 ♀ Garacharma, S. Andamans, ex. dry twigs 1. iv. 79 ; [Z. S. I. Reg. Nos. 620-631/H17].

Distribution.—India : West Bengal : Mauritius to Virgin Is. of Queensland ; Philippines ; Japan ; Hawaii Is. ; Caribbean Sea through My Islands in the Pacific Jamaica ; Virgin Is.

ACKNOWLEDGEMENTS

I am indebted to the Director, for providing necessary facilities, taking part in the collections, confirming the identity of the new taxa, going through the manuscript and offering valuable suggestions. My thanks are also due to Dr. A. K. Das, Zoologist, Officer-in-Charge Andaman Regional Station for providing all sorts of facilities during the survey ; to Drs. R. C. Basu & B. C. Das, Zoologists and M. Deb Roy, Zoological Assistant for their help in collections and to Dr. N. Muraleedharan, Zoologist for various help and preparation of the diagrams.

SUMMARY

The paper deals with the Thysanoptera fauna of Andaman Islands. 29 species have been recorded, all new records from the area and 2 species - *Gynaikothrips rossi* & *Polyphemothrips andamanensis* are new to science and one species - *Podothrips odonaspicola* is recorded for the first time from India.

REFERENCE

- MOULTON, D. 1929. Thysanoptera from India. *Rec. Indian Mus.*, 31 : 93-100.

**ON THE WOOD BORERS OF MANGROVES OF
ANDAMAN AND NICOBAR ISLANDS, INDIA,
WITH NOTE ON THE GALLERY PATTERN OF
SOME INSECT BORERS**

By

K. K. TIWARI

Zoological Survey of India, Calcutta

AND

A. K. DAS, M. K. DEV ROY AND T. N. KHAN

Andaman and Nicobar Regional Station,

Zoological Survey of India, Port Blair

INTRODUCTION

Mangrove ecosystem, though highly resilient, is unique in that it harbours a community of plants that can not exist anywhere else except in tidal mudflats with particular soil conditions and topography. Though not very extensive, and confined mostly to estuaries and sheltered coastlines in tropical and sub-tropical belt, mangroves form a very important and compensatory coastal niche, supporting not only a specialised plant community but also interesting faunal associations.

The present paper deals with one such faunal community, the marine and terrestrial borers that occur in the mangrove habitats in the Andaman and Nicobar Islands. Because of the damage caused to marine installations and timber, marine borers, particularly teredinid and pholadid bivalves, have received considerable attention, but boring insects are comparatively ignored. We got the opportunity to study two species of cerambycid beetles (Insecta : Coleoptera) infesting *Rhizophora apiculata* trees in the South Andaman and Car Nicobar mangroves, with particular reference to gallery pattern which is described here. In addition remarks on other borers, ten species of bivalves (Mollusca) and one crustacean (isopod), are also included.

In the mangrove formations two zones of study can be demarcated. Horizontally, mangroves occupy coastal land between the highest highwater mark and the sub-littoral zone. Vertically the study zone extends between tree tops and the substratum. Whether horizontally, or vertically, some zones are constantly or frequently inundated by tidal water. Along the heights the portion of the trees above highest highwater mark (generally upper portion of the trunk and canopy) are never inundated, and one can demarcate the faunal communities inhabiting the mangrove communities into aquatic, semi-aquatic (or

amphibious) and terrestrial types, the last including forms occupying the portion of vegetable communities above tidal influence. The borers inhabiting the zone inundated (either constantly or periodically) by water mostly belong to the marine communities (principally molluscs), and the terrestrial borers are non-marine in origin, and so far known to comprise of insects only.

MARINE WOOD BORERS OF MANGROVES (Pl. XIV, Figs. A-D)

Marine or estuarine wood borers of mangroves have been investigated in India in some detail (see Nair and Saraswati, 1968 ; Subba Rao, 1968). From the Andaman mangroves Das and Dev Roy (1980) have recently recorded eight species of wood-boring bivalves from South Andaman. Later field work revealed the occurrence of two more species of teredinid bivalves, viz. *Nausitora dunlopei* Wright from Car Nicobar and *Bankia rochi* Moll from the Middle Andaman. Among the crustacean wood-borers, the isopod *Sphaeroma terebrans* Spence-Bate is very common among mangroves, particularly in South Andamans, where it attacks the live pneumatophores of *Avicennia* and stilt roots of *Rhizophora*. Though Ganapati and Lakshmana Rao (1960) have recorded five species of marine wood-boring isopods of the genus *Limnoria* from the wooden jetty in Chatham, Port Blair, we have so far, been unable to collect any species of *Limnoria* from the mangrove habitats in these islands.

A list of marine wood-bores known from mangroves of Andaman and Nicobar Islands is given in Table-1.

Except for the Isopod *Sphaeroma terebrans* which attacks live trees at their pneumatophores or stilt roots, all the other marine borers were found infesting floating logs or dying and decaying mangroves wood. There does not seem to be any host specificity and their distribution on mangroves appears to be random as already pointed by Das and Dev Roy (*op. cit.*).

Among the molluscan borers *Bankia rochi* Moll is being recorded for the first time from the Andaman group of islands, and *Nausitora dunlopei* from Car Nicobar. Earlier Rajagopal and Daniel (1972) reported *N. dunlopei* from the Great Nicobar (southernmost island in the Nicobar group), but not from mangrove communities.

INSECT BORERS OF MANGROVE

Beeson (1941) has reported seven species of insect borers from mangrove plants. All these are beetles belonging to family Scolytidae of the order Coleoptera, and are listed in Table-2.

Except *Xyloborus cognatus*, which is a true wood borer, the remaining six species were reported by Beeson to attack germinating

seedlings, fruits or bark of mangrove trees. Under infestation by *Xyloborus cognatus* the mangrove wood becomes dotted with pinholes or black spots.

During our field work we have been able to collect two species of true wood borers (Xylophagus), both belonging to family Cerambycidae (Coleoptera), i. e. *Aeolesthes holosericea* (Fabricius) and *Ceresium flavipes* (Fabricius), from mangroves in Andamans and Car Nicobar Island. Larval and pupal stages of both these species were collected from their galleries inside the wood. The gallery pattern of these species was observed, and has been described below. Though these two species have been earlier reported from several localities in India and Andamans, there is no record of their recovery from mangroves, and the present constitutes the first record of these borers attacking mangrove wood.

THE GALLERY PATTERN OF CERAMBYCID BEETLES IN MANGROVE WOOD

Beeson (1941) has described the life history and gallery pattern of both these species from inland timber. The gallery patterns noticed by us in mangrove wood generally agree with those described by Beeson. The details of galleries noticed by us are described below.

Aeolesthes holosericea (Fabricius) (Pl. XV, Figs. A-C)

These beetles were found to attack logs and dying branches of *Rhizophora apiculata* in the supra littoral zone. The larval gallery found in the sub-cortical zone is wide and irregular, and filled with a mixture of granular and fibrous frass. The pupal tunnel first extends horizontally to the sapwood for some distance and then abruptly turns vertically up or down to end in the pupal chamber. The outer end of pupal chamber (from which the insect emerges) is closed by a calcareous operculum, as described by Beeson. The adult emerges by breaking through the operculum.

Ceresium flavipes (Fabricius) (Pl. XV, Figs. D, E)

This species of beetles have been found attacking dead and unhealthy portions of the living mangroves in Andamans and Car Nicobar. Larval galleries of this species is irregular and closely crowded and packed tightly with a fine powdery frass. Mature larva after its entrance inside the wood excavates its gallery more or less parallel to the wood fibre. But just before the construction of the pupal chamber it suddenly moves deeper for a small distance somewhat obliquely. The pupal chamber is, however, built on the same axis as that of the larval mine (pl. XV, fig. E). The adult emerges by tunnel and escapes through the operculum in the pupal chamber.

ACKNOWLEDGEMENTS

We are thankful to Dr. N. P. Balakrishnan, Botanical Survey of India, Port Blair, for identification of mangrove trees ; to Dr. P. K. Maity, Zoological Survey of India, Calcutta, for identification of the cerambycid borers and to Shri G. Ramakrishnan of Zoological Survey of India, Calcutta, for identifying the isopod, *Sphaeroma terebrans*.

SUMMARY

In the present paper both the marine and terrestrial borers of the mangrove community of Andaman and Nicobar islands have been dealt with. The marine borers consist of ten species of teredinid and pholadid bivalves (Mollusca) and one species of isopod (Crustacea) while the terrestrial borers include two species of cerambycid beetles. Gallery pattern of both the species of cerambycid borers is also described.

REFERENCES

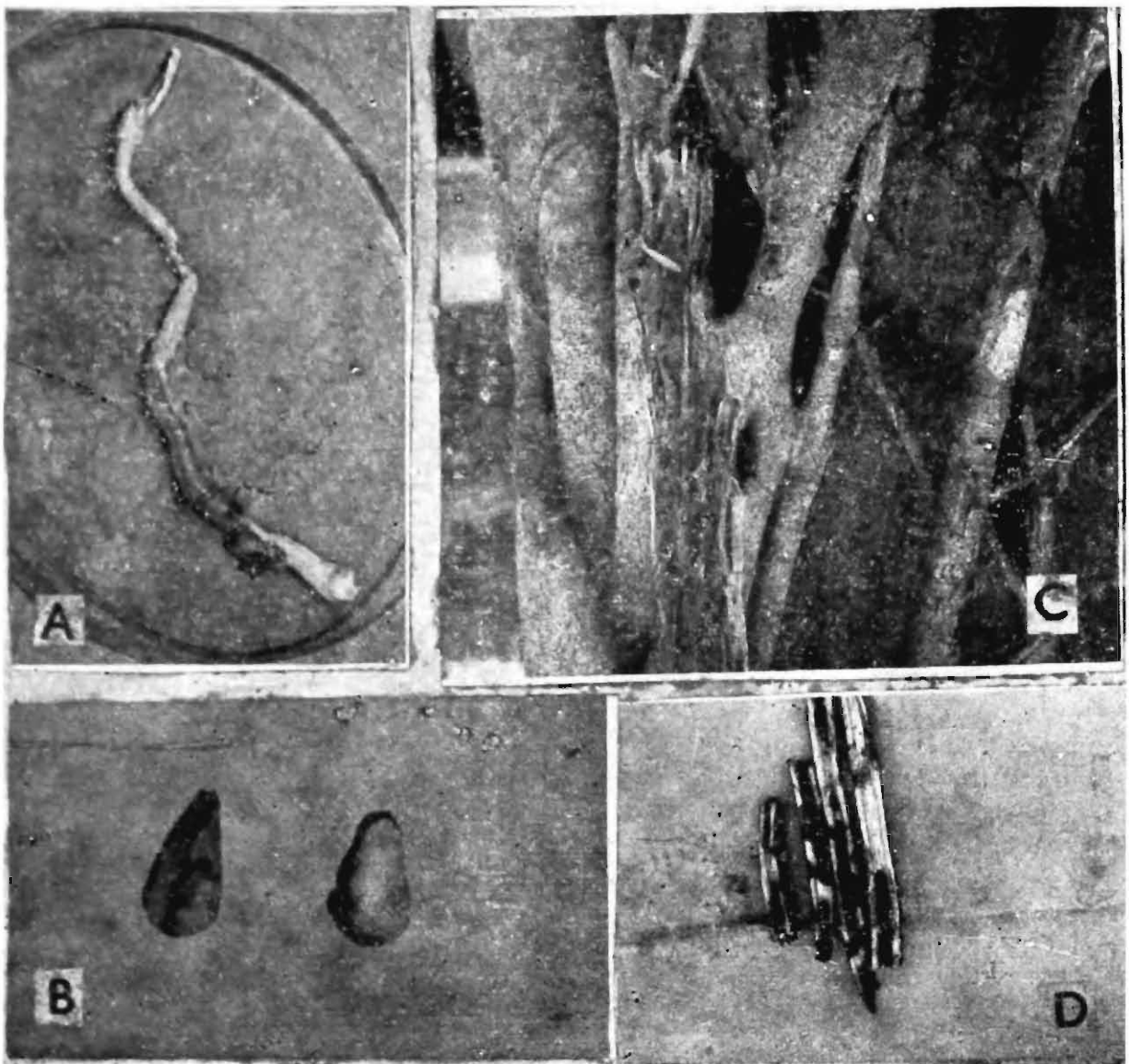
- BEESON, C. F. C. 1941. *The ecology and control of the forest insects of India and the neighbouring countries* : 1-767 (Government of India).
- DAS, A. K. and DEV ROY, M. K. 1980. On the wood-boring molluscs of South Andamans, India. *Rec. zool. Surv. India*, 77 : 179-187.
- GANAPATI, P. N. and LAKSHMANA RAO, M. V. 1960. On some crustacean wood borers from Andamans. *Curr. Sci.*, 29 (7) : 275-276.
- NAIR, B. N. and SARASWATI, M. 1968. Some recent studies on shipworms of India. *Proc. Symposium on Mollusca*. III, *Mar. Biol. Assoc. India* : 718-729.
- RAJAGOPAL, A. S. and DANIEL, A. 1972. Boring organisms of the Great Nicobar Island. Mollusca : Teredinidae. *J. Bombay nat. Hist. Soc.*, 69 (3) : 676-678.
- SUBBA RAO, N. V. 1968. Report on the collection of the wood boring molluscs from Mahanadi estuary, Orissa, India. *Proc. Symposium on Mollusca*. I. *Mar. biol. Assoc. India* : 85-93.

Table 1. List of marine wood borers of the mangroves of Andaman and Nicobar Islands

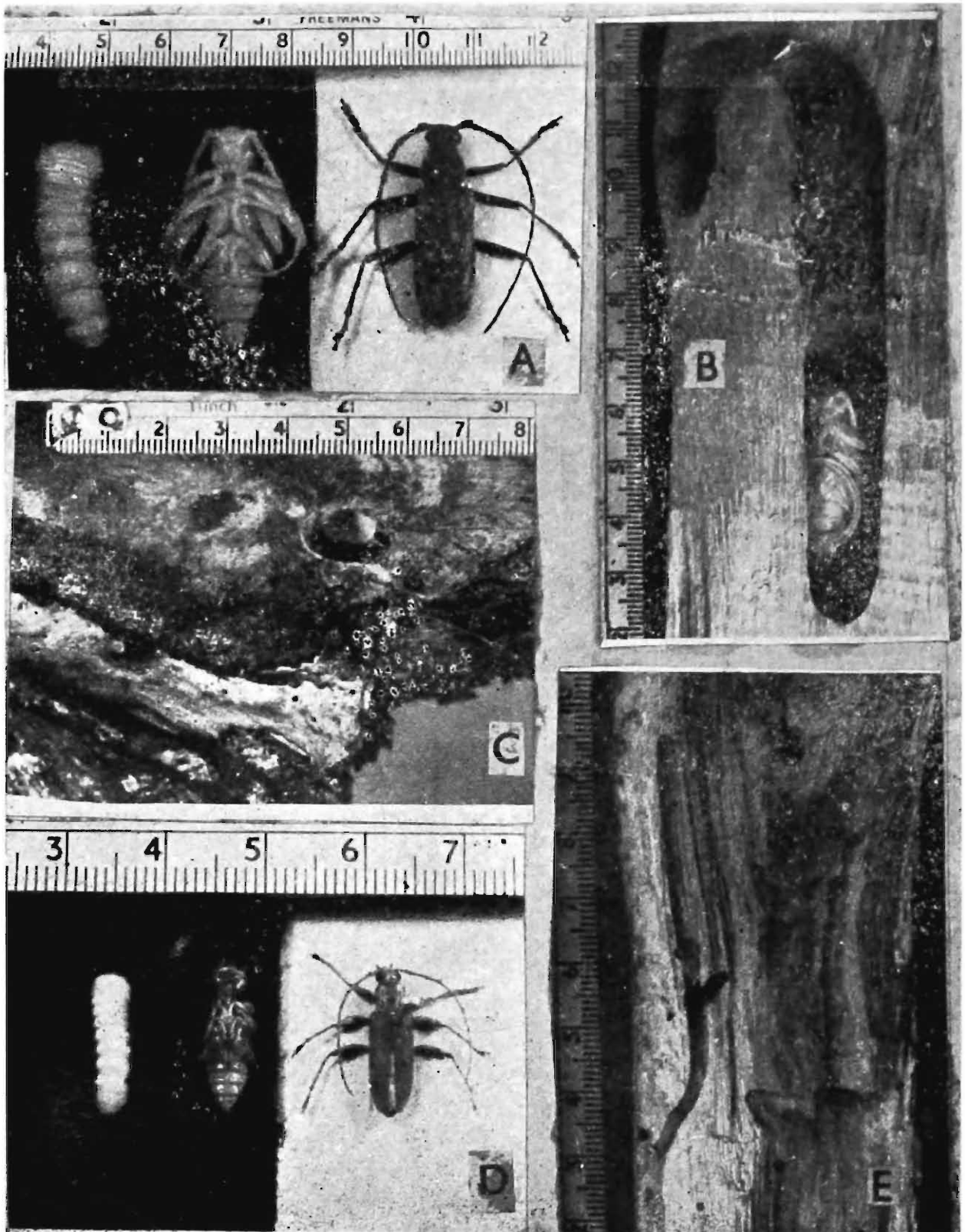
Sl. No.	Name of the Species	Locality
	Phylum : Mollusca	
	Class : Bivalvia	
	Order : Myoida	
	Family : Teredinidae	
1.	<i>Bactronophorus thoracites</i> (Gould)	Guptapara, Wright Myo, Shippighat, Wandoor, Chydyatapu, Rangachan, Lohabari, Baratang Island (All in South Andaman)
2.	<i>Dicyathifer manni</i> (Wright)	Guptapara, Wright Myo, Sippighat (All in South Andaman) Bakultala (Middle Andaman)
3.	<i>Uperotus rehderi</i> (Nair)	Rangachan (South Andaman)
4.	<i>Lyrodus pedicellatus</i> (Quatrefages)	Chidyatapu, Rangachan (South Andaman)
5.	<i>Nototerodo edax</i> (Hedley)	Chidyatapu (South Andamans)
6.	<i>Nausitora hedleyi</i> Shepmann	Wright Myo, Sippighat, Chidyatapu, Rangachan (All in South Andamans), Bakultala (Middle Andaman)
7.	<i>Nausitora dunlopei</i> Wright	Car Nicobar
8.	<i>Bankia bipenneta</i> (Turton)	Chidyatapu, Rangachan (South Andaman), Bakultala, Myabunder (Middle Andamans)
9.	<i>Bankia rochi</i> Moll.	Bakultala (Middle Andaman)
10.	<i>Martesia (Martesia) striata</i> (Linn)	Wright Myo, Chidyatapu, Kadakachang (All in South Andamans)
	Phylum : Arthropoda	
	Class : Crustacea	
	Order : Isopoda	
	Family : Sphaeromidae	
11.	<i>Sphaeroma terebrans</i> Bate	Commonly available in South Andaman mangroves

Table 2. *List of Scolytid borers of Mangroves*

Sl. No.	Name of the Insect borer	Host mangrove plants	Locality	Nature of boring
1.	<i>Epsis litoralis</i>	<i>Rhizophora mucronata</i>	Andamans	Germinating seedlings
2.	<i>Poecilips fallax</i>	<i>R. apiculata</i> <i>R. conjugata</i> <i>Ceriops candolleana</i>	Bengal to Java	Green living seedlings
3.	<i>Xyleborus cognatus</i>	<i>R. mucronata</i> <i>Bruguiera paryiflora</i> <i>Heritiera fomes</i>	Sunderbans to Malaya	Wood borer
4.	<i>Thamnurgides litoralis</i>	<i>R. mucronata</i> <i>Heritiera fomes</i>	—	Radicle of fallen germinating seedlings fruits
5.	<i>T. nephelli</i>	<i>R. mucronata</i>	—	Fruits
6.	<i>T. opaciformes</i>	<i>H. fomes</i>	—	Bark



A. Teredinid borer, *Bactronophorus thoracites* (Gould) B. Pholadid borer, *Martesia (Martesia) striata* (Linnaeus) C. Trunk of mangroves (*Rhizophora apiculata*) attacked by teredinid borers D. Pneumatophores of mangroves attacked by crustacean borer, *Sphaeroma terebrans* Bate



A. Larva, pupa and adult *Aeolesthes holocericea* (Fabricius) B. Pupal chamber of *A. holocericea* C. Larval, mine of *A. holocericea* showing the operculum
 D. Larva, pupa and adult of *Cerecium flavipes* (Fabricius) E. Pupal chamber of *C. flavipes*

Records of the Zoological Survey of India

A Journal of Indian Zoology



**Issued by the Director
Zoological Survey of India, Calcutta**