

# FAUNA OF ORISSA

PART—III

ZOOLOGICAL SURVEY OF INDIA  
1990



STATE FAUNA SERIES 1

# FAUNA OF ORISSA

Part 3

*Edited by*  
*Director, Zoological Survey of India*



ZOOLOGICAL SURVEY OF INDIA  
1991

© Copyright, 1991 Government of India

Published : March 1991

Project Co-ordinator :  
O. B. Chhotani, Joint Director, ZSI

Price  
Indian : Rs. 260.00  
Foreign : \$ 20.00 £ 13.00

Published by  
The Director, Zoological Survey of India, Calcutta

Laser set by Neatpoint Photocomposers, 6A Sudder Street, Calcutta 700 016  
and printed by Sun Lithographing Co., Calcutta 700 010

# FAUNA OF ORISSA

## PART 3

### C O N T E N T S

MARINE MOLLUSCS <i>Subba Rao N. V., Surya Rao K. V. and Maitra S.</i>	1
INSECTA : ORTHOPTERA : ACRIDIDAE <i>Bhowmik H. K.</i>	177
INSECTA : HOMOPTERA : CICADELLIDAE <i>Ghosh L. K. and Ghosh M.</i>	191
INSECTA : LEPIDOPTERA : HETEROCERA : NOCTUIDAE <i>Mandal D. K. and Maulik D. R.</i>	209
INSECTA : LEPIDOPTERA : HETEROCERA : SPHINGIDAE AND GEOMETRIDAE <i>Mandal D. K. and Maulik D. R.</i>	227
INSECTA : LEPIDOPTERA : RHOPALOCERA : NYMPHALIDAE : DANAINAE <i>Mandal D. K. and Maulik D. R.</i>	235
INSECTA : COLEOPTERA : CICINDELIDAE <i>Saha S. K., Biswas S and Halder S. K.</i>	239
INSECTA : COLEOPTERA : SCARABAEIDAE <i>Biswas S and Chatterjee S. K.</i>	243

## MARINE MOLLUSCS

N.V. SUBBA RAO, K.V. SURYA RAO and S. MAITRA

*Zoological Survey of India  
Calcutta*

### INTRODUCTION

Orissa has a coast line of about 482 km. length stretching over four districts, namely Baleshwar, Cuttack, Puri and Ganjam. The coast line is indented by several small and big rivers which debouch into Bay of Bengal forming estuaries at their points of confluence. Mangrove vegetation is a characteristic feature of the estuaries. According to a recent study by remote sensing, Orissa has 214 sq. km. of mangrove forests. The mangrove ecosystem offers suitable habitats for molluscs and also for several species of invertebrates and vertebrates.

Besides the mangrove ecosystem, Orissa has well-known sandy beaches extending from Chandaneshwar (Talaseri) to Gopalpur-on-sea. At Chandipur the shore slopes very gradually and at the time of spring tides a 5 km stretch of littoral area gets exposed during low tide. The molluscs found there include estuarine species as well as those which are truly marine.

Thus along Orissa coast two important types of habitats can be noticed, namely the mangrove ecosystem and sandy shore. Rocky shore is absent along the coast but at a few places such as Gopalpur rocks are seen in the littoral region. Two species, whose natural habitat is rocky coast, were collected from a rock on the coast near Gopalpur.

The continental shelf is narrow along Orissa coast, extending from 40 to 120 km. The 5 fathom shelf extends from 200 m to 23 km from Hooghly in West Bengal to Mahanadi in Orissa. Off Konarak, there is a reef composed of a recent conglomerate of sand and decomposed shells. In the shore region of Orissa molluscs are more abundant than on the muddy grounds off Sunderbans in West Bengal (Jenkins, 1912).

The material studied has accumulated through shore collections made by different survey parties of Zoological Survey of India. It also included shells cast on the shore. As such the material includes molluscs of littoral and also of sublittoral region. It is in the latter zone that greatest number of species occur. Very few species are known from the littoral region of Orissa coast as the intertidal zone does not offer all types of habitats. Among littoral species of molluscs sand burrowing and mangrove associated molluscs are in majority. It includes molluscs ranging from very minute to large ones.

In the past, offshore molluscs were collected by "Golden Crown," a steam trawler of Bengal Fisheries and by RIMS "Investigator." During 1908-1909, "Golden Crown" explored Bay of Bengal at 27-54 m line and along Orissa coast and made collections from the mouth of Devi River to the mouth of Chilka Lake and beyond up to Visakhapatnam, in Andhra Pradesh. "Golden Crown" trawling was very much limited in shallow waters but the 'Investigator' worked from shallow waters to 180 metres depth and its shallow water trawling was confined to Orissa coast. Based on "Golden Crown" material, Jenkins (1912) made some general observations on shallow water fauna of Bay of Bengal, which included only a small part of Orissa coast. Some of the mollusc collections were studied by Preston (1910), who described a few new species. All this material present in the Zoological Survey of India, was also examined.

Molluscs of Orissa coast in general are known through the publications by Jenkins (1912), Preston (1910, 1914, 1915), Ray (1968) and Nagabhushanam & Chandrasekhara Rao (1969). Although marine molluscs are poorly known, molluscs of Chilka Lagoon were wellworked out and exhaustive accounts were published (Preston, 1910, 1914, 1915; Annandale, 1924; Annandale & Kemp, 1916; Eliot, 1916; Ghosh, 1916; Patnaik, 1972). Molluscs of the Mahanadi estuary were studied by Subba Rao (1968) and Subba Rao & Mookherjee (1975). The present report is the first attempt to give a comprehensive account of molluscs of Orissa coast. Several species have their type locality in Orissa. In order to up-date our knowledge of those species a separate list with their current scientific names is also given.

A total of 324 species : 170 species of gastropods, one species of scaphopod, 147 species of bivalves and six species of Cephalopods, are reported in this paper. Besides these species, the representatives of which were examined by us, there are 14 other species reported in literature. Of these literature records four species are known by their types only and are not available in the National Zoological Collection for study. As many as nine species (three of gastropods and six of bivalves) are first records from India. There is a poor representation of Opisthobranch molluscs in the collection and there is scope for augmenting the number of species if intensive collection is attempted in off shore waters.

Abbreviations used : A.D., A. Dey; A.G.K.M., A.G.K. Menon; B.P., Bains Prasad; B.S.C., B.S. Chauhan; B.V.P., B.V. Parida; C.A.N.R., C.A. Nageswara Rao; Cm. Centimetre; C.M.F.R.I., Central Marine Fisheries Research Institute; Coll., Collector; D., Diameter; D.B., Dak Bunglow; Dist. District; D.P.S., D.P. Sanyal; E, East; ex(s), Example (s); F.H.G., F.H. Gravely; G.R.K., G. Rama Krishna; H.A., Height of Aperture; H.A.F., H.A. Hafeez; H.C.R. Harish Chandra Ray; Ht., Height; H.S., Height of spire; I.B., Inspection Bunglow; I.C.Z.N., International Code of Zoological Nomenclature; Km, Kilometer; K.K.T., K.K. Tiwari; K.S.M., K.S. Misra; L, Length; Litt., Literature; M, Meter; M.C., Mary Chandy; M.H., M. Hafeezullah; mm. millimetre; MS., Manuscript; N, North; N.A., N. Annandale; NE, North east; N.V.S.R., N.V. Subba Rao; Nr., Near; NW, North west; N.Z.C., National Zoological Collection; O.D., Original Designation; R.E.L., R.E. Lloyd; S, South; SE, South east; S.B., S. Barua; S.Bi., S. Biswas; S.D., subsequent Designation; Stn., Station; S.N.M., S.N. Misra; S.L.H., S.L. Hora; SW, South west; S.W.K., S.W. Kemp; T., Thickness; V.K.P., V.K. Premkumar; W., West; W.A. Width of Aperture; Y.C., Y Chaturvedi.

#### LIST OF MARINE MOLLUSCS FROM ORISSA COAST

\* Indicates species reported in literature only, but not included in the text as we could not examine any material.

Class Amphineura  
Subclass Polyplacophora  
Order Neoloricata  
Family Acanthochitonidae

1. *Acanthochitona mahensis* Winckworth

Class Gastropoda  
Subclass Prosobranchia  
Order Archaeogastropoda  
Family Fissurellidae

2. *Diadora bombayana* (Sowerby)  
Family Patellidae
3. *Cellana radiata radiata* (Born)  
Family Trochidae
4. *Euchelus alabastrum* Reeve
5. *E. horridus* (Philippi)
6. *Umboonium vestiarium* (Linnaeus)
7. *Solariella (Solariella) satparaensis* Preston  
Family Cyclostrematidae
8. *Cyclostrema eburnea* Nevill
9. *Tubiola microscopica* (Nevill)
10. *Leucorhynchia variegata* (Preston)  
Family Phasianellidae
11. *Tricolia indica* (Winckworth)  
Family Neritidae
12. *Nerita (Amphinerita) articulata* Gould
13. *N. (Theliostyla) albicilla* Linnaeus
14. *N. (T.) chamaeleon* Linnaeus
15. *N. (T.) squamulata* Le Guillou
16. *Neritina (Dostia) violacea* (Gmelin)
17. *Pseudonerita sulculosa* (Von Martens)
18. *Smaragdina (Smaragdella) mamilla* Annandale
19. *Clithon oualaniensis* (Lesson)  
Order Mesogastropoda  
Family Littorinidae
20. *Littorina (Littoraria) undulata* Gray
21. *L. (Littorinopsis) scabra scabra* (Linnaeus)
22. *L. (L.) melanostoma* Gray
23. *Nodilittorina (Nodilittorina) pyramidalis pyramidalis* (Quoy & Gaimard)  
Family Irvadiidae
24. *Irvadia ornata* Blanford  
Family Planaxidae
25. *Planaxis nigra* Quoy and Gaimard  
Family Architectonicidae
26. *Architectonica laevigata* (Lamarck)

## Family Turritellidae

27. *Turritella acutangula* (Linnaeus)  
 28. *T. fultoni* Melvill  
 29. *T. columnaris* Kiener

## Family Siliquariidae

30. *Siliquaria anguina* (Linnaeus)  
 31. *S. cumingii* Moerch  
 32. *S. tostus* Moerch  
 33. *S. trochlearis* Moerch

## Family Potamididae

34. *Cerithidea (Cerithideopsilla) cingulata* (Gmelin)  
 35. *C. (Cerithidea) obtusa* (Lamarck)  
 36. *Telescopium telescopium* (Linnaeus)  
 37. *Terebralia palustris* (Linnaeus)

## Family Epitoniidae

38. *Epitonium hamatulae* Preston  
 39. *E. immaculatum* (Sowerby)  
 40. *Acrilla acuminata* (Sowerby)  
 41. *A. gracilis* (Sowerby)  
 42. *Eglisia tricarinata* Adams & Reeve

## Family Litiopidae

43. *Alaba blanfordi* A. Adams

## Family Finellidae

44. *Finella virgata* (Philippi)

## Family Eulimidae

45. *Niso pyramidelloides* G. & H. Nevill  
 46. *Eulima oxytata* Watson

## Family Fossaridae

47. *Chilkaia imitatrix* Preston

## Family Crepidulidae

48. *Crepidula walshi* Reeve

## Family Amaltheidae

50. *Amathina tricarinata* (Linnaeus)

## Family Vanikoridae

51. *Vanikoro cancellata* (Lamarck)

## Family Strombidae

52. *Strombus (Gibberulus) gibberulus gibberulus* Linnacus





80. *Murex trapa* Roeding
  81. *M. tribulus* Linnaeus
  82. *Naquetia annandalei* (Preston)
  83. *Rapana rapiformis* (Born)
  84. *Cronia (Ergalatax) contracta* (Reeve)
  85. *Cymia lacera* (Born)
  86. *Mancinella bufo* (Lamarck)
  87. *Morula biconica* (Blainville)
  88. *M. granulata* (Duclos)
  89. *Thais rugosa* (Born)
  90. *T. tissoti* (Petit)
- Family Buccinidae
91. *Babylonia spirata* (Linnaeus)
  92. *Cantharus tranquebaricus* (Gmelin)
  93. *Nassaria nivea* (Gmelin)
  94. *N. suturalis* (Adams)
  95. *Colubraria muricata* (Lightfoot)
- Family Melongenidae
96. *Pugilina cochlidium* (Linnaeus)
- Family Nassariidae
97. *Nassarius (Aciculina) subconstrictus* (Sowerby)
  98. *N. (A.) vittatus* (A. Adams)
  99. *N. (Hima) stolatus* (Gmelin)
  100. *N. (Niotha) ariel* (Preston)
  101. *N. (N.) jacksonianus* (Quoy and Gaimard)
  102. *N. (N.) livescens* (Philippi)
  103. *N. (N.) variegatus* (A. Adams)
  104. *N. (Plicarcularia) callospira* (A. Adams)
  105. *N. (P.) pullus* (Linnaeus)
  106. *N. (Pygmaeonassa) orissaensis* (Preston)
  107. *N. (Zeuxis) comptus* (A. Adams)
  108. *N. (Z.) dorsatus* (Roeding)
  109. *N. (Z.) foveolatus* (Reeve)
  110. *Bullia (Leiodomus) livida* Reeve
  111. *B. (Bullia) tranquebarica* (Roeding)
  112. *B. (Dorsanum) vittata* (Linnaeus)

113. *Cyllene (Cyllene) fuscata* A. Adams  
Family Fascioliariidae
114. *Fusinus colus* (Linnaeus)  
Family Olividae
115. *Oliva oliva* (Linnaeus)
116. *O. vidua* (Roeding)
117. *Agaronia nebulosa* (Lamarck)
118. *Amalda ampla* (Gmelin)
119. *Olivancillaria gibbosa* (Born)  
Family Harpidae
120. *Harpa davidis* (Roeding)  
Family Cancellariidae
121. *Cancellaria asperella* Lamarck
122. *C. oblonga* Sowerby
123. *Trigonostoma lamellosa* (Hinds)  
Family Marginellidae
124. *Marginella angustata* Sowerby
125. *Persicula (Gibberula) ventricosa* (Fischer)  
Family Mitridae
126. *Cancilla interlirata* (Reeve)
127. *Neocancilla circula* (Kiener)
128. *Scabricola (Swainsonia) fusca* (Swainson)  
Family Costellariidae
129. *Vexillum (Costellaria) mandirella* (Ray)  
Family Turridae
130. *Lophiotoma (Lophioturris) indica* (Roeding)
131. *Gemmula speciosa* (Reeve)
132. *Turricula tornata tornata* (Dillwyn)
133. *T. tornata fulminata* (Kiener)
134. *T. javana* (Linnaeus)
135. *Asthenotoma vertebrata* (Smith)
136. *Brachytoma crenularis* (Lamarck)
137. *Drillia euchores* Melvill
138. *D. ganjamensis* Preston
139. *D. major* (Reeve)
140. *Lienardia (Etrema) cosmia* Winckworth



Family Atyidae

169. *Atys (Aliculastrum) cylindricus* Helbling

170. *Haminoea crocata* Pease

Family Retusidae

171. *Retusa pyramidata* (A. Adams)

Family Cylichnidae

172. *Tornatina estriata* Preston

Subclass Pulmonata

Order Basommatophora

Family Ellobiidae

173. *Ellobium aurisjudae* (Linnaeus)

174. *E. (Auriculina) gangeticum* (Pfeiffer)

175. *Pythia plicata* (Gray)

Order Sacoglossa

Family Elysiidae

\*176. *Elysia chilkaensis* Elliot

Family Stiligeridae

\*177. *Stiliger pica* Annandale and Prashad

Order Nudibranchia

Family Cuthonidae

\*178. *Cuthona henrici* Eliot

Order Soleolifera

Family Onchidiidae

179. *Onchidium verruculatum* Cuvier

Class Scaphopoda

Family Dentaliidae

180. *Dentalium octangulatum* Donovan

Class Bivalvia

Order Nuculoida

Family Nuculidae

181. *Nucula (Leionucula) convexa* Sowerby

182. *Nucula (Nucula) mitralis* Hinds

Family Nuculanidae

183. *Nuculana (Nuculana) robsoni* Prashad

## Order Arcoida

## Family Arcidae

184. *Barbatia (Calloarca) bistrigata* (Dunker)  
 185. *B. (Cucullaearca) helblingi* (Bruguiere)  
 186. *Anadara (Tegillarca) granosa* (Linnaeus)  
 187. *A. (T.) rhombea* (Born)  
 188. *Scapharca inaequalvis* (Bruguiere)  
 189. *S. deyrollei* (Jousseaume)  
 190. *S. clathrata* (Reeve)

## Family Cucullaeidae

191. *Cucullaea (Cucullaea) labiata* (Lightfoot)

## Family Noetiidae

192. *Striarca lactea* (Linnaeus)

## Family Glycymerididae

193. *Glycymeris tenuicostatus* (Reeve)

## Order Mytiloida

## Family Mytilidae

194. *Perna viridis* (Linnaeus)  
 195. *Musculus cumingianus* (Dunker)  
 196. *Modiolus (Modiolus) striatulus* Hanley  
 197. *M. undulatus* (Dunker)  
 198. *M. philippinarum* Hanley  
 199. *Amygdalum watsoni* Smith

## Order Pterioida

## Family Pteriidae

200. *Pteria smithi* (Preston)

## Family Isognomonidae

201. *Isognomon isognomum* Linnaeus  
 202. *I. legumen* (Gmelin)

## Family Pectinidae

203. *Amusium pleuronectes* (Linnaeus)  
 204. *Volachlamys tranquebaricas* (Gmelin)  
 205. *Pecten (Pecten) pyxidatus* (Born)

## Family Spondylidae

206. *Spondylus hystrix* Roeding  
 207. *S. layardi* Reeve

- Family Anomiidae
208. *Anomia scabra* Reeve
209. *Enigmonia aenigmatica* (Holten)
- Family Limidae
210. *Ctenoides annulata* (Lamarck)
- Family Ostreidae
211. *Crassostrea cuttackensis* (Newton and Smith)
212. *C. lacerata* (Hanley)
213. *Saccostrea cucullata* (Born)
214. *S. deformis* (Lamarck)
215. *S. futamiensis* (Seki)
216. *Lopha (Lopha) frons* (Linnaeus)
- \*217. *Ostrea lentiginosa* Sowerby
- Family Gryphaeidae
218. *Hyotissa hyotis* (Linnaeus)
- Order Veneroida
- Family Ungulinidae
219. *Diplodonta bullata* Dunker
220. *D. barhampurensis* Preston
221. *D. satparaensis* Preston
222. *Felania annandalei* Preston
223. *F. chilkaensis* Preston
224. *F. ovalis* Preston
- Family Chamidae
225. *Chama (Chama) lazarus* Linnaeus
226. *C. (C.) reflexa* Reeve
- Family Kelliidae
227. *Kellia chilkaensis* Preston
- \*228. *K. mahosaensis* Preston
- Family Galeommatidae
229. *Galeomma argentea* Deshayes
230. *Scintilla chilkaensis* Preston
- Family Carditidae
231. *Cardites antiquata* (Linnaeus)
- Family Cardiidae
232. *Acanthocardia coronata* (Schroeter)





265. *M. (Psammacoma) truncata* (Jonas)  
 266. *M. (Psammotreta) ala* (Hanley)  
 267. *Apolymetis edentula* (Spengler)  
 268. *Tellina barhampurensis* (Preston)  
                     Family Donacidae  
 269. *Donax (Donax) pulchella* Hanley  
 270. *D. (Hecuba) scortum* Linnaeus  
 271. *D. (Latona) incarnatus* Gmelin  
 272. *D. (L) lubricus* Hanley  
 273. *D. (Paradonax) aperittus* Melvill  
                     Family Psammobiidae  
 274. *Gari (Gari) maculosa* (Lamarck)  
 275. *G. (Psammobia) mahosaensis* (Preston)  
 276. *Sanguinolaria (Soletellina) acuminata* Deshayes  
 277. *S. (Soletellina) diphos* (Linnaeus)  
                     Family Semelidae  
 278. *Theora (Theora) opalina* (Hinds)  
 279. *Cumingia hinduorum* Preston  
                     Family Trapeziidae  
 280. *Trapezium (Neotrapezium) sublaevigatum* (Lamarck)  
                     Family Veneridae  
 281. *Gafrarium pectinatum* (Linnaeus)  
 282. *Sunetta (Sunetta) scripta* (Linnaeus)  
 283. *S. (S.) donacina* (Gmelin)  
 284. *S. (S.) effosa* (Hanley)  
 285. *S. (S.) meroe* (Linnaeus)  
 286. *S. (Cyclosunetta) excavata* (Hanley)  
 287. *Meretrix meretrix* (Linnaeus)  
 288. *M. casta* (Gmelin)  
 289. *Tivela dillwyni* (Deshayes)  
 290. *Pitar alabastrum* (Reeve)  
 291. *Pelecypora (Pelecypora) excisa* (Sowerby)  
 292. *P. (P.) trigona* (Reeve)  
 293. *Dosinia (Asa) fibula* (Reeve)  
 294. *D. (A.) tumida* (Gray)  
 295. *Clementia vatheleti* Mabilie



- Order Pholadomyoidea  
Family Pandoridae
325. *Pandora brevifrons* Sowerby  
Family Laternulidae
326. *Laternula navicula* (Reeve)  
327. *L. truncata* (Lamarck)  
Family Cuspidariidae
328. *Cuspidaria annandalei* Preston  
329. *C. chilkaensis* (Preston)  
Class Cephalopoda  
Order Sepioidea  
Family Sepiidae
330. *Sepia aculeata* Ferussac and d'Orbigny  
\*331. *S. brevimana* Steenstrup  
332. *S. pharaonis* Ehrenberg  
333. *Sepiella inermis* (Ferussaac and d'Orbigny)  
Order Teuthoidea  
Family Loliginidae
334. *Loliolus investigatoris* Goodrich  
335. *Loligo duvauceli* d'Orbigny  
Family Enoploteuthidae
- \*336. *Abraliopsis lineata* (Goodrich)  
Family Octopodidae
337. *Octopus (Octopus) globosus* Apelloef  
\*338. *Octopus (Octopus) rugosus* (Bosc)

LIST OF SPECIES DESCRIBED FROM ORISSA WITH THEIR CURRENT SCIENTIFIC NAMES

Name of the species described	Current Scientific Name
Class Gastropoda	
Order Archaeogastropoda	
Family Trochidae	
1. <i>Solariella satparaensis</i> Preston, 1914	Same
2. <i>S. utkalensis</i> Ray, 1968	<i>S. satparaensis</i> Preston, 1914
Family Cyclostrematidae	
3. <i>Cyclostrema eburnea</i> Nevill, 1875	Same

- |  |   |
|--|---|
| 4. <i>C. (Tubiola) innocens</i> Preston, 1915                    | <i>Tubiola microscopica</i> (Nevill, 1877)                            |
| 5. <i>Tinostoma variegata</i> Preston, 1914                      | <i>Leucorhynchia variegata</i> (Preston, 1914).                       |
| Family Neritidae   |   |
| 6. <i>Smaragdia mamilla</i> Annandale, 1924                      | <i>Smaragdia (Smaragdella) mamilla</i><br>Annandale, 1924             |
| Order Mesogastropoda   |   |
| Family Stenothyridae   |   |
| 7. <i>Stenothyra blanfordiana</i> Nevill, 1880                   | Same  |
| 8. <i>S. chilkaensis</i> Preston, 1914                           | <i>S. blanfordiana</i> Nevill, 1880                                   |
| 9. <i>S. obesula</i> Preston, 1915                               | – do –  |
| 10. <i>S. orissaensis</i> Preston, 1914                          | <i>S. minima</i> (Sowerby, 1837)                                      |
| 11. <i>S. trigona</i> Preston, 1915                              | <i>Gangetia miliacea</i> (Nevill, 1880)                               |
| Family Epitoniidae   |   |
| 12. <i>Epitonium hamatulae</i> Preston, 1915                     | Same  |
| Family Litiopidae  | Family Finellidae   |
| 13. <i>Litiopa (Alaba) kempii</i> Preston, 1915                  | <i>Finella virgata</i> (A. Adams, 1849)                               |
| 14. <i>L. (A.) copiosa</i> Preston, 1915                         | – do –  |
| Family Eulimidae   |   |
| 15. <i>Niso pyramidelloides</i> G. & H. Nevill, 1871             | Same  |
| Family Fossaridae  |   |
| 16. <i>Chilkaia imitatrix</i> Preston, 1915                      | Same  |
| Family Tonnidae  |   |
| 17. <i>Dolium varicosum</i> Preston, 1910                        | <i>Tonna sulcosa</i> (Born, 1778)                                     |
| Family Ficidae   |   |
| 18. <i>Pirula investigatoris</i> Smith, 1894                     | <i>Ficus investigatoris</i> (Smith, 1894)                             |
| Order Neogastropoda  |   |
| Family Muricidae   |   |
| 19. <i>Cuma disjuncta</i> var. <i>obliterata</i> Annandale, 1924 | <i>Cymia lacera</i> (Born)  |
| 20. <i>Pteronotus annandalei</i> Preston, 1910                   | <i>Naquetia annandalei</i> (Preston, 1910)                            |
| Family Nassariidae   |   |
| 21. <i>Nassa denegabilis</i> Preston, 1914                       | <i>Nassarius (Aciculina)</i><br><i>subconstrictus</i> (Sowerby, 1899) |
| 22. <i>N. orissaensis</i> Preston, 1914                          | <i>N. (Pygmaeonassa) orissaensis</i><br>(Preston, 1914)               |
| 23. <i>N. ariel</i> Preston, 1910                                | <i>N. (Niotha) ariel</i> (Preston, 1910)                              |

- |     |   |  |
|-----|---|--|
|     | Family Costellariidae   |  |
| 24. | <i>Costellaria mandirella</i> Ray, 1968   | <i>Vexillum (Costellaria) mandirella</i> Ray, 1968 |
|     | Family Turridae   |  |
| 25. | <i>Drillia ganjamensis</i> Preston, 1910  | Same   |
|     | Family Terebridae   | Family Pyramidellidae                              |
| 26. | <i>Terebra rambhaensis</i> Preston, 1915  | <i>Turbonilla rambhaensis</i> (Preston 1915)       |
| 27. | <i>T. durgella</i> Ray, 1968  | Same   |
| 28. | <i>T. asiatica</i> Ray, 1968  | Same   |
|     | Order Entomotaeniata  |  |
|     | Family Pyramidellidae   |  |
| 29. | <i>Chrysallida (Mormula) ecclesia</i> Preston, 1915                             | <i>Pyrgulina ecclesia</i> (Preston, 1915)          |
| 30. | <i>C. (M.) nadiensis</i> Preston, 1915  | <i>P. nadiensis</i> (Preston, 1915)                |
| 31. | <i>Odostomia chilkaensis</i> Preston, 1914                                      | Same   |
| 32. | <i>Chrysallida (Mormula) chilkaensis</i> Preston, 1915                          | <i>P. humilis</i> (Preston, 1915)                  |
| 33. | <i>Syrnola dubiosa</i> Nevill, 1871   | Same   |
| 34. | <i>Turbonilla kempi</i> Ray, 1968   | Same   |
| 35. | <i>T. prestoni</i> Ray, 1968  | Same   |
| 36. | <i>T. prashadi</i> Ray, 1968  | Same   |
| 37. | <i>T. puriensis</i> Ray, 1968   | Same   |
| 38. | <i>T. materna</i> var. <i>melvilli</i> Ray, 1968                                | <i>T. materna</i> Melvill, 1912                    |
|     | Order Cephalaspidea   |  |
|     | Family Cylichnidae  |  |
| 39. | <i>Tornatina estriata</i> Preston, 1914   | Same   |
| 40. | <i>T. soror</i> Preston, 1914   | - do -   |
|     | Order Sacoglossa  |  |
|     | Family Elysiidae  |  |
| 41. | <i>Elysia chilkaensis</i> Eliot, 1916   | Same   |
|     | Family Stiligeridae   |  |
| 42. | <i>Stiliger pica</i> Annandale & Prashad, 1924                                  | Same   |
|     | Order Nudibranchia  |  |
|     | Family Cuthonidae   |  |
| 43. | <i>Cuthona henricii</i> Eliot, 1916   | Same   |
|     | Order Stylommatophora   |  |
|     | Family Streptaxidae   |  |
| 44. | <i>Ennea bicolor</i> (Hutton) race <i>barkudensis</i> Annandale & Prashad, 1920 | <i>Ennea (Gulella) bicolor</i> (Hutton)            |

45. *Gulella rambhaensis* Ray, 1960 Same  
Family Ariophantidae
46. *Macrochlamys ganjamensis* Godwin-Austen, 1910 Same  
Class Bivalvia  
Order Nuculoida  
Family Nuculidae
47. *Nucula rabaniana* Nevill, 1871 *Nucula mitralis* Hinds, 1843  
Order Mytiloida  
Family Mytilidae
48. *Modiola annandalei* Preston, 1911 *Modiolus (Modiolus) striatulus*  
Hanley, 1844
49. *M. celator* Preston, 1911 – do –
50. *M. chilkaensis* Preston, 1911 *M. (Modiolus) undulatus* (Dunker, 1856)
51. *M. jenkinsi* Preston, 1910 *M. (M.) striatulus* Hanley, 1844
52. *M. undulatus* var. *crassicostata* Preston, 1914 *M. (M.) undulatus* (Dunker, 1856)  
Order Pterioida  
Family Pteriidae
53. *Avicula smithi* Preston, 1910 *Pteria smithi* (Preston, 1910)  
Family Ostreidae
54. *Ostrea gryphoides* var. *cuttackensis* *Crassostrea cuttackensis*  
(Newton & Smith, 1912) (Newton & Smith)  
Order Veneroida  
Family Ungulinidae
55. *Diplodonta satparaensis* Preston, 1915 Same
56. *D. barhampurensis* Preston, 1915 Same
57. *D. (Felania) annandalei* Preston, 1914 *Felania annandalei* Preston, 1914
58. *D. (F.) chilkaensis* Preston, 1914 *F. chilkaensis* Preston, 1914
59. *D. (F.) ovalis* Preston, 1914 *F. ovalis* Preston, 1914  
Family Kelliidae
60. *Kellia chilkaensis* Preston, 1915 Same
61. *K. mahosaensis* Preston, 1915 Same  
Family Mactridae
62. *Standella annandalei* Preston, 1915 *Spisula (Standella) annandalei*  
Preston, 1915  
Family Galeommatidae
63. *Scintilla chilkaensis* Preston, 1915 Same

	Family Solenidae	
64.	<i>Solen annandalei</i> Preston, 1915	Same
65.	<i>S. graveyli</i> Ghosh, 1920	Same
66.	<i>S. kempi</i> Preston, 1915	Same
	Family Cultellidae	
67.	<i>Neosolen aquaedulcioris</i> Ghosh, 1920	Same
	Family Tellinidae	
68.	<i>Tellina chilkaensis</i> Preston, 1915	<i>Tellina (Pharaonella) iridescens</i> (Benson, 1842)
69.	<i>Tellina confusa</i> Preston, 1914	<i>Tellina (Omala) texturata</i> Sowerby, 1867
70.	<i>T. barhampurensis</i> Preston, 1915	May be Semelidae
	Family Psammobiidae	
71.	<i>Psammobia mahosaensis</i> Preston, 1915	<i>Gari (Psammobia) mahosaensis</i> Preston, 1915
	Family Semelidae	
72.	<i>Cumingia hinduorum</i> Preston, 1915	Same
	Family Petricolidae	
73.	<i>Petricola esculpturata</i> Preston, 1915	Family Trapeziidae <i>Trapezium (Neotrapezium)</i> <i>sublaevigatum</i> (Lamarck)
	Family Veneridae	
74.	<i>Corbicula (Velorita) satparaensis</i> Preston, 1914	<i>Meretrix casta</i> (Gmelin, 1791)
75.	<i>Cytherea (Caryatis) pudicissima</i> Smith, 1894	<i>Pitar alabastrum</i> (Reeve)
76.	<i>Clementia annandalei</i> Preston, 1914	<i>Clementia vatheleti</i> Mabilie, 1901
77.	<i>Meroe chilkaensis</i> Preston, 1914	<i>Sunetta meroe</i> (Linnaeus, 1758)
78.	<i>M. satparaensis</i> Preston, 1914	<i>S. scripta</i> (Linnaeus, 1758)
	Family Corbulidae	Family Cuspidariidae
79.	<i>Corbula chilkaensis</i> Preston, 1911	<i>Cuspidaria chilkaensis</i> (Preston, 1911)
	Family Pholadidae	
80.	<i>Martesia delicatula</i> Preston, 1970	Same
	Family Pandoridae	
81.	<i>Pandora perangusta</i> Preston, 1910	<i>P. breviformis</i> Sowerby, 1835
	Family Laternulidae	
82.	<i>Anatina barkulensis</i> Preston, 1915	<i>Laternula navicula</i> (Reeve, 1863)
83.	<i>A. barkudaensis</i> Preston, 1915	- do -

84. *A. granulosa* Preston, 1917 – do –  
Family Lyonsiidae
85. *Lyonsia samalinsulae* Preston, 1914 – do –  
Family Cuspidariidae
86. *Cuspidaria annandalei* Preston, 1915 Same

## KEYS TO THE FAMILIES

## Class Gastropoda

1. Shell absent, animal covered with warty mantle, foot broad and flat.....*Onchidiidae*  
Shell present, usually external..... 2
2. Shell uncoiled, whorls irregular, not compact..... *Vermetidae*  
Shell coiled, whorls regular and compact ..... 3
3. Shell limpet, cup or cap shaped, spire rudimentary or absent; aperture very large in proportion to size of shell or shell flattened, aperture not defined ..... 4  
Shell globose or elongate, spire distinct, low or depressed or concealed within the bodywhorl; aperture considerably smaller in proportion to shell ..... 7
4. Shell limpet shaped, spire absent ..... 5  
Shell either cup or cap shaped; spire rudimentary..... 6
5. Apex of the shell perforated like key hole; interior not nacreous..... *Fissurellidae*  
Apex of the shell not perforated; interior nacreous ..... *Patellidae*
6. Outer surface with three longitudinal ridges; internal accessory plate absent.....  
.....*Amaltheidae*  
Outer surface without longitudinal ridges; an internal accessory plate present.....  
..... *Calyptraeidae*
7. Shell minute not exceeding more than 10 mm in height..... 8  
Shell medium to large exceeding more than 10 mm in height.....17
8. Shell porcellaneous; umbilicus wide..... *Cyclostrematidae*  
Shell not porcellaneous; umbilicus narrow..... 9
9. Spire with less than seven whorls .....10  
Spire with more than seven whorls.....14
10. Shell either turreted or ovate; operculum present .....11  
Shell either conical or cylindrical; operculum absent.....12
11. Shell turreted, non umbilicate.....*Iravadiidae*  
Shell ovate, umbilicate ..... *Fossaridae*



12. Shell conical, aperture large, outerlip thick, anteriorly notched; columella with plaits ..... *Ringiculidae*  
 Shell cylindrical, aperture small, narrow; outerlip thin, simple, without notch anteriorly, columella simple.....13
13. Spire sunken, outerlip extends beyond body whorl; suture distinct..... *Retusidae*  
 Spire not sunken, outerlip does not extend beyond spire and body whorl; suture indistinct..... *Cylichnidae*
14. Shell with varix on bodywhorl .....15  
 Shell without varix on bodywhorl.....16
15. Aperture produced anteriorly; shell imperforate.....*Litiopidae*  
 Aperture not produced anteriorly; shell perforate .....*Finellidae*
16. Shell smooth, polished, spire slightly bent, outerlip thick; columella straight.....  
 .....*Eulimidae*  
 Shell sculptured with axial ribs and spiral striae, spire never bent, outer lip thin; columella with folds.....*Pyramidellidae*
17. Spire either low or depressed; umbilicus deep, wide; lower surface flattened.....18  
 Spire elevated, sometimes concealed within body; umbilicus small, lower surface not flattened .....19
18. Spiral whorls rapidly diminishing in diameter; spire low; umbilicus often closed; shell usually attached with other shells and stones.....*Xenophoridae*  
 Spiral whorls regularly diminishing in diameter; spire depressed; umbilicus toothed not closed; shell free from attachment of other shells and stones..... *Architectonicidae*
19. Inner layer of shell nacreous; operculum corneous, shell either conical or lenticular ...  
 ..... *Trochidae*  
 Inner layer of shell not nacreous; operculum either calcareous or horny.....20
20. Spire high, elongate, many whorled.....21  
 Spire low, not many whorled, sometimes either concealed or sunken .....24
21. Aperture rounded, without anterior canal; whorls rounded or keeled .....22  
 Aperture ovate; anterior canal prominent; whorls not keeled .....23
22. Whorls keeled in middle, sculpture with spiral striae; shells large, exceeding 40 mm in length .....*Turritellidae*  
 Whorls not keeled in middle; sculptured with prominent transpiral ribs; shell smaller in size not exceeding 40mm in length.....*Epitoniidae*
23. Shell broad, dull coloured, not polished; aperture broad, outer lip expanded; columella twisted; operculum rounded, many whorled ..... *Potamididae*

- Shell slender, polished, brightly coloured; aperture narrow, outerlip simple, columella with anterior fold; operculum oval.....*Terebridae*
24. Shell thin, fragile; spire sunken; animal cannot be withdrawn completely within the shell.....*Atryidae*
- Shell thick; spire not sunken; animal can be withdrawn completely within the shell ..  
.....25
25. Shell spindle shape, both spire and siphonal canal long; aperture small in proportion to shell .....26
- Shell not spindle shape; spire and siphonal canal short; aperture large in proportion to shell .....27
26. Outerlip margin with a deep or shallow notch on outerpart; siphonal canal shorter than spire ..... *Turridae*
- Outerlip margin entire; siphonal canal longer than spire ..... *Fasciolaridae*
27. Varices thick and strongly raised; ornamented either with lamellose or foliaceous or with long spines; whorls strongly sculptured.....28
- Varices either absent, or when present feebly developed; whorls either smooth or finely sculptured .....31
28. Posterior canal well developed; varices two on each whorl, continuous along body and spire.....*Bursidae*
- Posterior canal absent; varices two or more in each whorl, but discontinuous .....29
29. Varices two on body whorl, body whorl much inflated, oval in shape; columellar shield well developed; aperture longitudinal..... *Cassidae*
- Varices two or more on each whorl, body whorl not much inflated; aperture being circular or oval, columellar shield less developed or absent.....30
30. Varices two on body and spiral whorls; body whorl rounded; aperture oval; columella wrinkled, outerlip margin thick and toothed.....*Cymatiidae*
- Varices if present, more than two, sculptured with either frilled or lamellose spines; columella not wrinkled; outerlip margin not thick, either dentate or lirate ...*Muricidae*
31. Shell smooth, usually thick; imperforate.....32
- Shell sculptured, either perforate or imperforate.....34
32. Spire prominent; operculum present; outerlip thin and its margin smooth.....33
- Spire concealed in the body whorl; operculum absent; outerlip margin folded and dentate .....*Marginellidae*
33. Shell ovately globose; columella smooth, operculum calcareous..... *Phasianellidae*
- Shell cylindrical, columella folded; operculum usually absent, if present thin and corneous ..... *Olividae*

34. Shell thin, some times fragile; body whorl inflated; spire either low or depressed ...35  
 Shell thick, body whorl not much inflated; spire high.....37
35. Anterior canal long, broadly open; spire very low, sometimes depressed; shell with reticulate sculpture .....*Ficidae*  
 Anterior canal short; spire not depressed and acute; shell sculptured with either axial or spiral ribs and threads in between.....36
36. Shell globose; aperture broad, sculptured with broad flat spiral ribs and threads in between; columella twisted; operculum present in juvenile stage; outerlip simple; siphonal fasciole present.....*Tonnidae*  
 Shell ovoid, sculptured with transpiral ribs; columella smooth without folds; operculum absent; outerlip folded; siphonal fasciole absent .....*Harpidae*
37. Shell cone shape; apex at lower part tapering; aperture narrow, elongate; columella straight, lips parallel..... *Conidae*  
 Shell not cone shape; apex at lower part not tapering; aperture wide; columella curved, lips not parallel.....38
38. Columella smooth .....39  
 Columella either with folds, or plaits or denticles.....44
39. Shell perforate .....40  
 Shell imperforate .....41
40. Shell thin; sculptured with both axial ribs and spiral striae; operculum corneous; funicle absent..... *Vanikoridae*  
 Shell thick, smooth, occasionally with growth striae; umbilicus deep and some times closed by callus; operculum calcareous or horny; funicle present .....*Naticidae*
41. Shell large, elongately fusoid; spire high; siphonal canal distinct .....42  
 Shell small, turbinate; siphonal canal short, sometimes indistinct or absent.....43
42. Whorls rounded; outerlip extended into a wing-like structure with a notch towards anterior part, siphonal canal sometimes drawn to a narrow elongate canal.....  
 .....*Strombidae*  
 Whorls angulate; outerlip without a notch at anterior part nor forming a wing like structure; siphonal canal wide.....*Melongenidae*
43. Columella truncate; aperture with prominent ridge posteriorly, lirate; shell sculptured with spiral grooves, thick.....*Planaxidae*  
 Columella not truncate; aperture without a ridge inside, not lirate; shell sculptured with spiral striae, or with rows of nodules or granules, not thick.....*Littorinidae*
44. Spire low, sometimes depressed; columella wide, flattened, ornamented; aperture semicircular; operculum calcareous, with apophysis inside..... *Neritidae*  
 Spire high; columella not flattened, narrow; aperture not semicircular; operculum either calcareous or horny without apophysis inside.....45

45. Shell smooth, except for growth striae; aperture with ridges or teeth, narrow; outer lip thick, inner lip with folds anteriorly; animals air breathing, gills replaced by lungs.....*Ellobiidae*
- Shell sculptured, rarely smooth, columella either with plications or with pustules; aperture not narrow, without ridges inside; outer lip thin; animals not air breathing, gills present.....46
46. Shell ovate, sculptured with both axial and spiral ridges giving cancellate appearance. ....*Cancellariidae*
- Shell either spindle shape or oblong or fusoid; sculptured with prominent axial ribs and light striae but not cancellate appearance .....47
47. Shell elongately fusoid; columella with three to eight plications; aperture elongate; operculum absent.....48
- Shell ovate or oblong; columella with denticles or sometimes smooth; aperture oval; operculum present.....49
48. Aperture smooth.....*Mitridae*
- Aperture lirate inside.....*Costellariidae*
49. Canal short; columella with denticles above canal; shells polished, not covered by periostracum .....*Nassariidae*
- Canal either short or long, recurved; columella smooth, shell usually covered by periostracum .....*Buccinidae*

#### Class Bivalvia

1. Shell greatly reduced covering only anterior tip of animal; body elongated worm like, posterior end provided with a pair of pallets.....*Teredinidae*
- Shell completely enclosing the animal; body of different shapes but not worm like, without any pallets..... 2
2. Hinge with numerous teeth arranged either in continuous straight line or broken and curved on either side of umbo; muscle scars two, well developed..... 3
- Hinge with not more than five teeth when present or reduced or absent; muscle scars usually two, sometimes reduced to one or even absent..... 8
3. Hinge straight, scarcely arched; teeth arranged in straight line, middle teeth small; shell attached by byssus on ventral margin..... 4
- Hinge arched; teeth of equal size arranged in lateral rows on either side of ligamental pit; animal without byssus ..... 6
4. Byssal gape on ventral margin; muscle scars without shelf on its inner margin.....*Arcidae*
- Byssal gape absent in adult stage; muscle scars with shelf on its inner margin..... 5

5. Teeth more or less similar as in Arcidae; ligament vertically striated.....*Noetiidae*  
 Teeth differentiated into central small ones followed by transverse and divergent towards anterior and posterior margins; ligament with few chevron shaped grooves....  
 ..... *Cucullaeidae*
6. Shell orbicular, large (exceeds 20 mm) sculptured with radial ribs.....*Glycymerididae*  
 Shell ovate or triangular, small (not exceeding 20 mm); surface smooth or concentrically striated..... 7
7. Posterior margin beaked; interior not nacreous; ventral margin smooth.....  
 .....*Nuculanidae*  
 Posterior margin not beaked; interior nacreous; ventral margin crenulate or smooth ...  
 .....*Nuculidae*
8. Anterior adductor scar much reduced or even absent; hinge teeth scarcely developed, when developed either like tubercles or tooth like processes..... 9  
 Anterior adductor scar well developed; hinge teeth well developed and differentiated .17
9. Umbo either terminal or subterminal; shell elongate; hinge dysodont; interior nacreous; animals attached by byssus; anterior muscle scar present ..... *Mytilidae*  
 Umbo centrally placed; ligament with one or two nodules; shell either rounded or irregular in shape or dorso-ventrally produced; anterior muscle scar absent; shell either free or attached by its either valve.....10
10. Shell irregular in shape; attached by left valve or byssus; umbo without wing-like extension.....11  
 Shell regular in shape; either free or attachment by valves; umbo usually with wing-like extensions .....13
11. Lower valve flat with hole, through which byssus passes for attachment, upper valve inflated, nacreous, byssus absent in adult.....*Anomiidae*  
 Lower valve not flat, without hole; byssus absent; attachment by valve only; not nacreous .....12
12. Muscle scar reniform, away from hinge; umbonal groove deep; shell without plications .....*Ostreidae*  
 Muscle scar rounded, close to hinge; umbonal groove shallow with radial plications..  
 .....*Gryphaeidae*
13. Shell highly inaequilateral; equivalve; wings more prominent, unequal; left valve more inflated; interior nacreous.....14  
 Shell less inequilateral, subequivalve; wings less prominent, equal; interior not nacreous.....15
14. Shell not regular in shape, more elongate, dorsoventral; ligament with multiple grooves; pallial line broken into pits; outer surface lamellose; adductor muscle scar single .....*Isognomonidae*

- Shell regular in shape, ovate or suborbiculate; ligament without grooves; pallial sinus continuous; outer surface smooth or radially sculptured; adductor muscle scars two but anterior scar reduced in adult stage, posterior large .....*Pteriidae*
15. Shell thin, higher than long; valves compressed; auricles less prominent; byssal gape well developed, gaping extends downwards along margin ..... *Limidae*
- Shell thick, valves not compressed; auricles prominent; byssal gape less developed; no gaping along margin .....16
16. Shell heavy, inequivalve, gibbose, usually attached by umbonal area by right valve; hinge with two large teeth and corresponding cavities on opposite valve; resilium in deep pit; shell sculptured with irregular spines on both the valves .....*Spondylidae*
- shell light, equivalve; usually free, sometimes attached; hinge without teeth and corresponding cavities; resilial pit shallow; shell either radially ribbed or smooth .....  
.....*Pectinidae*
17. Shell very irregular, very thick; hinge with single cardinal, weak laterals; muscle scar subequal, large; ornamented with flattened spines either concentric or radial sculpture. ....*Chamidae*
- Shell regular; moderately thick or thin; hinge with more than one cardinal, laterals not weak; shell not ornamented with spines .....18
18. Hinge with three cardinals in each valve, laterals feeble or absent .....19
- Hinge with less than three cardinals in each valve, laterals present, rarely absent ....20
19. Shell either trigonal, ovate or rounded, thick; surface either smooth or sculptured; posterior lateral feeble ..... *Veneridae*
- Shell elongate, thin; surface finely striated; covered with periostracum; laterals absent .....*Glauconomidae*
20. Shell strongly sculptured with radial ribs; not gaping .....21
- Shell either smooth or sculptured but not strongly with radial ribs alone; usually gaping .....22
21. Shell equilateral; ovate, oblong or trigonal; hinge with laterals distantly placed; cardinals small, not grooved, margin smooth .....*Cardiidae*
- Shell inequilateral; either cordiform or mytiliform; hinge with laterals rudimentary not distantly placed; cardinals large, grooved; margin crenulate .....*Carditiidae*
22. Shell with internal ligament in a socket behind cardinal; either triangular or ovate ..23
- Shell without internal ligament; hinge normal, without socket .....24
23. Shell triangularly ovate; inflated; ligamental socket triangular; left valve with inverted 'V' shape cardinal, right valve with two cardinals; pallial sinus broadly open ..... *Mactridae*
- Shell oval or rounded; not inflated; ligamental socket elongate and oblique, extended backwards and downwards; cardinal teeth normal; pallial sinus narrowly open .....  
.....*Semelidae*

- 24. Valves equal in size; not fit into other valve.....25  
     Valve not of equal in size, valves some times fits into other .....35
- 25. Shell elongate, subcylindrical or flattened; umbo near terminal or subterminal, gaping at both ends .....26  
     shell less elongate, neither subcylindrical nor flattened; gaping either anterior or posterior ends .....27
- 26. Shell subcylindrical, straight, margins parallel; umbo terminal, anterior and posterior ends truncate; hinge with single tooth in each valve; valves less gap in between .....  
     ..... *Solenidae*  
     Shell flattened, more compressed; margin not straight, umbo subterminal, anterior and posterior ends rounded; hinge with more than one cardinal; valves with wider gap in between .....*Cultellidae*
- 27. Shell more or less wedge shape; umbo placed far behind; oblique keel or angulation runs from umbo to posteroventral part .....*Donacidae*  
     Shell not wedge shape, either elongate, ovate or oblong; keel or angulation absent....  
     .....28
- 28. Anterior part widely gaping; shell some times with accessory plates.....29  
     Anterior part not widely gaping; shell without accessory plates.....30
- 29. Surface sculptured with oblique spinose radial ribs towards anterior part, posterior either smooth or concentrically striated; valves with accessory plates .....*Pholadidae*  
     Surface sculptured with fine concentric striations; accessory plates absent .....  
     .....*Gastrochaenidae*
- 30. Valves inflated; posterior end less gaping; not covered with periostracum; hinge with laterals present, sometimes edentate .....31  
     Valves not inflated, compressed; posterior end generally gaping; covered with thick periostracum; hinge laterals wanted.....*Psammobiidae*
- 31. Anterior and posterior margins truncate; gaping; ligament supported by thin oblique ridge.....*Laternulidae*  
     Anterior and posterior margins not truncate; ligament not supported by ridge.....32
- 32. Shell transverly ovate; umbo anteriorly placed; pallial line entire; hinge narrow, two cardinals in each valve..... *Trapeziidae*  
     Shell either ovate or transversely oblong; umbo not anteriorly placed; hinge not narrow, with two or less cardinals in each valve; pallial line sinuate .....33
- 33. Shell oval or rounded; muscle scars irregular .....34  
     Shell variable in shape; muscle scars regular .....*Galeommatidae*
- 34. Median cardinal bifid, incomplete; anterior muscle scar elongate, posterior large.....  
     ..... *Ungulinidae*

- Median cardinal not bifid; right valve with single strong lateral, left valve with two unequal cardinals, anterior one upward and posterior one downwardly placed, anterior lateral indistinct, posterior strong; muscle scar oval in shape..... *Kelliidae*
35. Shell generally smaller in size (not exceeding 15mm), one valve fits into other .....36  
Shell usually large (exceeds 15mm), valve does not fit into other; some times one valve less inflated than other, pallial sinus large.....*Tellinidae*
36. Shell oblong, much compressed, smooth; hinge toothless, dorsal border of one valve overlapping the other.....*Pandoridae*  
Shell either ovate or trigonal, not compressed, hinge with teeth, dorsal border does not over lap .....37
37. Shell thick, strongly sculptured with concentric ribs; posterior margin not produced ..  
.....*Corbulidae*  
Shell thin, smooth or with fine concentric striations; posterior margin produced in to a beak..... *Cuspidariidae*

#### Class Cephalopoda

1. Shell absent; animal with eight arms of equal size, provided with suckers, base connected by membrane .....*Octopodidae*  
Shell present internally; animal with ten arms, two longer than rest, not connected by membrane at base ..... 2
2. Body wide; flattened; fins narrow, extending entire body; shell calcareous, thick.....  
.....*Sepiidae*  
Body narrow, more or less cylindrical; fins wide, extending; shell chitinous, fragile...  
.....*Loliginidae*

#### SYSTEMATIC ACCOUNT

Class        AMPHINEURA  
Subclass    POLYPLACOPHORA  
Order        NEOLORICATA  
Family I.    ACANTHOCHITONIDAE  
Genus 1.    **Acanthochitona** Gray, 1821

##### 1. *Acanthochitona mahensis* Winckworth

1927. *Acanthochitona mahensis* Winckworth, *Proc.malac.Soc.Lond.*, 17 : 207, pl.29, figs 9-10 (Type locality: Chombala nr.Mahe, S.India)

1976. *Acanthochitona mahensis*: Rajagopal and Subba Rao, *J.mar. biol.Ass.India*, 16( 2): 401.

*Material examined* : Ganjam district: 3 exs., Gopalpur, coll.G.R.K., 29.xi.1962; 13 exs., nr.light house, Gopalpur, coll.V.K.P.,15.ii.1972.

*Measurements* : L 6.90 17.65; D. 3.92 9.90.



**Distribution** : India : Orissa (as above); Andhra Pradesh: Waltair; Tamil Nadu: Gulf of Mannar; Pondicherry : Mahe (Type locality), Andaman and Nicobar Islands. Elsewhere : Sri Lanka.

**Remarks** : Animal small, not more than 18mm in length; elongately ovate; encircled by a girdle with eighteen rounded pockets bearing tufts of bristles, brown in colour : valves sculptured with radiating ridges on lateral side, middle part smooth.

Class        GASTROPODA  
 Subclass    PROSOBRANCHIA  
 Order        ARCHAEOGASTROPODA  
 Family II.   FISSURELLIDAE  
 Genus 2.    *Diodora* Gray, 1821

### 2. *Diodora bombayana* (Sowerby)

1862. *Fissurella bombayana* Sowerby, *Thes. Conchyl.*, 3 : 196.

1928. *Diodora bombayana* : Melvill, *Proc. malac. Soc. Lond.*, 18 : 96.

1961. *Diodora bombayana* : Menon, Dattagupta and Dasgupta, *J. Bombay nat. Hist. Soc.*, 58 (2) : 475.

**Material examined** : Ganjam district : 1 ex. S. of light house, Gopalpur, coll.V.K.P., Puri district : 2 exs., Puri, No data; 1 ex. Panth Nivas, Puri, coll. GRK, 9.2.1975.

**Measurements** : L. 15.95 - 24.90; D. 11.61 - 18.44; Ht. 6.10 - 8.63.

**Distribution** : India : Orissa (as above); Tamil Nadu : Krusadai Island; Goa; Maharashtra : Bombay; Gujarat : Pirotan Island. Elsewhere Iran : Makran coast; Pakistan : Karachi; Jashak; Burma : Arakan.

**Remarks** : Shell oval in shape; aperture subcentral, oval; distinguished by the presence of secondary ribs in between main radial ribs, reticulate; ventral margin crenulate; shell with seven to eight broad brown rays extending from apex to ventral margin.

Family III. PATELLIDAE

Genus 3. *Cellana* H.Adams, 1869

### 3. *Cellana radiata radiata* (Born)

1778. *Patella radiata* Bom, *Index Rerum Naturalium Caesarei Vindobonensis*, pt. 1 : 443, pl.18,fig.10 (Type locality : 'In Africa, stadius Muller; in Indiis, Davalia').

1973. *Cellana radiata radiata* : Powell, *Indo-Pacif. Mollusca*, 3 (15) : 149, pl.67,figs.8,9; pl.120.

1978. *Cellana radiata radiata* : Rajagopal and Mookherjee, *Rec. zool. Surv. India, Occ.Pap.*, 12 : 14.

**Material examined** : Ganjam district : 29 exs. Gopalpur, coll.G.R.K.; 135 exs., Gopalpur, coll.V.K.P.,18.iii.1973.

**Measurements** : L. 15.95 23.52; D. 12.40 18.55; Ht. 3.95 7.20.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Bhimilipatnam, Waltair; Tamil Nadu : Mandapam, Tuticorin, Tranquebar; Kerala : Cochin; Maharashtra; Bombay : Andamans. Elsewhere : Seychelles : Mahe; Sri Lanka; Burma : Mergui Archipelago; Philippines; Australia : Queensland.

**Remarks** : Commonly occurs on intertidal rocks. Shell shows variations in colour, shape etc. and hence the species was described under different names. Powell (1973) gave details of its synonymy, description and habitat.

## Family IV. TROCHIDAE

## Key to genera

1. Shell orbicular, small; umbilicus deep, wide ..... *Solariella*  
Shell conical, large, umbilicus not deep, small, sometimes covered by callous deposit..... 2
2. Shell button shape; spire depressed, umbilicus closed; aperture without tooth; highly polished, exhibiting polymorphism..... *Umbonium*  
Shell conical, spire elevated, whorls rounded; umbilicus open; aperture with tooth on its inner lip..... *Euchelus*

Genus 4. *Euchelus* Philippi, 1847

(Pl. I, fig. 7)

4. *Euchelus alabastrum* Reeve

1857. *Trochus (Euchele) alabastrum* Reeve, *Proc.zool.Soc.Lond.* 1857 : 209 (Type locality : Island of Diego Garcia, a dependency of the Mauritius).

*Material examined* : Puri district : 3 exs. Puri, coll. No data.

*Measurements* : L - 4.21 - 19.25; D. 4.65 - 18.30; HS. 29.30 - 11.90.

*Distribution* : India : Orissa (as above); Tamil Nadu : Pondicherry. Elsewhere : Malaysia : Penang.

*Remarks* : Shell can be distinguished by the presence of prominent carinate ridges on whorls, three on spiral whorls and eight on body whorl, first four well spaced, rest close at base, beaded appearance, interspersed with scaly striations; aperture ovate; interior lirate, iridescent; colour creamy white with dark brown blotches on ridges. This species is reported for the first time from India.

5. *Euchelus horridus* (Philippi)

1846. *Trochus horridus* Philippi, *Conchyl.Cab.*, 2 (2 & 3), sp. 207 : 172, pl.27, fig.12 (Type locality : Pacific Ocean).

1978. *Euchelus horridus* : Rajagopal and Mookherjee, *Rec.zool. Surv.India, Occ.Pap.* 12 : 18.

*Material examined* : Ganjam district : 2 exs. Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 5.75 - 5.49; D. 6.15 - 4.55; HS. 4.95 - 3.82\* (\*spire broken)

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pulli Island, Hare Island, Tuticorin; Maharashtra : Bombay. Elsewhere : Mediterranean; Indo Pacific.

*Remarks* : Shell small, globosely conoidal; umbilicate; sculptured with spiral ridges. The species seems to be similar to young shells of *E.asper* (Gmelin). Rajagopal and Mookherjee (1978) pointed out that "they do not seem to attain to the original size of *E. asper*. One of the specimens has a broken spire and coat of bryozoans.

Genus 5. *Umbonium* Link, 18076. *Umbonium vestiarius* (Linnaeus)

1758. *Trochus vestiarius* Linnaeus, *Syst.Nat.*, 3d. 10: 758, sp. 515 (Type locality : "M. Mediterranes, Asiatico, Chinensis").

1915. *Umbonium vestiarius* : Preston, *Rec. Indian Mus.*, 11 : 297.  
 1916. *Umbonium vestiarius* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 343.  
 1978. *Umbonium vestiarius* : Rajagopal and Mookherjee, *Rec.zool. Surv.India, Occ.Pap.* 12: 29.

*Material examined* : Cuttack district : 92 exs., Khira Gachha Madeli nr. Cuttack. coll. G.R.K., 10 & 11.xi.1962; 13 exs. coll. N.V.S.R., 1 & 2.iii.1964; 18 exs. Lions' Rump, coll. B.P., 8.vi.1938; 16 exs., coll. M.C. & G.R.K. 19.20.ii.1948; 50 exs., coll. V.K.P., 8.ii.1972 & 14.iii.1973; 3 exs. Chilka Lake; 83 exs. Konarak, coll. G.R.K., 18-20.xi.1962. Ganjam district : 5 exs. Gopalpur, coll. G.R.K., 29.xi.1962; 5 exs. coll. V.K.P., 9.ii.1972 & 28.i.1973; 14 exs. Chatrapur, coll. G.R.K., 24.xi. 1962.

*Measurements* : L. 6.08 - 9.80; D. 9.75 - 15.19.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Pulicate lake; Tamil Nadu : Madras, Porto Novo, Mandapam, Krusadai Island, Tuticorin; Pondicherry : Karikkal; Kerala : Cochin; Goa; Maharashtra : Bassei, Bombay; Gujarat. Common in sandy beaches near river mouths. Elsewhere : Mediterranean; IndoPacific.

*Remarks* : Commonly known as button shell, occurs in shallow beaches on sandy coast near river mouths and backwaters on both the coasts of India. It exhibits polymorphism. Shells used as ornaments.

#### Genus 6. *Solariella* Wood, 1842

##### 7. *Solariella (Solariella) satparaensis* Preston

(Pl. I, figs. 1-4)

1914. *Solariella satparaensis* Preston, *Rec. Indian Mus.*, 10 : 302, figs. 11, 11a-b (Type locality : Off Satpara Island, Chilka Lake).  
 1916. *Solariella Satparaensis* : Annandale and Kemp, *Mem. Indian Mus.* 5 : 348.  
 1968. *Solariella utkalensis* Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 16, text fig. 2 (Type locality : Off Puri, Orissa coast).

*Material examined* : Puri district : 1 ex. Off Satpara Island, Chilka Lake (Holotype); 4 exs. (Cotypes), coll. N.A., 17.ix.1913; 4 exs. Off Puri, coll. S.W.K. (Holotype and Paratypes of *S. utkalensis*).

*Measurements* : L. 2.02 - 3.66; D. 3.10 - 4.65 (*S. satparaensis*)

L. 4.55; D. 5.45 (*Holotype, S. utkalensis*)

L. 2..60; D. 3.05 (*Holotype of S. satparaensis*)

*Distribution* : India : Orissa (as above); Kerala; Cochin, Calicut; Maharashtra : Bombay. Elsewhere: Malaysia : Penang.

*Remarks* : Shell small, turbinate, umbilicus bordered by beaded ridge; aperture subquadrate, shining blueish grey colour.

The species, *S. utkalensis* Ray, 1968 very closely agrees in its nature of whorls, suture, umbilicus, aperture, columella and even peristome with *S. satparaensis* Preston except in size. After examining the types we are of the opinion that *S. utkalensis* are probably the young ones of *S. satparaensis*. Annandale and Kemp (1916) mentioned, "this species occurs throughout the year in the outer channel of Chilka lake in the vicinity of Satpara and Berhampur but is rather scarce."

#### Family V. CYCLOSTREMATIDAE

The family includes three species under three genera represented from Orissa.

## Key to genera

1. Shell strongly sculptured; umbilicus open. .... 2  
Shell smooth, glossy; umbilicus partly concealed by columellar fold.. *Leucorhynchia*
2. Shell lenticular, whorls angulate..... *Cyclostrema*  
Shell conical; whorls rounded..... *Tubiola*

Genus 7. *Cyclostrema* Marryat, 18188. *Cyclostrema eburnea* Nevill

(Pl. I, figs. 5, 6)

1875. *Cyclostrema eburnea*, Nevill, *J.Asiat.Soc.Beng.*, 44(2) : 101, pls.8, figs. 21-22 (Type locality : 'Pooree', Bay of Bengal).

*Material examined* : Puri district : 2 exs. Puri (Syntypes), coll. No data.

*Measurements* : L. 2.35; D. 4.56 (Lectotype); L.2.20; D.4.15 (Paralectotype).

*Distribution* : India : Known only from type locality i.e. Puri.

*Remarks* : Nevill (1875) gave a detailed description of the species and mentioned it as rare. There are no subsequent reports. One of the shell studied agrees with the description, figure and measurements given by Nevill (1875). Nevill never selected a holotype, however he gave the measurements for one of the specimens. We take this opportunity to designate the lectotype.

Genus 8. *Tubiola* A.Adams, 18639. *Tubiola microscopica* (Nevill)

1877. *Valvata* (?) *microscopica* Nevill, *Catalogue of Mollusca in the Indian Museum* : 21 (Type locality : Port Canning).

1915. *Cyclostrema (Tubiola) innocens* Preston, *Rec.Indian Mus.*, 11: 296, figs. 9, 9a, 9b (Type locality : Serua Nadi, 1-3 M, Chilka lake).

1916. *Cyclostrema (Tubiola) innocens* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 347, fig. 3 (Nevill's cotype).

1924. *Tubiola microscopica* : Annandale and Kemp, *Mem. Indian Mus.*, 5: 858

*Material examined* : Puri district : 1 ex. Serua Nadi, Chilka Lake, (Type).

*Measurements* : L. 0.82; D. 2.38 (Type of *Cyclostrema (Tubiola) innocens* Preston).

*Distribution* : India : Orissa (as above); West Bengal : Port Canning only.

*Remarks* : Annandale and Kemp (1916) stated "Nevill's *microscopica* may belong to *Cyclostrema (Tubiola) innocens* Preston described from Chilka Lake and Preston's type differs from Nevill's species in being smaller in size, reddish colour on its surface. Preston's type is bleached and perhaps somewhat eroded."

Annandale (1924) while revising the gastropod fauna of Chilka lake justified in keeping this species under the genus *Tubiola* after observing its operculum which was horny, circular, thick and apparently multispiral. True Valvatidae does not occur in the Oriental region.

Genus 9. **Leucorhynchia** Crosse, 1867

10. ***Leucorhynchia variegata*** (Preston)

(Pl. I, figs. 8, 9)

1914. *Tinostoma variegata* Preston, *Rec.Indian Mus.*, 10 : 302, figs.6,6a-b (Type locality : Manikpatna, Lake Chilka, at depth of 1.2 M).  
 1916. *Tinostoma variegatum* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 348.  
 1924. *Tinostoma variegata* : Annandale, *Mem.Indian Mus.*, 5 : 858.

*Material examined* : Puri district : 1 ex. Manikpatna, Chilka lake (Holotype).

*Measurements* : L. 0.75; D. 1.75.

*Distribution* : India : orissa (as above), known only from Type locality.

*Remarks* : In Preston's (1914) paper the name of the genus was inadvertently printed as *Tinostoma*, and the same was repeated by Annandale and Kemp (1916). According to Brookes Knight et al.(1960) *Teinostoma* H. & A. Adams (= *Tinostoma* Preston) is included in the family Vitrenellidae and the species *T.variegata* is transferred to the genus *Leucorhynchia* Crosse.

Family VI. PHASIANELLIDAE

Genus 10. **Tricolia** Risso, 1826

11. ***Tricolia indica*** Winckworth

(Pl. II, figs. 2,3)

1940. *Tricolia indica* Winckworth, *Proc.malac. Soc.Lond.*, 24(2) : 41, fig.1 (Type locality : Madras).  
 1942. *Phasianella (Tricolia) indica* : Gravely, *Bull.Madras Govt. Mus. new Ser.*, 5 (2) : 18, fig.2b.  
 1985. *Tricolia indica* : Robertson, *Monogr. Marine Molusca*, 3 : 53, pls., 33-37.

*Material examined* : Puri district : 9 exs. Puri.

*Measurements* : L. 3.82 4.40; W. 2.40 3.00.

*Distribution* : India : orissa (as above); Maharastra : Bombay; Kerala : Cochin; Tamil Nadu : Madras. Elsewhere : Sri Lanka; Malaysia : Penang.

*Remarks* : Shell small, ovate; columella perforated, smooth; operculum convex externally. This species which was recorded earlier from Madras is now reported for the first time from Orissa.

Family VII. NERITIDAE

The family includes eight species and four genera from Orissa.

*Key to genera*

1. Shell usually thick, large; strongly sculptured ..... 2  
 Shell not thick, small; mildly sculptured..... 3
2. Spire short; columella straight.....*Nerita*  
 Spire strongly elevated; columella sinuate..... *Pseudonerita*
3. Shell obliquely oval; columella smooth; shell not ornamented with spines .....  
 ..... *Smaragdia*

Shell globose; columella finely dentate; shell sometimes ornamented with spines .....  
 .....*Clithon*

Genus 11. *Nerita* Linnaeus, 1758

Subgenus *Amphinerita* von Martens, 1889

12. *Nerita (Amphinerita) articulata* Gould

1847. *Nerita articulata* Gould, *Proc. Boston Soc. nat. Hist.*, 2 : 220 (Type locality : Tavoy, Burma).

1974. *Nerita (Nerita) articulata* : Brandt, *Arch. Moll.* : 105, pl.1, fig.1.

1975. *Nerita lineata* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed. Natarajan) : 167.

*Material examined* : Baleshwar district : 1 ex. Kasafal nr. Chandipur, coll., V.K.P., 23.i.1972;  
 Cuttack district : 33 exs. Hukitola, coll., N.V.S.R., 17.iii.1964.

*Measurements* : L.14.20 - 33 - 95; D.15.10 - 32.80.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning, Sunderbans, Ganga Sagar, Matlah River, Namkhana, Digha, Frazergunj; Andaman and Nicobar Islands. Elsewhere : Western Australia, Polynesia north to Philippines.

*Remarks* : Generally occurs on the roots and branches of mangrove vegetation. This species has been recorded earlier as *N. lineata* Gmelin, 1791 which is a junior homonym of *N. lineata* Muller, 1774. Hence *N. articulata* Gould, 1847 is proposed by Mienis (1973) as a replacement name.

Subgenus *Theliostyla* Moerch, 1852

13. *Nerita (Theliostyla) albicilla* Linnaeus,

(Pl. II, fig. 1)

1758. *Nerita albicilla* Linnaeus, *Syst. Nat.*, ed. 10 : 778, sp. 640, (Type locality : 'Ad Hitoe')

1975. *Nerita (Theliostyla) albicilla* : Subba Rao, *Studies on Indian Neritids (Mollusca : Gastropoda : Neritidae)* Ph.D, Thesis, Calcutta University : 42, pl.2, figs.1-4; pl.17, fig.4; pl. 35, fig.1.

*Material examined* : Cuttack district : 9 exs., Paradip, coll.S.K.Misra, 6-9.v.1984.

*Measurements* : L.10.86 - 20.64; D.11.68 - 25.20.

*Distribution* : India : orissa (as above); Andhra Pradesh: Bhimilipatnam, Visakhapatnam; Tamil Nadu; Madras, Krusadai Island, Pulli Island, Porto Novo, Tuticorin, Tranquebar, Capecomorin; Kerala : Cochin; Goa; Maharashtra : Bombay; Gujarat : Hanumandandi, Balapur, Porbandar, Mandvi; Andaman and Nicobar Islands. Elsewhere : Widely distributed in Indo Pacific region, from Africa to Red sea and to Australia and Polynesia to Japan.

*Remarks* : Usually found on rocky beaches. in the intertidal region in shady and damp places. Shells thick; columella, flat, and broad, sculptured with fine granules. Colour variable, densely maculated or blotched.

14. *Nerita (Theliostyla) chamaeleon* Linnaeus

(Pl. II, fig. 5)

1758. *Nerita chamaeleon* Linnaeus, *Syst. Nat.*, ed. 10 : 779, sp. 644 (Type locality : 'O, Asiae as bandam').

1978. *Nerita (Theliostyla) chamaeleon* : Rajagopal and Mookherjee, *Rec. zool. Surv. India*, Occ. Pap. 12 : 40.

*Material examined* : Cuttack district : 2 exs. Paradip, coll.B.V.P.; 8 exs. Paradip, coll.S.K.M., 9.v.1984.

*Measurements* : L.12.20 - 16.72; D. 12.75 - 19.58.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Pamban, Tuticorin; Maharashtra : Devgad; Andaman and Nicobar islands. Elsewhere : East Africa; Burma : Akyab, Mergui Archipelago; Singapore; Indonesia to Polynesia.

**Remarks** : This species also occurs in the same habitat as that of preceding species, highly variable in colouration, closely similar to *N. squamulata* but differs in having elevated spire.

### 15. *Nerita (Theliostyla) squamulata* Le Guillou

(Pl. II, fig. 4)

1841. *Nerita squamulata* Le Guillou, *Revue Zool.Soc.Cuvier* : 344, (Type locality : Not given).

1975. *Nerita (Theliostyla) squamulata* : Subba Rao, *Studies on Indian Neritids (Mollusca : Gastropoda : Neritidae)*, Ph.D., Thesis, Calcutta University : 66, pl.7, figs.1-3; pl.17, fig.2

1976. *Nerita (Theliostyla) squamulata* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 50, pl.11, figs 6-6a.

**Material examined** : Cuttack district : 4 exs. Paradip, coll.B.V.P.

**Distribution** : India : Orissa (as above); Tamil Nadu : Krusadai Island; Andaman and Nicobar Islands.

**Remarks** : This species has been often confused with preceding one and even synonymised. It can be distinguished from *N.chamaeleon* in having scaly sculpture which is not uniform; and a depressed spire.

## Genus 12. *Neritina* Lamarck, 1816

### Subgenus *Dostia* Gray, 1840

### 16. *Neritina (Dostia) violacea* (Gmelin)

1791. *Nerita violacea* Gmelin, *Syst.Nat.*, ed. 13 : 3686, sp.68 (Type locality : Not given).

1975. *Neritina violacea* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed. Natarajan) : 166.

1978. *Neritina (Dostia) violacea* : Rajagopal and Mookherjee, *Rec. zool. Surv. India, Occ. Pap.* 12 : 44.

**Material examined** : Cuttack district : 6 exs. Khiragachha Madeli, coll.N.V.S.R., 26-29.ii.1964 & 23.iii.1964; 6 exs. Paradip, coll.V.K.P., 30.i.1972.

**Measurements** : L. 3.28 - 9.75; D. 8.05 - 12.79.

**Distribution** : India : Orissa (as above) : West Bengal : Port Canning, Calcutta; Andhra Pradesh : Kakinada, Godavary and Krishna estuaries; Tamil Nadu : Porto Novo, Killai estuary; Kerala : Cochin backwaters; Karnataka : Netravati rivermouth nr. Mangalore, Kumta, Kodibag nr. Karwar; Goa; Maharashtra; Ratnagiri; Andaman and Nicobar Islands. Elsewhere : Burma : Mergui Archipelago; Malaysia; Philippines; China; Japan.

**Remarks** : A very common mollusc of Indian estuaries and backwaters.

## Genus 13. *Pseudonerita* Baker, 1923

### 17. *Pseudonerita sulculosa* (von Martens)

1879. *Neritina sulculosa* von Martens, in *Martini and Chemnitz's Syst.Conch.Cab.*, 2 (10) : 69, 136, 278, pl.8, fig.23-26.

1975. *Pseudonerita sulculosa* : Subba Rao, *Studies on Indian Neritids (Mollusca : Gastropoda : Neritidae)*, Ph.D., Thesis, Calcutta University : 205, pl.30, figs.1-2.

**Material examined** : Cuttack district : 11 exs. Lions' Rump, coll.N.V.S.R., 4.iii.1964; 6 exs. Khira Gachha madeli, coll.N.V.S.R., 26-28.ii.1964; 22 exs. Paradip port, coll. N.V.S.R., 6-21.iii.1964; 43 exs. False Point, coll. N.V.S.R., 13-14.iii.1964.

**Measurements** : L. 3.70 - 7.85; D. 2.80 - 5.15.

**Distribution** : India : Orissa (as above); West Bengal : Port Canning. Elsewhere ; Indonesia : Celebes, Flores.

**Remarks** : Generally found in estuaries adhering to wood, inside its bark and sometimes in empty tunnels of shipworms. This species closely resembles *P.obtusa* in shape, but differs from it in having more projected spire, strong spiral striae, broad outer lip and aperture bluish gray in colour.

Subfamily SMARAGDINAE

Genus 14. **Smaragdia** Issel, 1869

Subgenus **Smaragdella** Baker, 1923

18. ***Smaragdia (Smaragdella) mamilla*** Annandale

(Pl. III, figs. 3,4)

1924. *Smaragdia mamilla* Annandale, *Mem.Indian Mus.*, 5 : 860, figs. 3 & 4 (Type locality : Outer channel of Chilka lake).

1975. *Smaragdia mamilla* : Subba Rao, *Studies on Indian Neritids (Mollusca : Gastropoda : Neritidae)*, Ph.D., thesis, Calcutta University : 241, pl.9, figs.3,4.

**Material examined** : Puri district : 1 ex. Seruanadi, lake Chilka (Holotype); 9 exs. Chilka lake.

**Measurements** : L.3.10 - 4.23; D. 2.40 - 3.20; HA.2.23 - 2.72. Holotype L. 5.30; W.3.5; H.A.2.60.

**Distribution** : India – known from Chilka lake only.

**Remarks** : No collection was made after its original discovery from Chilka lake. Preston (1915) originally identified these shells as *Neritina souverbiana* Montrouzieri and this was accepted by Annandale and Kemp (1916) p.347. in their report on Chilka lake molluscs. Annandale (1924) while revising the gastropods of Chilka lake described it as a new species. Annandale and Kemp (1916) remarked this species as 'common near Mahosa in the freshwater season, living among weeds.' But it is a marine species found in outer channel of the lake.

Genus 15. **Clithon** Montfort, 1910

19. ***Clithon oualaniensis*** (Lesson)

(Pl. III, figs. 1,2)

1831. *Neritina oualaniensis* Lesson, *Voy.Coquille.zool.*, 2 (1) : 379 (Type locality : Oulan, Fiji).

1978. *Clithon oualaniensis* : Rajagopal and Mookherjee, *Rec, zool. Surv. India, Occ. Pap*, 12 : 43.

**Material examined** : Puri district : 152 exs. Kushabhadra river mouth near Konarak, coll.N.V.S.R., 2.xii.1977; 1160 exs., Arakuda village at Chilka Lake, coll.N.V.S.R., 25.xii.1977; 47 exs. Brahmagiri near Arakuda village, coll.C.A.N.R.,21.ii.1984; Ganjam district : 516 exs. Gopalpur, coll. N.V.S.R., 29.xii.1977.

**Measurements** : L.5.39 - 8.15; D. 5.92 - 7.60.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Bhimilipatnam, Godavary estuary; Tamil Nadu : Vellar estuary, nr.Porto Novo, Mandapam, Rameswaram, Kundugal point; Kerala : Quilon; Karnataka : Netravati river mouth nr. Mangalore, Murdeswar, Kodibag; Andaman and Nicobar Islands. Elsewhere : Sri Lanka; Thailand; Indonesia : Java, Sumatra, extends to Polynesia.



*Remarks* : This species usually found in brakishwater near river mouths in shady places either on mud flats or on sandy patches. Smaller in size exhibiting polymorphism.

One of us (N.V.S.R.) collected samples of this species from different localities on the Orissa coast (population, 38,39 and 40-Gruneberg, 1979). In Kushabhadra river mouth the snails were collected on a substratum which consisted of sandy mud with creeper grass extending over the exposed area and there was a seepage of ground water in the area east of Ramchandi temple near Konarak. The substratum was sandy and water was very clear. In Chilka Lake near Arakuda village, the snails were collected from eel grass on the mud flat exposed during low tide. In Rushikulya estuary near Gopalpur the samples were collected from the surface of the thick mattress of filamentous algae growing on a muddy substratum. *Cerithidea cingulata* was also found to occur in the same area along with *Clithon oualaniensis*.

Order MESOGASTROPODA

Family VIII. LITTORINIDAE

The family includes four species under two genera from Orissa.

*Key to genera*

Shell large, sculptured with spiral striae; spire more than half the length of body whorl..... *Littorina*

Shell small, sculptured with rows of nodules; spire short..... *Nodilittorina*

Genus 16. *Littorina* Ferussac, 1822

Subgenus *Littoraria* Griffith & Pidgeon, 1834

20. *Littorina (Littoraria) undulata* Gray

1839. *Littorina undulata* Gray, *The Zoology of Captain Beecheys Voyage in HMS Blossom Mollusks* : 140 (Type locality : Okinawa, Ryukyu Island, designated by Rosewater, 1970).  
 1970. *Littorina (Littoraria) undulata* : Rosewater, *Indo-Pacif. Mollusca*, 2 (11) : 436, pls., 325, 332, 333.  
 1975. *Littorina undulata* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed. Natarajan) : 167.

*Material examined* : Cuttack district : 2 exs. Hukitola, coll.N.V.S.R., 17.iii.1964; 2 exs. Paradip port, coll.S.N.M.,21.v.1984.

*Measurements* : L. 8.44 19.30; D. 5.70 11.04.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pamban, Krusadai Island, Mandapam, Tuticorin, Tranquebar, Tiruchendur, Capecomorin; Kerala : Cochin; Karnataka : Kumta nr. Karwar; Goa; Gujarat : Gulf of Kutch; Andaman and Nicobar Islands; Lakshadweep. Elsewhere : Taiwan; Philippines; Indo Pacific.

*Remarks* : Shells of this species thick with weak spiral striae; columella with violet colour; shell with brown undulate markings. Usually found in rocky intertidal region remaining in clusters during day and active during night.

Subgenus *Littorinopsis* Moerch, 187621. *Littorina (Littorinopsis) scabra scabra* (Linnaeus)

1758. *Helix scabra* Linnaeus, *Syst. Nat.*, ed. 10 : 770 (Type locality : Amboina, Moluccas, Lectotype designated by Rosewater, 1970)
1970. *Littorina (Littorinopsis) scabra scabra* : Rosewater, *Indo-Pacif. Mollusca*, 2 (11) : 456, pls. 325, figs. 1-4; pls. 352, 353
1975. *Littorina scabra* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology* (ed. Natarajan) : 166.
1982. *Littorina (Littorinopsis) scabra scabra* : Rajagopal and Mookherjee, *Rec. zool. Surv. India, Occ. Pap.*, 28 : 9.

**Material examined** : Cuttack district : 101 exs. Jetty nr, Lions' Rump, coll.N.V.S.R., 10.iii.1964; 273 exs. Hukitola, coll.N.V.S.R., 17.iii.1964. Ganjam district : 2 exs. Chatapur, coll.G.R.K., 24.xi.1962.

**Measurements** : L. 14.10 - 15.75; D. 9.20 - 9.40.

**Distribution** : India : Orissa (as above); West Bengal : Port Canning; Tamil nadu : Madras, Gulf of Mannar, Tuticorin; Kerala : Cochin; Karnataka : Mangalore; Goa; Maharashtra : Bombay; Andamans. Elsewhere : Very common throughout Indo Pacific.

**Remarks** : Rosewater (1970) gave detailed description of this species. It commonly occurs in the crevices in intertidal region. Gravely (1942) states that 'this species prefers stems and leaves of mangrove vegetation in backwaters and estuaries.'

Subba Rao and Mookherjee (1975) recorded this from Hukitola in Mahanadi estuary.

22. *Littorina (Littorinopsis) melanostoma* Gray

1839. *Littorina melanostoma* Gray, *Zoology of Captain Beechys 'Voyage H.M.S. Blossom, Mollusks* : 140 (Type locality : Indian Ocean, Penang, Malaysia).
1970. *Littorina (Littorinopsis) melanostoma* : Rosewater, *Indo-Pacific. Mollusca*, 2 (11) : 462, pl.325, figs.28-29; pl. 355, figs. 1-4.
1982. *Littorina (Littorinopsis) melanostoma* : Rajagopal and Mookherjee, *Rec. zool. Surv. India Occ. Pap.*, 28 : 11.

**Material examined** : Cuttack district : 1 ex. Khira Gachha Madeli, coll.G.R.K., 11.xi.1962; 4 exs. Khira Gaccha Madeli, coll.N.V.S.R., 26-29.ii.1964; 20 exs. Hukitola, coll. N.V.S.P. 17.iii.1964.

**Distribution** : India : Orissa (as above); West Bengal : Port Canning, Matla, Ganga Sagar, Muriganga estuary in Sunderbans; Andhra Pradesh : Godavary estuary; Tamil Nadu : Mandapam, Pulli Island. Elsewhere : Sri Lanka; Burma : Mergui Archipelago, Akyab; Singapore; Philippines.

**Remarks** : This species usually found clinging to the branches and leaves of mangrove plants in the estuaries; yellowish white in colour with brown longitudinal markings between spiral striae arranged axially; body flattened, weakly keeled; spiral tip black.

Subba Rao and Mookherje (1975) recorded this species from Mahanadi estuary.

Genus 17. *Nodilittorina* von Martens, 1897Subgenus *Nodilittorina* s.s23. *Nodilittorina (Nodilittorina) pyramidalis pyramidalis* (Quoy & Gaimard)

(Pl. III, figs. 5,6)

1833. *Littorina pyramidalis* Quoy and Gaimard, *Voyage d L'Astrolabe, Zoolgie*, 2 : 482, pl.33, figs. 12-15. (Type locality : Jerves Bay, New South Wales, Australia).

1970. *Nodilittorina (Nodilittorina) pyramidalis pyramidalis* : Rosewater, *Indo-Pacif. Mollusca*, 2(11) : 481, pl.325, figs. 24-25; pl.326, figs.9,11; pl.370,371.  
 1982. *Nodilittorina (Nodilittorina) pyramidalis pyramidalis* : Rajagopal and Mookherjee, *Rec.zool.Surv. India Occ. Pap.*, 28 : 12.

*Material examined* : Cuttack district : 8 exs. Paradip, coll.S.N.M., 21.v.1984.

*Measurements* : L. 9.75 - 12.55; D. 6.94 - 7.19.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Bhimilipatnam, Visakhapatnam; Tamil Nadu : Mandapam, Rameswaram, Tiruchendur, Tuticorin, Tranquebar, Capecomorin; Karnataka : Kumta nr. Karwar; Goa; Maharashtra : Bombay. Elsewhere - Pakistan; Sri Lanka; Burma; Malaysia; Penang; Thailand; Vietnam; China; Philippines; New South Wales; New Guinea.

*Remarks* : This species can be distinguished by the presence of rows of nodules on the whorls; shells smaller in size; found in the crevices of rocks in the intertidal region.

Family IX. IRAVADIIDAE

Genus 18. *Iravadia* Blanford, 1867

24. *Iravadia ornata* Blanford

1867. *Iravadia ornata* Blanford, *J.Asiat.Soc.Beng.*, 36 (1) : 56, pl.13, figs. 13, 14 (Type locality : Irawady delta).

1975. *Iravadia ornata* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed. Natarajan) 168.

*Material examined* : Cuttack district : 7 exs. False Point, coll.N.V.S.R., 14.ii. 1964.

*Measurements* : L. 3.45-5.80; D. 2.05-2.95.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning. Elsewhere : Burma : Irawady delta.

*Remarks* : Adequate description was given by Blanford (1867). It Occurs under stones in creeks. Subba Rao and Mookherjee (1975) collected it from the bark of wood in the jetty near light house at False Point.

Family X. PLANAXIDAE

Genus 19. *Planaxis* Lamarck. 1822

25. *Planaxis nigra* Quoy and Gaimard

(Pl. IV, fig. 1)

1833. *Planaxis nigra* Quoy and Gaimard, *Voyage de decouvertes de l'Astrolabe, Zool. Moll.*, 2 : 491.

1848. *Planaxis acutus* Krauss, *Sudafrikanischen Mollusken* : 103, pl. 6, fig 2 (Type locality : Natal).

1952. *Planaxis acutus* : Subrahmanyam, Karandikar, and Murti, *J. Univ. Bombay*, 21 (3) : 33, fig. 41.

1972. *Planaxis niger* : Cernohorsky, *Marine shells of the Pacific*, 2, 59, pl. 12, fig. 19.

*Material examined* : Cuttack district : 5 exs. Paradip Port, coll. S.N.M., 21.v.1984.

*Measurements* : L. 9.20 - 9.89; D. 5.14 - 5.80; H.S. 6.02 - 6.28.

*Distribution* : India : Orissa (as above); Maharashtra : Bombay; Andamans. Elsewhere Mauritius; Bourbon, Sri Lanka.

*Remarks* : Generally found among rocks and boulders in the crevices in clusters along with littorinids (Subrahmanyam et al.1952). This species varies much in size, and shows tendency to subangulation at the periphery (Nevill, 1884).

## Family XI. ARCHITECTONICIDAE

Commonly known as 'Sun Dial' shells, found in intertidal region on sandy shores. Empty shells usually found washed ashore.

## Subfamily ARCHITECTONICINAE

Genus 20. *Architectonica* (Bolten) Roeding, 179826. *Architectonica laevigata* (Lamarck)

1822. *Solarium laevigatum* Lamarck, *Hist.nat.Anim.sans vert.*, 7 : 3.

1982. *Architectonica laevigata*, Rajagopal and Mookherjee, *Rec.zool.Surv.India Occ.Pap.* 28 : 21.

*Material examined* : Cuttack district : 1 ex. Khira Gachha Madeli, coll.G.R.K., 10.xi. 1962. Puri district : 1 ex. Chandrabhaga marine drive nr.Konarak, coll.V.K.P., 11.ii.1972; Ganjam district : 1 ex. Gopalpur, coll.V.K.P.,30.iii.1973.

*Measurements* : L. 7.82 - 12.90; D. 15.15 - 24.95.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Karaikal, Porto Novo, Pondicherry : Kundugal point, Nagapattinam, Tranquebar; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Persian Gulf; Burma : Maungmagan.

*Remarks* : This species can be distinguished from another species viz. *A.perspectiva*, commonly found along with it in having four grooves followed by deep suture; umbilicus bordered by beaded margin with two grooves; brown blotches below suture.

## Family XII. TURRITELLIDAE

Commonly known as 'screw shells or turret shells', Empty shells found washed ashore. Live animals found in fishermen's nets after trawling the continental shelf region.

Genus 21. *Turritella* Lamarck, 179927. *Turritella acutangula* (Linnaeus)

1758. *Turbo acutangulus* Linnaeus, *Syst.Nat.*, ed. 10 : 766, sp.599 (Type locality : not given).

1982. *Turritella acutangula* : Rajagopal and Mookherjee, *Rec.zool.Surv.India Occ.Pap.* 28 : 15.

*Material examined* : Baleshwar district : 5 exs. Talburai, nr. Chandipur, coll.G.R.K., 4.xi.1962. Cuttack district : 6 exs. Khira Gachha Madeli, coll. N.V.S.R.,29.ii. 1964 & 2.iii.1964; 3 exs. Lions' Rump, coll. N.V.S.R. 6.iii.1964; 2 exs. Paradip, coll. V.K.P., 31.i.1972. Puri district : 32 exs. Konarak, coll. G.R.K., 19.xi.1962; 2 exs. Chandrabhaga, nr. Konarak. coll.V.K.P.,11.ii.1972; 3 exs. Puri, coll. N.A.,18.i.1908; 1 ex.Panthnivas, Puri,coll.G.R.K., 9.ii.1972. Ganjam district : 13 exs. Ganjam coast, coll. No data; 3 exs. Chatrapur, coll.G.R.K., 24.xi.1962.

*Measurements* : L. 56.18 - 129.85; D. 14.10 - 27.66.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Mandapam, Rameswaram, Point Calimere, Tranquebar; Pondicherry : Karaikal; Maharashtra : Devgadh, Bombay; Gujarat : Gulf of Kutch. Elsewhere : Madagascar; Sri Lanka; Burma : Maungmagan; Indonesia; Philippines.

*Remarks* : Adequate description has been given by earlier authors. However collection shows variation. Rajagopal and Mookherjee (1982) dealt with synonyms.etc. *Turritella duplicata* Linnaeus, 1758 is synonym of this species, but *T.acutangula* Linnaeus is retained as the latter has priority over the former.

**28. *Turritella fultoni* Melvill**

1897. *Turritella fultoni* Melvill, *Mem. and Proc. Manch. Lit. & Phil. Soc.*, 41 (7) : 14, pl.6, fig.12 (Type locality : Omara Bay, Persian Gulf).

1968. *Eglisia fultoni* : Ray, *Indian Mus.Bull.*, 3 (1&2) : 18, text fig.5.

*Material examined* : 1 ex. Off Puri, coll.S.W.K.

*Measurements* : L. 18.00; D.5.60; HA.4.42; WA. 3.64.

*Distribution* : India : Orissa (as above); known only from Puri. Elsewhere : Persian Gulf; Henjam Island; Mussandam (Melvill, and Standen, 1901).

*Remarks* : Ray (1968) wrongly assigned this species to the genus *Eglisia*. The shell does not possess any vertical ribs or cancellate sculpture in addition to the spiral ridges and threads which is the characteristic feature of the genus *Eglisia* of the family Epitonidae.

**29. *Turritella columnaris* Kiener**

1843-44. *Turritella columnaris* Kiener, *Icon. Coq.Viv.*, 10 : 10, pl.7, fig.1 (Type locality : Unknown).

1982. *Turritella columnaris* : Rajagopal and Mookherjee, *Rec. zool. Surv. India Occ. Pap.*, 28 : 18.

*Material examined* : Cuttack district : 1 ex. Khira Gachha Madeli, coll, N.V.S.R., 1.iii.1964. Ganjam district : 1 ex. Chatrapur, coll.G.R.K., 24.xi.1962.

*Measurements* : Material in hand are in damaged condition, hence no measurements are given.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Adiramapatnam. Elsewhere : Sri Lanka; Mergui Archipelago; Burma : Rangoon; California.

*Remarks* : This species can be distinguished from *T. acutangula* by its flattened whorls and whorls being more than thirty in number; earlier whorls mildly keeled.

**Family XIII. SILIQUARIIDAE**

Commonly known as 'Slit-worm' shells, occurs in groups as clusters or individual forms. Shells irregularly twisted.

**Genus 22. *Siliquaria* Bruguiere, 1789**

*Key to species*

1. Shell distantly ridged, ridges sharply squamose or spined .....*S. anguina*  
Shell closely ridged, ridges neither squamose nor spined ..... 2
2. Shell narrow, elongate, finely striated, convoluted narrowly .....*S. cumingii*  
Shell thick, not elongate, broadly convoluted ..... 3
3. Early whorls compactly coiled like disc; whorls with rough sculpture; spiral fissure not bordered by a line of elevated denticles ..... *S. trochlearis*  
Early whorls not compactly coiled like disc; whorls with fine sculpture; spiral fissure bordered by a line of elevated denticles.....*S. tostus*

**30. *Siliquaria anguina* (Linnaeus)**

1758. *Serpula anguina* Linnaeus, *Syst.Nat.*, ed. 10 : 787, sp.700 (Type locality : India)

1860. *Tenagodus anguinus* : Moersch, *Proc. zool. Soc. Lond.* 1860 : 402.

1906. *Siliquaria muricata* : Smith, *Ann.Mag.Nat.Hist.* (7) 18 : 175.  
 1911. *Siliquaria muricata* : Annandale, *Rec.Indian Mus.*, 6 : 48, pl.8, fig.1.

*Material examined* : Ganjam District : Several examples, Off Gopalpur, coll.(Bengal Fisheries). Golden Crown, (55 - 70 M).

*Measurements* : Material in hand are in clusters embeded in hard sponge and few are in broken condition. Hence measurements are not given.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Sri Lanka. Widely distributed in Indo Pacific (Annandale, 1911).

*Remarks* : Shell thick, irregularly twisted and can be distinguished by presence of spinose spiral ridges. Material collected from Gopalpur are found embedded in hard sponge, *Spongorites topsenti* Dendy. Shells collected from Andamans are light brown in colour.

### 31. *Siliquaria cumingii* Moerch

(Pl. IV, fig. 2)

1860. *Tenagodus (Siliquarius) cumingii* Moerch, *Proc. zool. Soc. Lond.* 1860 : 403 (Type locality : Philippines).  
 1879. *Siliquaria cumingii* : Sowerby, In Reeves' *Conch. Icon.*, 20, sp.2, pl.1, fig.2.  
 1911. *Spiroglyphus cumingii* : Annandale, *Rec.Indian Mus.*, 6 : 48, pl.8, fig.2.

*Material examined* : Ganjam district : 4 exs. Off Gopalpur; Several examples in a cluster embedded in sponge, coll.Bengal Fisheries.

*Measurements* : Material in hand are in broken condition. Hence no measurements are given.

*Distribution* : India : Orissa (as above) only. Elsewhere : Philippines; Japan.

*Remarks* : Shell narrow, elongate, apex coiled; sculptured with fine spiral ridges except on either side of siphonal slit. Material collected from Gopalpur by Bengal fisheries were found in clusters embedded in a sponge, *Racodiscus scaptrellifera* var. *siproglyphi* Annandale, 1911.

### 32. *Siliquaria tostus* Moerch

1860. *Tenagodus (Siliquarius) tostus* Moerch, *Proc. zool. Soc. Lond.* 1860 : 405 (Type locality : Ceylon = 'Sri Lanka').  
 1879. *Siliquaria tostus* : Sowerby, in Reeve's *Conch. Icon.*, 20, sp.11, pl.4, fig.11.

*Material examined* : Ganjam district : Several exs. Off Gopalpur, coll.Bengal Fisheries (Golden Crown).

*Measurements* : Shells are in broken condition and hence measurements could not be given.

*Distribution* : India : Orissa (as above) only. Elsewhere : Philippines.

*Remarks* : This species is similar to *S.cumingii* but differs in being thicker in diameter; siphonal slit bordered by denticulate ridge on either side.

### 33. *Siliquaria trochlearis* Moerch

(Pl. IV, fig.3)

1860. *Tenagodus (Siliquarius) trochlearis* Moerch, *Proc. zool. Soc. Lond.* 1860 : 408 (Type locality: Philippines).  
 1879. *Siliquaria trochlearis* : Sowerby, in Reeve's *Conch. Icon.*, 20, sp.4, pl.2, fig.4.

*Material examined* : Ganjam district : 1 ex. Off Gopalpur, coll.Bengal Fisheries (Golden Crown).

*Measurements* : Material damaged. Hence no measurements are given.

*Distribution* : India : Orissa (as above) only. Elsewhere : Philippines.

*Remarks* : Early part of shell compactly coiled like disc is the distinguishing feature of this species; tube thick with fine spiral striations, scabrous, prominent towards posterior part.

Annandale (1911) referred this species as *Siliquaria cochlearis* Moersch which is obviously an inadvertent error.

#### Family XIV. POTAMIDIDAE

Species belonging to this family generally occur in estuaries and backwaters. Four species included in three genera are recorded from Orissa.

#### Key to genera

1. Shell small, not exceeding 50mm in height, elongate, whorls not more than ten; aperture extending anteriorly with straight canal .....*Cerithidea*  
Shell large, more than 50mm in height; conical, whorls more than ten; aperture not extending anteriorly..... 2
2. Sculpture consists of strong spiral threads only; whorls without axial ribs.....  
.....*Telescopium (T. telescopium)*  
Sculpture with transpiral ribs; whorls with three deep spiral grooves each; body whorl with axial ribs. ....*Terebralia (T. palustris)*

#### Genus 23. *Cerithidea* Swainson, 1840

#### Subgenus *Cerithideopsilla* Thiele, 1929

#### 34. *Cerithidea (Cerithideopsilla) cingulata* (Gmelin)

1791. *Murex cingulatus* Gmelin, *Syst. Nat.*, ed. 13 1 (6) : 3561, sp.138 (Type locality : Tranquebar).  
1975. *Cerithidea cingulata* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology* (ed. Natarajan) : 169.  
1982. *Cerithidea (Cerithideopsilla) cingulata* : Rajagopal and Mookherjee, *Rec. zool. Surv. India Occ. Pap.*, 28 : 27.

*Material examined* : Baleshwar district : 99 exs. N.E., I.B., Chandipur, coll.G.R.K., 4-6.xi.1962; 12 exs. Burhibalang river bed, nr.Chandipur, coll.V.K.P., 10.iii.1973; 4 exs. Chandipur, coll.N.V.S.R., 28.xi.1984. Cuttack district : Khira Gachha Madeli, 2 exs. coll.G.R.K. 11.xi.1962; 39 exs. coll.N.V.S.R., 26-29.ii. 1964; 65 exs. Lions' Rump, coll.N.V.S.R., 4.iii.1964; 45 exs. Hukitola, coll.N.V.S.R., 17.iii.1964. Puri district : Chilka Lake 3 exs. Kalidai Island, coll.B.S.C. & K.K.T. 21.ix.1950; 1 ex. nr.Balugaon I.B., coll.B.S.C. & K.K.T, 22.ix.1950; 63 exs. N.W. of Barkuda coll.K.S.M., 20.i.1954; 27 exs. nr.Satpara D.B., coll.K.S.M., 29.i.1954; 27 exs. Mahosa and Barhampur islands, coll.K.S.M., 28.i.1954; 83 exs. Barkul point nr.Balugaon, coll.K.S.M., 2.ii.1954; 27 exs. Keshpur, S.W. of Balugaon, coll.K.S.M., 3.ii.1954; 7 exs. S.W. of Balugaon & 1/2 mile E. of Barkul bungalow, coll.K.S.M., 11.ii.1954; 375 exs. Chiriyakuda, coll.K.S.M., 7.ii.1954; 16 exs. Satpara island, coll.H.C.R., 29.xii.1954; 120 exs. Rambha, coll.G.R.K. 27.ii.1975; 23 exs. Gopakuda island, coll.K.S.M., 6.ii.1954. Ganjam district : 24 exs. Gopalpur, coll.H.A.F., 23.i.1941; 7 exs. nr. D.B., Gopalpur, coll.M.C. & G.R.K., 21.ii.1948; 113 exs. Gopalpur, coll.V.K.P., 15 & 16.ii.1972.

*Measurements* : L. 8.95 - 30.35; D. 4.16 - 10.76; H.S. 6.75 - 23.60.

*Distribution* : India : Orissa (as above); estuaries and backwaters of the states, West Bengal; Andhra Pradesh; Tamil Nadu; Kerala; Karnataka; Goa; Maharashtra and Gujarat. Very common in the Indian waters. Elsewhere - Common in Indo Pacific region.

*Remarks* : Generally used in curios for making necklaces etc. Large quantities of shells of the species are collected from estuary near Gopalpur and are supplied to lime kilns in Berhampur.

#### Subgenus *Cerithidea* s.s.

##### 35. *Cerithidea (Cerithidea) obtusa* (Lamarck)

1822. *Cerithium obtusum* Lamarck, *Hist.Nat.Anim.Sans.Vert.*, 7 : 71.

1975. *Cerithidea obtusa* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology* (ed. Natarajan) : 170.

*Material examined* : Baleshwar district : 1 ex. Kasafal nr. Chandipur, coll.V.K.P., 22.i.1972. Cuttack district : 1 ex. Khira Gachha Madeli, coll.N.V.S.R., 29.xii. 1964; 3 exs. False point, coll.N.V.S.R., 12 & 16.iii.1964. Ganjam district : 13 exs. Gopalpur backwaters, coll.M.C. & G.R.K., 21.iv.1948.

*Measurements* : L. 34.05 - 44.52; D. 19.25 - 24.74; H.S. 22.68 - 30.85; .A. 14.45 - 19.74.

*Distribution* : India : Orissa (as above); West Bengal : Sunderbans; Nicobars. Elsewhere : Indian Ocean to Western Pacific (Cernohorsky, 1972).

*Remarks* : Adequate description was given by van Bentham Jutting (1956). Subba Rao and Mookherjee (1975) reported this species from Mahanadi estuary earlier. Most of the shells are found decollated. It occurs in the mangrove ecosystem and in backwaters.

#### Genus 24. *Telescopium* Montfort, 1810

##### 36. *Telescopium telescopium* (Linnaeus)

1758. *Trochus telescopium* Linnaeus, *Syst.Nat.*, ed. 10 : 760, sp.521 (Type locality : Not given).

1916. *Potamides (Telescopium) fuscum* : Annandale and Kemp, *Mem.Indian Mus.*, 5 : 344.

1924. *Telescopium telescopium* : Annandale, *Mem.Indian Mus.*, 5 : 865.

1975. *Telescopium telescopium* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology* (ed. Natarajan) : 169.

1982. *Telescopium telescopium* : Rajagopal and Mookherjee, *Rec.zoo.Surv.India Occ.Pap.* 28 : 30.

*Material examined* : Baleshwar district : 17 exs. Talburai nr.Chandipur, coll.G.R.K., 4 & 6.xi.1962; 4 exs. Burhibalang & Bagda nr.Chandipur, coll.V.K.P.,21 & 22.i.1972. Cuttack district : 34 exs. Khira Gachha Madeli, coll.G.R.K., 26-29. ii.1962; 4 exs. Mahanadi river, coll.N.V.S.R., 29.ii.1964; 33 exs. False Point, coll.N.V.S.R., 1.iii.1964; 65 exs. Lions' Rump, coll.N.V.S.R., 4.iii.1964; 5 exs. Hukitola, coll.N.V.S.R., 17. iii. 1964; 2 exs. Paradip, coll.V.K.P., 9.ix.1973; 1 ex. Paradip,coll.V.K.P., 30.i.1972. Puri district : 2 exs. Konarak coll.G.R.K., 19 & 20. xi.1962; Chilka Lake-63 exs. N.W. of Barikuda, coll.K.S.M., 20.i.1954; 6 exs. Barkul island, coll.K.S.M.2.ii.1954; 27 exs. Keshpur, S.W. Balugaon, coll. K.S.M.,3.ii.1954; 375 exs. Cheryakuda nr.Rambha,coll.K.S.M., 7.ii.1954; 2 exs. Barikuda nr. mouth, coll.K.S.M.5.1.1955; 2 exs. right side of channels, mouth of Chilka, coll. K.S.M., 30.i.1941. Ganjam district : 3 exs. Gopalpur, coll.H.A.F., 23.i.1941; 1 ex.Chatrapur, coll.G.R.K., 24.xi.1962.

*Measurements* : L. 58.24 - 90.35; D. 28.48 - 42.90.

*Distribution* : India : Orissa (as above); West Bengal; Sunderbans, Sagar Island, Muriganga



estuary, Digha; Andhra Pradesh : Bhimilipatnam, Godavary and Krishna estuaries; Tamil Nadu ; Killai estuary nr. Porto Novo, Adiramapattinam; Pondicherry : Karaika, Kerala : Cochin, Malabar coast; Vengurla; Gujarat : Gulf of Kutch, Kandla port, Salaya beach, Murdeswar; Andaman and Nicobar islands. Elsewhere : Madagascar; Sri Lanka, Burma, Malay Peninsula, Singapore, Indonesia; Philippines, North Australia.

*Remarks* : This species commonly known as 'Horn Shell' is mainly used in manufacture of lime. Large quantities of this species collected in Sunderbans are exported to Calcutta for lime factories which yields a good quality of lime.

Genus 25. *Terebralia* Swainson, 1840

37. *Terebralia palustris* (Linnaeus)

1767. *Potamides palustris* Linnaeus, *Syst.Nat.*, ed. 12 ; 1213.

1972. *Terebralia palustris* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 61, pl.13,fig.5.

*Material examined* : Cuttack district : 1 ex. Khira Gachha Madeli, coll.G.R.K., 11.xi.1962; Ganjam district : 1 ex. Gopalpur backwaters, coll.M.C. & G.R.K. 21.ii.1948.

*Measurements* : L.18.20 - 44.86; D. 6.95 - 17.35.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Godavary and Krishna estuaries; Tamil Nadu: Kundugal point, Krusadai island. Elsewhere: Widely distributed throughout Tropical Pacific (Cernohorsky, 1972).

*Remarks* : This species closely agrees with *Telescopium telescopium* occurring in the same habitat, but differs in having prominent transpiral ribs. This species is used as food by local people (M. Smith, 1961).

Family XV. EPITONIIDAE

Species of this family are called as 'Wentle Traps' Snails of this family are carnivorous.

*Key to Genera*

1. Shell with distant axial ribs, ribs crested; base not keeled.....*Epitonium*  
Shell with fine axial ribs, ribs narrow and not crested; base keeled..... 2
2. Suture depressed; inner lip flattened, outer lip thickened internally .....*Eglisia*  
Suture not depressed; inner lip not flattened, outer lip not thickened internally .*Acrilla*

Genus 26. *Epitonium* Roeding, 1798

38. *Epitonium hamatulae* Preston

(Pl. IV. figs. 5,6)

1915. *Epitonium hamatulae* Preston, *Rec.Indian Mus.*, 11 : 294, fig. 5 (Type locality : Canal off Barhampur Island, 2-3 M, Chilka lake).

1916. *Epitonium hamatulae* : Annandale and Kemp, *Mem.Indian Mus.*, 5 : 346.

*Material examined* : Puri district : 1 ex. Stn.127, Chilka Survey, Channel off Barhampur Island, Chilka lake. (Holotype).

*Measurements* : L. 7.80; D. 4.40; H.A. 3.75; W.A. 2.65

**Distribution** : India : Known from Type locality only.

**Remarks** : Annandale and Kemp (1916) remarked "A single dead shell of this species was found in the outer channel of Barhampur Island in the freshwater season. Its small size renders its introduction by hermit crab improbable and it may be presumed that this species is a marine one that occasionally enters the channel."

### 39. *Epitonium immaculatum* (Sowerby)

(Pl. IV, fig. 4)

1844. *Scalaria immaculata* Sowerby, *Proc. zool. Soc. Lond.*, 1844, Pt.12: 26 (Type locality : Catanuam, Luzon, Philippines); *Thes. Conchl.*, 1(4); 93, Pl.33, fig.58.

1982. *Epitonium immaculatum* : Rajagopal and Mookherjee, *Rec. zool. Surv. India Occ. Pap.*, 28 : 43.

**Material examined** : Baleshwar district: 1 ex. Chandipur, coll. N.V.S.R., 30.xi.1984.

**Measurements** : L. 13.15; D. 5.85; H.S. 4.56.

**Distribution** : India : Orissa (as above); Tamil Nadu: Tuticorin, Agasthampalli, Point Calimere; Maharashtra: Bombay. Elsewhere: Philippines.

**Remarks** : This species is similar to the preceding one but differs in its gibbous nature; outer lip thick; sculptur with fine spiral ribs in addition to crested ribs.

### Genus 27. *Acrilla* H. Adams, 1860

#### 40. *Acrilla acuminata* (Sowerby)

(Pl. V, fig. 3)

1844. *Scalaria acuminata* Sowerby, *Proc. zool. Soc. Lond.* 1844, Pt. 12: 31 (Type locality : Malacca). *Thes. Conch.*, Pt. 4, pl. 35, fig. 130

1982. *Acrilla acuminata* : Rajagopal and Mookherjee *Rec. zool. surv. India Occ. Pap.* 28: 47.

**Material** : Cuttack district: 1 ex. Khira Gachha Madeli, coll. N.V.S.R., 2.iii.1964.

**Measurements** : L. 25.15; D. 17.65; H.A. 6.10.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras, Tranquebar, Point Calimiere; Pondicherry: Karaikal, Maharashtra: Bombay. Elsewhere : Sri Lanka; Malaysia: Malacca; Japan. Indo Pacific, warm waters (Smith, 1961).

**Remarks** : This species can be distinguished by the presence of a fine spiral rib above suture; body whorl with prominent keel at base; whorls with numerous vertical ribs.

#### 41. *Acrilla gracilis* (Sowerby)

1844. *Scalaria gracilis* Sowerby. *Proc. zool. Soc. Lond.* 1844: 12; *Thes. Conch.* pt. 4, Pl. 32, figs. 33, 34 (Type locality : Dumaguete, Negros, Philippines).

1860. *Acrilla gracilis* H. Adams, *Proc. zool. Soc. Lond.* 1860: 241.

**Material examined** : Baleshwar district: 13 exs. Chandipur, coll. Subhashis Das, January, 1984.

**Measurements** : L. 4.45-9.55; D. 2.00 - 2.75.

**Distribution** : India-Orissa (as above); West Bengal: Digha, Sandheads; Maharashtra: Bombay. Elsewhere: Philippines.

**Remarks** : This species differs from preceding one in having oblique varices; body whorl without a keel at base. Subba Rao (1977) reported this species from Digha.

Genus. 28. **Eglisia** Gray, 1847

42. ***Eglisia tricarinata*** Adams and Reeve

1850. *Eglisia tricarinata* Adams and Reeve, *Zool. Voy. 'Samarang' Moll.*, no, 33 : 49, pl.12, fig. 8. (Type locality : China Sea.

1968. *Eglisia tricarinata* : Ray, *Indian Mus. Bull.*, 3 (1&2): 17, text fig. 4.

**Material examined** : Puri district: 3 exs. Off puri coll. S.W. K., 2-29.iii.1916. 2 exs., coll. No. date. (Regd. 1436).

**Measurements** : L.5.90 - 11.15; D.1.65 - 3.10.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras; Maharashtra : Bombay; Andamans. Elsewhere: Persian Gulf; Torres Strait; Philippines; Japan.

**Remarks** : Ray (1968) reported this species from Puri for the first time and gave a description and discussion of this species along with its distribution.

Family XVI. LITIOPIDAE

Genus 29. **Alaba** H.& A. Adams, 1853

43. ***Alaba blanfordi*** A. Adams

1862. *Alaba blanfordi* A. Adams, *Ann. Mag. Nat. Hist.*, (3),10: 296, no. 16 (Type locality : Siam?).

1968. *Alaba blanfordi* : Ray, *Indian Mus. Bull.*, 3 (1 & 2):17, text fig. 3(for other synonyms).

**Material examined** : Puri district : 1 ex. off puri, col. S.W. 24-29.iii.1916.

**Measurements** : L.4.66; D. 2.38.

**Distribution** : India : Orissa (as above); Tamil Nadu: Coromandel coast; Maharashtra : Bombay; Andamans. Elsewhere : Burma : Arakan, Cape Negrais; Japan.

**Remarks** : Ray (1968) gave a full description and distribution of this species.

Family XVII. FINELLIDAE

Genus 30. **Finella** A. Adams, 1860

44. ***Finella virgata*** (Philippi)

(Pl. IV, figs. 7,8; pl. V, figs. 1,2)

1849. *Rissoa virgata* Philippi, *Zeits. Mal. Suez, Aden, &c., Descr. de l'Egypte* Pl. 3, fig. 29.

1914. *Litiopa (Alaba) kempi* Preston, *Rec. Indian Mus.*, 10 : 300, Fig.3 (Type locality: Rambha Bay, Lake Chilka).

1915. *Litiopa (Alaba) copiosa* Preston, *Rec. Indian Mus.*, 11: 292, figs.2,2a (Type locality : Serua Nadi, 2-3 M. Lake Chilka).

1924. *Finella virgata* : Annandale, *Mem. Indian Mus.*, 5 : 863, Figs. 6-7.

**Material examined** : Puri district : 1 ex., Rambha Bay, Chilka Lake (Type of *Litiopa (Alba) kempi* Preston); 1 ex. Serua Nadi, Chilka Lake (Type of *Litiopa (Alaba) copiosa* Preston); Several examples from Sankuda Island, Nalbano, Barkuda Island, Rambha Bay, Mahosa, Barhampur Island, Channel between Barrikuda and Satpara of Chilka lake, coll. Chilka Survey party.

**Measurements** : L. 3.00 8.70; D. 1.47 3.14. L. 4.25; D. 2.50 Type of *Litiopa (Alaba) copiosa* Preston L. 5.95; 2.60 Type of *Litiopa (Alba) kempi* preston.

**Distribution** : India : Orissa (as above) Tamil Nadu: Ennur backwaters, Madras. Elsewhere: Pakistan: Karachi; Mauritius.

**Remarks** : Annandale (1924) while revising the gastropods of Chilka Lake, found Preston's

species of *Litiopa (Alaba) kemp* and *Litiopa (Alba) copiosa* to be conspecific with *Finella virgata*. Shells are highly variable. Living shells exhibit green colouration but become rose pink in formalin.

Family XVIII. EULIMIDAE

Key to the Genera

- Shell perforate; outer lip not thickened.....*Niso*  
 Shell imperforate; outer lip thickened.....*Eulima*

Genus 31. *Niso* Risso, 1826  
 (Pl. V, figs. 4,5)

45. *Niso pyramidelloides* G. & H. Nevill.

1871. *Niso pyramidelloides* Nevill, G. & H., *J. Asiat. Soc. Beng.*, 40 (2) : 5, pl. 1, fig. 14 (Type locality: sands at 'Pooree', (=Puri) Bay of Bengal).

1968. *Niso pyramidelloides* : Ray, *Indian Mus Bull.*, 3 (1 & 2) : 18, text fig. 6 (for other synonyms).

*Material examined* : Puri district 10 ex., Puri (Syntypes); 1 ex. Off Puri, coll. S.W.K., 24-29-iii.1916.

*Measurements* : L. 7.65 - 11.90; D. 2.55 - 4.06; H.A. 2.50 - 2.90; W.A. 1.85 2.05.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pamban strait. Elsewhere: Malaysia : Penang; Malacca.

*Remarks* : Nevill (1871) did not designate the holotype. The collection contains 10 exs (Regd. No. 1417) marked as 'Type' in the register. However one of the shells closely agrees with the measurements given by Nevill (1871) and is designated here as 'Lectotype' the rest are as 'Paralectotype'

Genus 32. *Eulima* Risso, 1826

46. *Eulima oxytata* Watson

1883. *Eulima oxytata* Watson, *J.Linn. Soc.*, 17 : 117 (Type locality: Philippines ?).

1886. *Eulima oxytata* : Tryon, *Man. Conch.*, 8 : 278.

*Material examined* : Ganjam district : 1 ex. off Ganjam coast, 44-54 M, coll. Bengal Fisheries. (Golden Crown).

*Measurements* : L. 4.94; D. 2.05.

*Distribution* : India : Orissa (as above); Andamans.

Family XIX. FOSSARIDAE

Genus 33. *Chilkaia* Preston, 1915

47. *Chilkaia imitatrix* Preston.

(Pl. VI, figs. 1,2)

1915. *Chilkaia imitatrix* Preston, *Rec. Indian Mus.*, 11 : 291, fig. 1, 1 a (Type locality: Mahosa, southwards towards sand hills, 1-2 M).

1916. *Chilkaia imitatrix* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 345.

*Material examined* : Puri district : 1 ex. Mahosa Chilka Lake (Holotype); 2 exs. serua Nadi, Chilka lake, coll. Chilka Survey.

*Measurements* : L. 2.96 - 3.15 ; D. 2.20 - 2.21.

*Distribution* : India : Orissa (as above) only.

*Remarks* : There are no subsequent records after its original discovery. Preston (1915) gave adequate description. Annandale and Kemp (1916) stated 'specimens were collected from outer channel of Chilka Lake in the month of September and it was scarce.'

Family XX. CREPIDULIDAE

*Key to genera*

Shell conical; apex central; internal appendage not flattened.....*Calyptraea*  
 Shell elongately ovate, flattened; spire obsolete, marginal; internal appendage flattened ..... *Crepidula*

Genus 34. *Calyptraea* Lamarck, 1799

48. *Calyptraea extincorium* lamarck

1836. *Calyptraea extincorium* Lamarck, *Hist. nat. Anim. sans. Vert.*, 7 : 622, sp 1 (Type locality: Atlantic ocean).

1985. *Calyptraea (Crucibulum) extincorium* : Mookherjee, *Rec. zool. Surv. India, Occ Pap.* 75 : 20, pl. 3 fig. 10 a-b.

*Material examined* : Cuttack district : 1 ex. Khira Gachha Madeli, coll. N.V.S.R., 28.ii.1964.

*Measurements* : L. 6.90; D. 11.20.

*Distribution* : India : Oriassa (as above); Tamil Nadu: Madras, Krusadai Island, Kundugal point, Gulf of Manner, Tranquebar; Karnataka: Karwar; Andamans. Elsewhere : Sri Lanka; Burma: Maungmagan; Gulf of Thailand; Indonesia: Sumatra; Singapore; west Indies;

*Remarks* : Adequate description was given by Satyamurti (1952), and synonym and distribution by Ray (1977). Commonly found attached to other shells.

Genus 35. *Crepidula* Lamarck, 1799

49. *Crepidula walshi* (Reeve)

1859. *Crepidula walshi* Reeve, *Conch. Icon.*, 11, *Crepidula*, sp. 17, pl.3, fig. 17 a,b (Type locality : Singapore).

1971. *Ergaea walshi* : Kuroda et al, *The Sea Shells of Sagami Bay* : 90, pl.23, figs. 12,13.

1985. *Crepidula walshi* Mookherjee, *Rec. zool. Surv. India, Occ. Pap.*, 75: 22,pl.3, fig. 11a,b.

*Material examined* : Cuttack district : 1 ex. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964; 1 ex. Lions' Rump , coll N.V.S.R., 5.iii. 1964. Ganjam district : 3 exs. Off Ganjam, coll. Marine Survey, 17.iii.1884.

*Measurements* : L. 1.92 - 3.12; D. 11.00 - 22.10.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras, Porto Novo, Mandapam, Krusadai, Kundugal point, Tuticorin, Tranquebar; Maharashtra: Bombay; Gujarat: Kutch. Elsewhere: Sri Lanka; Burma : Arakan, Penang; Malaysia; Singapore; China. Widely ranging in Indo western pacific region (Kudroda et al, 1971.).

*Remarks* : Generally these animals are found attached to other shells which are occupied by hermit crabs (Kuroda et al. 1971).

## Family XXI. AMALTHEIDAE

Genus 36. *Amathina* Gray, 184250. *Amathina tricarinata* (Linnaeus)

(Pl. V, figs. 6,7)

1767. *Patella tricarinata* Linnaeus, *Syst. Nat. ed. 12*: 1259.1971. *Amathina tricarinata* : Kuroda et al., *The Sea Shells of Sagami Bay* : 88, pl. 23, fig.3.

*Material examined* : Ganjam district : 1 ex. sea shore about a mile from Dak Bungalow, Gopalpur, coll. M.C. & G.R.K., 21.ii.1948.

*Measurements* : L. 16.78; D. 11.72; H. 4.68.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras; Andamans. Elsewhere; Indo west Pacific (Kuroda et al. 1971).

*Remarks* : Generally found attached to other shells living on the sandy bottom at 10-15m. depth (Kuroda et al.1971).

## Family XXII. VANIKORIDAE

Genus 37. *Vanikoro* Quoy and Gaimard, 183351. *Vanikoro cancellata* (Lamarck)

(Pl. VI, Fig. 3)

1822. *Sigaretus cancellatus* Lamarck, *Hist. Nat. Anim. sans Vert.*, 6 (2) : 208.1972. *Vanikoro cancellata* : Cernohorsky, *Marine shells of the Pacific*, 2: 86, pl. 21, fig. 8.1977. *Vanikoro cancellata* : Ray, *Contribution to the knowledge of the molluscan fauna of Maungmagan, Lower Burma* Indian Mus., Calcutta : 35.

*Material examined* : Ganjam district : 1 ex. Ganjam coast, coll. Bengal fisheries (Golden Crown).

*Measurements* : L. 8.88; D. 7.97.

*Distribution* : India : Orissa (as above); Tamil Nadu: Cape Comorin; Andaman & Nicobar Islands; Lakshadweep. Elsewhere: Persian Gulf; Tanzania; Zanzibar; Pakistan: Karachi; Maldives; Mauritius; Seychelles; Bourbon; Malagasay. Moderately common in central and western Pacific (Cernohorsky, 1972).

## Family XXIII. STROMBIDAE

*Key to genera*

Shell with short siphonal canal; outer lip formed into a wing-like structure, without digitate processes .....*Strombus*

Shell with long siphonal canal; outer lip with digitate processes.....*Tibia*

Genus 38. *Strombus* Linnaeus

The genus includes nineteen species from India (Subba Rao, 1971). One species is reported from Orissa coast.

Subgenus *Gibberulus* Jousseume, 188852. *Strombus (Gibberulus) gibberulus gibberulus* Linnaeus1758. *Strombus gibberulus* Linnaeus, *Syst. Nat.*, ed. 10: 744, sp. 443 (Type locality: In 'O. Asiae')1960. *Strombus (Gibberulus) gibberulus gibberulus* : Abbott, *Indo pacif. Mollusca*, 1 (2) : 143, Pl.14, 28, pl. 114, figs. 5-7.1985. *Strombus (Gibberulus) gibberulus gibberulus* : Mookherjee, *Rec. Zool. Surv. India., Occ. Pap.* 75 : 15.

*Material examined* : Puri district : 1 ex. Puri, coll. Saibal Dey.

*Measurements* : Material not in hand presently hence no measurements are given.

*Distribution* : India : Orissa (as above); Tamil Nadu : Krusadai Island, Dhanushkodi; Andaman and Nicobar islands : Nancouri Harbour; Lakshadweep. Elsewhere Mocabique; Tazania; Malagasay; Seychelles; Maldives; Pakistan: Karachi; Sri Lanka; Singapore; Hong Kong; Cocos Keeling.

Genus 39. *Tibia* Roeding, 1798

53. *Tibia delicatula* (Nevill)

1881. *Rostellaria delicatula* Nevill, *J. Asiat. Soc. Beng.*, 50 (2): 262 (Type locality : Off Cheduba, Arakan, Burma).

1982. *Tiboa delicatula* : Subba Rao, *J.mar. biol. ass. India*, 19 (1 & 2) : 30, pl. 3, figs. C,D.

*Material examined* : Baleshwar district : 5 exs., Baleshwar bay. coll. Bengal (Golden Crown) Fisheries.

*Measurements* : L. 44.90-50.30; D. 18.62 - 20.98.

*Distribution* : India : Orissa (as above) : Andhra Pradesh : Off Godavary. Elsewhere : Persian Gulf; Common in deep water throughout the northern Indian Ocean (Subba Rao, 1982).

*Remarks* : Shells delicate and translucent, usually found in off shore area.

Family XXIV. XENOPHORIDAE

Genus 40. *Xenophora* Fisher Von Waldheim, 1807

*Key to species*

Shell with hollow spines radiating along margin; lower surface with radiating striae; umbilicus small.....*X. solaris*

Shell without hollow spines along margin, lower surface smooth; umbilicus wide....  
.....*X. indica*

54. *Xenophora solaris* (Linnaeus)

(Pl. VI, fig. 6,7)

1767. *Trochus solaris* Linnaeus, *Sys. Nat.*, ed. 12: 1229, sp 593 (Type locality : 'in India Orientali').

1985. *Xenophora solaris* : Mookherjee, *Rec zool. Surv. India, Occ. Pap.*, 75 : 24, Pl. 3, fig. 13.

*Material examined* : Baleshwar district : 1 ex. Balasore Bay, coll. Bengal Fisheries (Golden crown). Cuttack district : 1 ex. Khira Gachha Madeli, coll. G.R.K., 10.xi.1962. Ganjam district : 3 exs. Off gopalpur, coll. Bengal Fisheries (Golden Crown); 1 ex. Ganjam coast, coll. Bengal Fisheries (Golden Crown); 3 ex., Orissa coast, coll. Marine Survey.

*Measurements* : L. 10.88-37.48; D. 29.62 - 88.80.

*Distribution* : India : Orissa (as above); West Bengal: Sand heads; Tamil Nadu : Madras, Mandapam; Kerala: Malabar coast; Maharashtra: Bombay. Elsewhere: Burma: Arakan; Malaysia: Malacca; Maldives. Moderately common and deep- sea. Ranging from Indian Ocean to Central Indo-Pacific and available on rocks and shingles.

*Remarks* : Shell from Baleshwar Bay is the largest of the lot. Some of the shells are found attached with shells and stones on its spire in circles and one of them is found covered with serpulid

tubes. Commonly known as 'carrier shell', it agglutinates shells and stones on its dorsal surface, some times the whole animal is concealed by the shells and stones.

55 *Xenophora indica* (Gmelin)

(Pl. VI, figs. 4, 5)

1791. *Trochus indicus* Gmelin, *Syst. Nat.*, ed.13: 3575, sp.57, (Type locality: India)

1842. *Phorus indicus* : Reeve, *Proc. zool. Soc. Lond.*, 1842; *Conch. Syst.*, 2, pl.215, fig.6.

1961. *Xenophora indica* : M.Smith, *Universal Shells, Marine, Freshwater and Land* : 60, fig.

*Material examined* : Puri district: 1 ex. Puri, coll. No data.

*Measurements* : L.21.39; D. 45.15.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Cochinchina; Indian Ocean.

*Remarks* : Shells are devoid of hollow spines on its periphery and umbilicus is wider than in the preceding species.

Family XXV. NATICIDAE

Commonly known as 'Moon Shells', generally found in sandy beaches. Four genera and eight species are recorded from Orissa. Some of the species of naticids are common on Chandipur beach.

*Key to Genera*

1. Shell either globular or ovate; operculum either calcareous or corneus; aperture semilunar or ovate..... 2  
Shell auriform; operculum corneus; aperture large ..... *Sinum*
2. Shell thin; umbilicus deep, funnel shape; spirally sculptured..... *Eunaticina*  
Shell thick, solid; umbilicus either completely or partly closed by callus..... 3
3. Shell rounded; faint radial striae below suture; brightly coloured; operculum calcareous..... *Natica*  
Shell moderately inflated; smooth, porcellaneous; operculum corneous..... *Polinices*

Genus 41. *Natica* Scopoli, 1777

*Key to species*

1. Shell with low spire; broad pale band on body whorl ..... *N. vitellus*  
Shell with elevated spire; no band on body whorl..... 2
2. Surface with axial striations more prominent below suture; colour white.....  
..... *N. gualteriana*  
Surface smooth; colour white with either brown axial lines or mottled with pinkish brown dots..... 3
3. Shell thin; surface with axial wavy lines ..... *N. lineata*  
Shell thick; surface mottled with close set purplish brown dots arranged in spiral lines..... *N. tigrina*



Subgenus *Natica* s.str.

56. *Natica (Natica) gualteriana* Recluz

1844. *Natica gualteriana* Recluz, *Proc.zool. Soc. Lond.* 1844: 208 (Type locality : Sual, Luzon Island, Philippines).

1915. *Natica marochiensis* (non Gmelin) Preston, *Rec.Indian Mus.*, 11 : 294.

1976. *Natica (Natica) gualteriana* : Kilburn, *Ann. Natal Mus.*, 22(3) : 835.

*Material examined* : Puri district: 1 ex. Chandrabhaga beach, Konarak, coll. V.K.P., 17.iii.1973; 5 exs. Chilka Lake, coll.Chilka Survey.

*Measurements* : L. 15.30 18.05; D. 11.60 - 15.61; H.A. 10.95 - 12.75; W.A. 6.40 8.68.

*Distribution* : India : Orissa (as above); West Bengal: Digha, Muriganga estuary, Ganga Sagar; Tamil Nadu: Ennur backwaters nr. Madras, Krusadai Island, Kundugal point; Kerala: Cochin, Ernakulum. Elsewhere: North Africa; Sri Lanka; Philippines; Australia; Japan; Panama; West Indies.

*Remarks* : This species has been recorded earlier under the name *N. marochiensis* from Indian waters (Preston, 1915; Satyamurti, 1952; Cheriyan, 1968 and Mookherjee, 1985). Cernohorsky (1971) and Kilburn (1976) clarified its identity and gave full details of its synonymy and distribution.

57. *Natica (Natica) lineata* (Roeding)

1798. *Cochlis lineata* Roeding, *Museum Boltenianum*: 147, sp. 1846 (Type locality : not given).

1968. *Natica (Natica) lineata* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 22.

1985. *Natica lineata* : Mookherjee, *Rec.zool.Surv. India,Occ, Pap.* 75 : 45, pl.6, fig.29.

*Material examined* : Baleshwar district: Chandipur- 24 exs. coll. No. data, 4 & 7.iii. 1939; 3 exs. coll. S.L.H. & A.G.K.M., 27.vi.1949; 2 exs. Kasafal nr. Balaramguri, coll. V.K.P., 28.i.1972; 1 ex. Chandipur, coll.N.V.S.R., 30.xi.1984. Cuttack district: 3 exs. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964. Puri district: 1 ex. Off Puri, coll. S.W.K., 24-29.xi.1916. Ganjam district: 1 ex. Chatrapur, coll. G.R.K., 24.xi.1962. 1 ex. Orissa coast, coll. Marine Survey.

*Measurements* : L. 3.00 30.45; D. 3.04 - 27.95.

*Distribution* : India : Orissa (as above); West Bengal: Digha, Sandheads, mouth of Hooghly; Andhra Pradesh: Visakhapatnam, Kakinada; Tamil Nadu: Ennur backwaters nr, Madras, Pamban, Cuddalore; Kerala: Malabar coast; Maharashtra: Bombay; Andaman and Nicobar Islands: Elsewhere: Sri Lanka; Singapore; IndoChina; Gulf of Thailand; Bangkok; Indonesia: java, Timor. Range from North Queensland, Australia into Indian Ocean (Cernohorsky, 1972).

*Remarks* : This species can be distinguished by light orange yellow zig zag lines on its surface. It is a common species in backwaters and calm waters along the coast.

58. *Natica (Natica) tigrina* (Roeding)

1798. *Cochlis tigrina* Roeding, *Museum Boltenianum* : 147, sp. 1843 (Type locality : Not given).

1915. *Natica maculosa* : Preston, *Rec. Indian Mus.*, 11 : 294. Pap, 75 : 44, pl.6, fig.28.

*Material examined* : Baleshwar district : 590 exs. Talburai, nr. Inspection Bungalow, Chandipur, coll. G.R.K., 3-6.xi.1962; 5 exs. Baleshwar, coll. F.H.G. 3 exs. Bagda, nr. Balaramguri, coll. V.K.P., 21-22.i.1972; 5 exs., Balaramguri, coll. V.K.P., 10.iii.1973. Cuttack district : 1 ex. Lions' Rump, nr. Mahanadi river mouth, coll. N.V.S.R., 4.iii.1964.

*Measurements* : L. 7.56 23.40; D. 7.05 - 17.60.

*Distribution* : India : Orissa (as above); West Bengal: Digha, Murigana estuary, Ganga Sagar in Sunderbans; Tamil Nadu: Madras, Pamban, Coromandel coast. Kerala: Cochin; Maharashtra: Bombay;

Gujarat: Pirotan Island, in Gulf of Kutch. Elsewhere: Persian Gulf; Sri Lanka; Malaysia: Penang; Burma : Akyab; Singapore; Hong kong; Indonesia: Java; Philippines; China; Japan.

*Remarks* : Commonly occurs in river mouths on fine sand intermixed with mud. Population of *Natica tigrina* (= *N. melanostoma* in Mallik, 1979) is common on Chandipur beach. The egg masses are laid in typical "sand collars", which are reported to be common during premonsoon period. During a recent survey in December, 1984 we have however, observed a number of sand collars on Chandipur beach even after monsoon. The 'sand collars' were found all along the beach from guest house to river mouth, and have nothing to do with the crab holes as reported by Mallik (1979). These were found in abundance towards the mouth of Burhi balang River. During the course of one hour search we have counted 56 sand collars on the beach. But at the time of our visit no living specimens of *Natica* could be seen on the beach.

#### 59. *Natica (Natica) vitellus* (Linnaeus)

1758. *Nerita vitellus* Linnaeus, *Syst.Nat.* ed. 10: 776 (Type locality: 'O Asiae' (Asiatic Ocean).

1855. *Natica rufa* : Reeve, *Conch.Icon.*, 9, *Natica*, pl.16, fig.70.

1885. *Natica vitellus* : Mookherjee, *Rec.zool. Surv. India, Occ Pap.*, 75 : 42, pl.6, fig.26a-b.

*Material examined* : Cuttack district : 10 exs., Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964; 2 exs. Orissa, coll.V.K.P., 31.i.1972. Ganjam district : 1 ex. Chatrapur, coll. G.R.K., 24.xi.1962; 2 exs. Off Gopalpur, coll. Bengal Fisheries (Golden Crown)

*Measurements* : L. 3.50 - 42.05; D. 32.00 - 38.95.

*Distribution* : India : Orissa ( as above); West Bengal: Sand heads in Hooghly river mouth; Andhra Pradesh: Visakhapatnam, Kakinada; Tamil Nadu: Madras, Porto Novo, Rameswaram, Krusadai Island, Tuticorin, Tranquebar; Kerala: Malabar coast; Maharashtra: Bombay; Lakshadweep. Elsewhere: Fiji Island; North to south along western coast of Viti (Smith, M. 1961). Karachi; Mauritius; Singapore; Hong Kong.

*Remarks* : A species generally collected in the fishing net.

### Genus 42. *Polinices* Montfort, 1810

#### Subgenus *Glossaulax* Pilsbry, 1929

#### 60. *Polinices (Glossaulax) didyma* (Roeding)

1798. *Albula didyma* Roeding, *Museum Boltenianum* : 20, sp.145 (refers Chemnitz, 1781, pl. 186, figs.1856, 1857, Type locality : Not Known [= Tranquebar Chemnitz].

1972. *Polinices (Glossaulax) didyma* : Cernohorsky, *Marine Shells of the Pacific*, pt.2: 100, pl.26, fig.3.

1985. *Polinices (Glossaulax) didyma* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 54, pl.9, fig.37.

*Material examined* : Baleshwar district : 38 exs. Near Chandipur I.B., coll. G.R.K., 3-6.xi.1962 & Nov.1982; 2 exs. Chandipur coll.N.V.S.R., 30.xi.1984; 8 exs. Burhibalang river nr. Balaramguri, coll. V.K.P., 21-23.i.1972. Cuttack district : 19 exs. Lions' Rump, coll. N.V.S.R., 3-6.iii. 1964; 17 exs. Khira Gachha Madeli, coll. N.V.S.R., 27-29.ii.1964. Puri district : 1 ex. Puri, coll. G.R.K., 15.xi.1962.

*Measurements* : L. 10.48 - 58.20; D. 11.45 - 50.30.

*Distribution* : India : Orissa (as above); West Bengal: Digha; Tamil Nadu: Madras, Krusadai Island, Kundugal point; Maharashtra: Bombay; Gujarat: Pirotan Island in Gulf of Kutch. Elsewhere: Moderately common from Queensland, Australia to Indian Ocean (Cernohorsky, 1972).

*Remarks* : This species can be recognised by its globose and, laterally compressed shell; less elevated spire; parietal callus dark brown and tongue shaped with a deep groove. Kilburn (1916) gave a

detailed synonymy and distribution. Young shell is broader than long but shells measuring above 50mm are longer than broad.

Subgenus **Polinices** s.str.

61. *Polinices (Polinices) tumidus* (Swainson)

(Pl. VII, figs. 1, 2)

1840. *Mamillaria tumida* Swainson, *A Treatise on Malacology or natural classification of shells and shell fish*, London: 345 (refers Chemnitz, 1781, Type figures, pl. 189, figs. 1928-1931, (Type locality: Unknown [=East Indies and Tranquebar (Chemnitz)])

1985. *Polinices tumidus* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 49, pl.7, fig.32a-b.

**Material examined** : Baleshwar district: 1 ex. Chandipur, coll. M.C. & G.R.K., 17.iii.1949; 1 ex. Chandipur shore, coll.?, 24.i.1949; 46 exs. Talburai, coll. G.R.K., 4-6.xi.1962; 7 exs. coll. N.V.S.R. 28-30.xi.1984; 6 exs. Balaramguri, coll. G.R.K., 21-23.i.1972; 3 exs. Balaramguri, coll. V.K.P., March, 1973. Cuttack district : 28 exs. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964 & 1.iii.1964; 7 exs. Lions' Rump, coll. N.V.S.R., 5.iii.1964; 1 ex. Paradip, coll. V.K.P., 31.i.1972. Puri district: 1 ex. Chandrabhaga beach nr, Konarak, coll. V.K.P., 11.ii.1972.

**Measurements** : L. 4.21 - 38.34; D. 3.36 - 34.88.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras, Krusadai Island, Kundugal point, Shingle Island, Rameswaram, Tuticorin, Tranquebar, Tiruchendur; Kerala: Travancore; Maharashtra : Bassein, Bombay; Goa; Andamans; Lakshadweep. Elsewhere: Hawaii to Japan (Kilburn, 1976).

**Remarks** : This species differs from the preceding one in having pyriform shape and short spire; aperture wide, semicircular; umbilicus completely covered by a callus leaving groove in juveniles. Earlier this species is reported in India as *Natica mamilla* (Linnaeus) by authors. Kilburn (1976) discussed the validity of the species and mentioned that 'Linnaeus species can not be applied to Indo Pacific species.' Satyamurti (1952) reported that, 'this species live in soft sand where they are seen crawling on surface or burrowing.'

Genus 43. **Sinum** Roeding, 1798

62. *Sinum delessertii* (Recluz)

(Pl. VII, fig. 3,4)

1843. *Sigaretus delessertii* Recluz, *Illustrations Conchyliologiques, Sigaretus*, 3, pl.3, fig.8a,b; 1844. *Illustrations Conchyliologiques, Sigaretus*, 3 : 21 (Type locality: Sumatra).

1985. *Sinum delessertii* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 59, pl.10, fig.41.

**Material examined** : Cuttack district : 1 ex. False Point, coll. No. data.

**Measurements** : L. 4.62; D. 25.01.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras, Kundugal point, point Calimiere, Vedaraniyan; Indonesia: Java; Philippines; Malagasy; South Africa: Natal, Durban.

**Remarks** : The shell resembles that of *Haliotis* in shape but differs in the absence of nacreous interior. This species differs from *S. neritoideum* in its more flattened shell, closed umbilicus and in the presence of a brown band near suture.

63. *Sinum neritoideum* (Linnaeus)

(Pl. VII, figs. 5, 6)

1767. *Helix neritoidea* Linnaeus, *Syst.Nat.*, ed. 12 : 1250 (Type locality: not known).

1985. *Sinum neritoideum* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 60, pl.10, fig.42.

**Material examined** : Baleshwar district: 2 exs. Kasafal nr. Chandipur, coll. V.K.P., Puri district: 1 ex. Puri. coll. No data.

**Measurements** : L. 17.84 - 21.05; D. 22.42 - 23.70; H.A. 17.98 - 19.12; W.A. 16.00 - 16.80.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras, Santhome beach, Tranquebar, Point Calimiere, Kundugal point, pearl banks in Gulf of Mannar. Elsewhere: Pakistan: Karachi; Sri Lanka; Burma: Maungmagan; Malaysia; Indonesia; Philippines; China; Japan.

**Remarks** : This species differs from *S. delessertii* in having large ovate body whorl; umbilicus narrow, deep; interior of aperture dark brown.

#### Genus 44. *Eunaticina* Fischer, 1885

##### 64. *Eunaticina tener* Smith

1894. *Sigaretus (Eunaticina) tener* Smith, *Ann.Mag.nat.Hist.*, (6) 14 : 165, pl.4, fig.8 (Type locality: Bay of Bengal, 175M).

**Material examined** : Ganjam Dist.: 4 exs. 24 miles S.E. of Gopalpur, Investigator Stn.81, 170-162.8 M, coll. Marine Survey, 21.i.1890.

**Measurements** : L. 21.25 - 23.00; D. 14.40 - 15.65; H.A. 15.80 - 16.80; W.A. 11.60-10.89.

**Distribution** : India : Orissa (as above), also known from Mahanadi to Krishna in Bay of Bengal.

**Remarks** : This species has not been recorded subsequent to its original discovery.

#### Family XXVI CASSIDAE

Commonly known as 'Helmet or Bonnet shells' Widely distributed in tropical and temperate waters. Two species under the genus *Phalium* are included here. These are offshore in habitat and generally dead shells are either washed ashore or collected in fishing nets.

#### Genus 45. *Phalium* Link, 1807

##### Subgenus *Phalium* s.str.

##### 65. *Phalium (Phalium) areola* (Linnaeus)

1758. *Buccinum areola* Linnaeus, *Syst.Nat.*, ed. 10 : 736, sp.389 (Type locality : M. Mediterraneo (erroneous)).

1968. *Phalium (Phalium) areola* : Abbott, *Indo-Pacif.Mollusca*, 2 (9) : 86, pl.7, fig 57, pls.61, 63 (for synonyms).

1985. *Phalium (Phalium) areola* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75: 63, Pl.10, fig.44.

**Material examined** : Baleshwar district: 1 ex. Chandipur, coll. 31.i.1972, V.K.P.; Ganjam district: 1 ex. Gopalpur, coll.V.K.P., 30.iii.1973; 1 ex. Chatrapur, coll. G.R.K., 24.xi.1962. Cuttack district: 1 ex. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964.

**Measurements** : L. 26.78 - 45.65; D. 16.10 - 29.60.

**Distribution** : India : Orissa (as above); Andhra pradesh: Visakhapatnam; Tamil Nadu: Madras, Pamban; Kerala: Cochin; Andamans; Elsewhere: South Africa; Sri Lanka; Thailand; Samoa; Indonesia; Philippines; Australia.

**Remarks** : Mookherjee (1985) gave adequate description and distribution. It can be distinguished by the presence of five rows of squarose brown markings on body whorl.

#### Subgenus *Semicassis* Moerch, 1852

##### 66. *Phalium (Semicassis) bisulcatum* (Schubert and Wagner)

1829. *Cassis bisulcata* Schubert and Wagner, *Conchyl.Cab.*, Nurnberg, 12: 68, figs.3081.-1082 (Type locality: Not given).

1968. *Phalium (Semicassis) bisulcatum* : Abbott, *Indo-Pacif Mollusca*, 2 (9) : 126, pl.8, figs.13-21, pls.105-114.

1985. *Phalium (Semicassis) bisulcatum* : Mookherjee, *Rec.zool.India, Occ.Pap.*, 75 : 66, pl.11, fig. 46 a-b.

*Material examined* : Baleshwar district: 2 exs. Chandipur, coll. V.K.P., 31.i.1972. Cuttack district: 1 ex. Lions' Rump, coll.N.V.S.R., 5.iii.1964. Ganjam district: 1 ex. Off Gopalpur, coll.Bengal Fisheries (Golden Crown).

*Measurements* : L.33.52 - 39.88; D. 21.71 - 22.72.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Porto Novo; Tranquebar, Shingle Island; Pondicherry : Karaikal Andaman and Nicobar Islands: port Blair. Elsewhere: Ranges from East Africa to Marshall Islands, Japan to Australia (Abbott,1968).

*Remarks* : This species differs from preceding one in its more globular shape, absence of a varix opposite to outer lip, more elevated spire; and smooth lower part of outer lip.

#### Family XXVII TONNIDAE

The family is represented by two species under the genus *Tonna*. Commonly known as 'Tun shells' they prefer deeper waters, occasionally found washed into intertidal region, or collected in fishing nets.

#### Genus 46. *Tonna* Bruennich, 1772.

##### 67. *Tonna dolium* (Linnaeus)

1758. *Buccinum dolium* Linnaeus, *Syst.Nat.*, ed. 10 : 735 (Type locality: M. Siculo).

1985. *Tonna dolium* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75: 68, pl.12, fig. 47.

*Material examined* : Baleshwar district: 1 ex. Chandipur, coll.?.; 2 exs. Burhibalang river, coll. V.K.P., 21.i.1972; 23 exs. Talburai, nr. Chandipur, coll. G.R.K., 3-6.xi,1962. & coll. N.V.S.R., 30.xi.1984. Cuttack district: 12 exs. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964 & 1.iii.1964; 17 exs. Lions' Rump, coll.N.V.S.R., 4-6.iii.1964. 4 exs. Oriss coast, coll. No data.

*Measurements* : L. 24.75 - 93.15; D. 18.56 - 74.20.

*Distribution* : India : Orissa (as above); West Bengal : Sand heads in Hooghly mouth. Tamil Nadu: Madras, Pamban, Krusadai & Shingle Islands; Maharashtra: Bombay; Andaman and Nicobars: Nicobar Islands; Elsewhere: Uncommon in western Pacific, but common in Indonesia, ranges from Indian Ocean to Philippines, Japan, Fiji, New Zealand (Cernohorsky, 1972).

*Remarks* : This species can be distinguished from others by its sculpture of broad flat spiral ridges alternating with spiral threads, ridges maculated with brown spots on white background.

##### 68. *Tonna sulcosa* (Born)

(Pl. VIII. figs.1, 2)

1778. *Buccinum sulcosum* Born. *Index Rerum Naturalium Musei Caesarei Vindobonensis* : 230 (Type locality : Unknown)

1910. *Dolium varicosum* Preston, *Rec. Indian Mus.*, 5 : 34, fig.3 (Type locality : Baleshwar Bay).

1985. *Tonna sulcosa* : Mookherjee, *Rec.zool. Surv.India, Occ.Pap.*, 75 : 69, pl.12, fig.48.

*Material examined* : Baleshwar district : 5 exs. Baleshwar Bay, coll. Bengal Fisheries (Golden Crown) (Including holotype of *Dolium varicosum* preston, 1910). Cuttack district: 1 ex. Khira Gachha madeli, coll. N.V.S.R., 29.ii.1964; 5 exs. Lions' Rump, coll.N.V.S.R., 5 & 6.iii.1964.

*Measurements* : L. 46.65 - 55.70; D. 35.20 - 108.18.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras,

Pamban, Krusadai Island, Point Calimere; Andamans. Elsewhere : Sri Lanka; Philippines; China. Widely distributed in the Indopacific region (Kuroda *et. al.*, 1971).

*Remarks* : This species is distinguished from *T. dolium* by its elevated spire, dentate and thickened outer lip and continuous brown bands on body whorl. *Dolium varicosum* Preston, 1910 from Baleshwar Bay closely agrees with the present species except in having an abnormal growth of a axial ridge on its body whorl near the outer lip margin.

#### Family XXIII FICIDAE

Shells of this family are known as 'Fig shells', occasionally collected by fishing trawls from inshore waters. Three species are included here under the genus *Ficus*.

#### Genus 47. *Ficus* Roeding, 1798

##### *Key to species*

1. Spire high; canal short and broad; both axial and spiral cords prominent .....  
.....*F. investigatoris*
- Spire low; canal elongate and narrow; only spiral cords more prominent and axial  
cords fine..... 2
2. Sculpture fine; aperture wide, interior violet; shell mottled with irregular brown  
markings; outer lip margin crenulate.....*F. variegata*
- Sculpture coarse; aperture elongate, interior white; shell with axial brown streaks;  
outer lip margin smooth..... *F. gracilis*

#### 69. *Ficus gracilis* (Sowerby)

1825. *Pyrula gracilis* Sowerby, *Catalogue of the shells contained in collection of late Earl of Tankerville with description of many new species* : xvii (Type locality : not given).
1894. *Pyrula dussumieri* : Smith, *Ann. Mag.nat. Hist.*, (6) 14:164.
1982. *Ficus gracilis* : Abbott & Dance, *Compendium of Sea Shells* : 117, fig.

*Material examined* : Baleshwar district : 2 exs. Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). Puri district : 2 exs. 'Investigator' stn.69,E.of Puri,coll. Marine Survey.

*Measurements* : L. 40.95 - 89.61; D. 19.00 - 46.25.

*Distribution* : India : Orissa (as above); West Bengal: Investigator, stn.65, off Hooghly mouth; Andhra Pradesh: Bhimilipatnam. Elsewhere: Eastern Asia, Off shore to 100 M (Abbot & Dance, 1982).

*Remarks* : This species closely resembles *F. reticulata* in its sculpture but differs in having more elevated spire, elongate canal and slender body whorl with axial brown streaks.

#### 70. *Ficus investigatoris* (Smith)

(Pl. VIII, figs. 3,4)

1894. *Pirula investigatoris* Smith, *Ann. Mag.nat.Hist.*, (6) 14 : 367 (Type locality : Off Ganjam coast, East coast of India,179-186 M on sandy bottom).
1982. *Ficus investigatoris* : Abbott and Dance, *Compendium of Sea Shells* : 117, f ig.

*Material examined* : Ganjam district 1 ex. Ganjam coast, coll. Marine Survey (Holotype).

*Measurements* : L. 81.50; D. 48.65.

*Distribution* : India : Orissa (as above); Lakshadweep sea (Investigator stn. 258). Indian Ocean, deep water, rare (Abbott & Dance, 1982).

*Remarks* : After its original discovery no subsequent record has been made so far.

**71. *Ficus variegata* Roeding**

1798. *Ficus variegata* Roeding, *Museum Boltenianum* : 148 sp. 1852 (Type locality : Not given).

1985. *Ficus variegata* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 71, pl.12, fig.50.

*Material examined* : Cuttack district : 7 exs. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964 & 1.iii.1964; 2 exs. Lions' Rump, coll. N.V.S.R., 5.iii.1964; 2 exs. Off Paradip, coll. V.K.P., 31.i.1972. Puri district; 6 exs. Puri, coll, No data; 1 ex. Orissa coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 39.36 76.25; D. 25.65 - 47.42.

*Distribution* : India : Orissa (as above); West Bengal: Sand heads; Andhra Pradesh: Visakhapatnam; Tamil Nadu: Madras, Tuticorin, Tranquebar, Nagapattinam, Point Calimere, Keelakkarai; Pondicherry; Kerala: Malabar coast; Maharashtra: Bombay; Gujarat: Gulf of Kutch. Elsewhere: Persian Gulf; Iran : Makran coast; Red sea; Mauritius; Malagasay, Tanzania: Zanzibar; South Africa:Natal; Sri Lanka; Burma: Maungmagan, Tavoy coast; Singapore; Gulf of Thailand; Indonesia; Philippines; China; Japan.

*Remarks* : Adequate description was given by Mookherjee (1985). This species can be distinguished by its sculpture; violet aperture; crenulate outer lip margin and by irregular brown marking on surface of the shell.

**Family XXIX CYMATIIDAE**

Commonly known as 'Tritons' Usually occurs on rocks in shallow waters in intertidal region, some in deep waters. Two species under two genera are included here.

*Key to genera*

Shell distorted; whorls irregular; aperture constricted .....*Distorsio*

Shell not distorted; whorls regular; aperture not constricted .....*Cymatium*

Genus 48. *Cymatium* Roeding,1798

Subgenus *Gutturnium* Moerch,1852

**72. *Cymatium (Gutturnium) tripus* (Lamarck)**

1843. *Triton tripus* Lamarck, *Hist.nat.Anim. sans Vert.* (Deahayes ed.), 9 : 634 (Type locality : Not known).

1985. *Cymatium (Gutturnium) tripus* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 76, pl.13, fig. 52 a-b.

*Material examined* : Ganjam district : 1 ex. Palur canal, Ganjam Dist., coll. C.A.N.R., 18.xi.1983.

*Measurements* : L. 23.14; D. 13.62; H.A.11.04; H.S. 7.62.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras, Tuticorin; Indian Seas. Elsewhere: Oman : Muscat; Sri Lanka; Maldives; China.

*Remarks* : Present collection is represented by a single juvenile specimen, which has a smooth protoconch and the anterior canal broken at its tip.

Genus 49. *Distorsio* (Bolten) Roeding, 179873. *Distorsio reticulata* Roeding1798. *Distorsio reticulata* Roeding, *Museum Boltenianum* : 133, sp. 1674 (Type locality : Not given).1985. *Distorsio reticulata* : Mookherjee, *Rec.zool.Surv.India,Occ.Pap.*, 75 : 79.pl.14,fig.56 a-b.*Material examined* : Ganjam district: 9 exs. Ganjam coast, coll. Marine Survey.*Measurements* : L. 23.66 - 51.58; D. 8.75 - 32.65.*Distribution* : Indis : Orissa (as above); West Bengal : Sand heads nr. Mouth of Hooghly; Tamil Nadu : Thondiyarpet nr. Madras, Tranquebar; Kerala: Malabar coast, Calicut; Lakshadweep. Elsewhere: Red sea; Persian Gulf; Gulf of Oman; Seychelles; Sri Lanka; China; Philippines; Polynesia; West Indies.

## Family XXX BURSIDAE

These are commonly called as 'Frog Shells', normally occur among rocks and in shallow waters. The family is represented in Orissa by a single genus.

Genus 50. *Bursa* Roeding, 1798

## Key to species

1. Shell with rounded varices; sculptured with spiral rows of rounded tubercles alternating with fine granular threads; anterior canal narrow, and straight...*B. granularis*

Shell with sharp varices; sculptured with spiral rows of spinose tubercles enclosing in between several fine granular threads; anterior canal broad and recurved..... 2

2. Shell broad; varices without spines; outer lip broader and flat, expanded anteriorly in the form of a wing; columella calloused .....*B. crumena*

Shell comparatively narrow; varices with spines; outer lip not broad, but expanded posteriorly and anteriorly in the form of a wing; columella not calloused.....*B. rana*74. *Bursa crumena* (Lamarck)1816. *Ranella crumena* Lamarck, *Encycl. Meth. Vers.*, pl.412, fig.3 (Type locality: 'les mers de l'Inde').1843. *Ranella crumena* Lamarck, *Hist.nat.Anim.sans Vert.* (Deshayes ed.), 9 : 545.1972. *Bursa (Bufonaria). crumena* : Cernohorsky, *Marine Shells of the Pacific*, pt.2: 119.pl.34, fig.2.1985. *Bursa (Bufonaria) crumena* : Mookherjee, *Rec.zool.Surv.India, Occ.Pap.*, 75 : 85, pl.15, fig.60.*Material examined* : Ganjam district: 1 ex. Chatrapur, coll. G.R.K., 24.xi.1962.*Measurements* : L. 50.75; D. 38.02.*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam; Tamil Nadu: Madras, Porto Novo. Elsewhere: Sri Lanka. Indo pacific.75. *Bursa granularis* (Roeding)1798. *Tritonium granulare* Roeding, *Museum Boltenianum* : 127 sp.1641 (Type locality : Not given).1967. *Bursa granularis* : Cernohorsky, *Marine Shells of the Pacific*, Pt.1 : 44, pl.1,fig.4.*Material examined* : Ganjam district: 1 ex. Ganjam coast, 44-55 M., coll. Bengal Fisheries (Golden Crown).*Measurements* : L. 16.42; D. 9.92.



**Distribution** : India : Orissa (as above); Tamil Nadu: Krusadai Island, Kundugal point; Maharashtra: Bombay; Gujarat: Hanuman Dandi in Gulf of Kutch. Elsewhere : Maldives; Sri Lanka.

**Remarks** : This species is often confused with *Gyrineum natator* but can easily be differentiated from it by the presence of posterior canal.

**76. *Bursa rana* (Linnaeus)**

1758. *Murex rana* Linnaeus, *Syst.Nat.*, ed. 10 : 748, sp.452, (Type locality : 'O. Asiatico).

1972. *Bursa (Bufonaria) rana* : Cernohorsky, *Marine Shells of the Pacific*, pt.2 : 119, pl.32, fig.8.

1985. *Bursa (Bufonaria) rana* : Mookherjee, *Rec.zool.Surv.India,Occ.Pap.*, 75 : 84,pl.15,fig.59.

**Material examined** : Baleshwar district: 4 exs. Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). 2 exs. Chandipur, coll. No data, March, 1939. Cuttack district: 30 exs. Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964. & 1.iii.1964. 15 exs. Lions' Rump, coll. N.V.S.R., 5.iii.1964. Puri district : 6 exs. Puri coast, coll. G.R.K., 10.ii.1975. 2 exs. Orissa coast, coll. V.K.P, 31.i.1972.

**Measurements** : L. 36.80 - 70.96; D. 27.76 - 52.00.

**Distribution** : India : Orissa (as above); West Bengal : Sand Heads near Hooghly mouth; Tamil Nadu : Madras, Porto Novo, Pamban; Andamans. Elsewhere : Persian Gulf. Widely ranging in Indo Pacific region (Kuroda *et. al.*, 1971).

**Remarks** : This species is sometimes confused with *B. echinata* (= *B. spinosa*) and is reported under the latter name by earlier authors (Satyamurti, 1952; Subrahmanyam *et. al.*, 1952; Menon *et. al.*, 1961; Mookherjee, 1985). However, the species differs from *B. echinata* in having short spines and spire.

Order NEOGASTROPADA

Family XXXI MURICIDAE

*Key to genera*

1. Shell with varices ..... 2  
    Shell without varices ..... 5
2. Shell small, not more than 35 mm in height, body whorl with axial ribs, varices rounded ..... *Cronia*  
    Shell large, more than 35 mm in height, body whorl without axial ribs, varices frondose, lamellose or spinose ..... 3
3. Shell club shaped, canal elongate, narrow; varices with long spines ..... *Murex*  
    Shell fusiform, canal not elongate, broad, varices either frondose or lamellose ..... 4
4. Shell slender, varical extensions prominent anteriorly, lamellose, overlapping preceding whorl ..... *Naquetia*  
    Shell broad, varical extension not prominent anteriorly, frondose, branches not overlapping preceding whorl, shoulder spine large, followed by four short spines increasing in length on body whorl ..... *Chicoreus*
5. Spire depressed, body whorl large with three rows of spinose tubercles, row on shoulder prominent, gradually decrease in following rows, umbilicus deep and wide...  
    ..... *Rapana*

- Spire high, body whorl with less than three rows of tubercles, umbilicus shallow and narrow ..... 6
6. Whorls carinate, angular body whorl with two rows of spinose tubercles, shoulder row prominent.....*Cymia*  
Whorls not carinate, rounded body whorl with or without rows of tubercles..... 7
7. Shell globose, spire less elevate, large, columella calloused, body whorl with three to four rows of tubercles, gradually obsolete; outer lip lirate ..... *Mancinella*  
Shell spindle or ovate, spire high, aperture small, columella not calloused, body whorl with either tubercles or spiral ridges, outer lip denticulate..... 8
8. Shell ovate, whorls nodulose or with axial ribs whorls not angulate, inner lip with few plications anteriorly ..... *Morula*  
Shell spindle shaped, whorls angulate, with spiral ridges, inner lip smooth.....*Thais*

## Subfamily MURICINAE

Genus 51. *Chicoreus* Montfort, 181077. *Chicoreus microphyllus* (Lamarck)1816. *Murex microphyllus* Lamarck, *Encycl. Meth.*, pt. 28, pl. 415, list p. 5 (Type locality : Not known).1976. *Chicoreus microphyllus* : Radwin & D'Attilio, *Murex Shells of the world* : 39, pl. 4, fig. 7, pl. 5, fig. 7.

**Material examined** : Ganjam district : 1 ex., Off Gopalpur, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 73.60; D. 32.70; LC. 21.14; HS. 36.86.

**Distribution** : India : Orissa (as above), Tamil Nadu : Madras; Andamans. Elsewhere : Throughout Indo Pacific (Radwin and D'Attilio, 1976).

Genus 52. *Murex* Linnaeus, 175878. *Murex trapa* Roeding1798. *Murex trapa* Roeding, *Museum Boltenianum* : 145 (Type locality : Not given).1976. *Murex trapa* : Radwin & D'Attilio, *Murex Shells of the world* : 72, pl. 10, fig. 14.

**Material examined** : Baleshwar district : 2 exs., Chandipur, coll. No data. Cuttack district : 6 exs., Lions' Rump, coll. N.V.S.R., 4-5.iii.1964; 3 exs., off Paradip, coll. V.K.P., 31.i.1972. Puri district: 1 ex., Puri, coll. M.C. & G.R.K., 19.ii.1948. 1 ex., Orissa Coast, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 43.25-79.40; D. 22.78-39.24.

**Distribution** : India : Orissa (as above). Common on East coast from Sand Heads in Hooghly mouth to Madras and Andamans.

**Remarks** : This species closely resembles *M. tribulus* but differs from it in having angular whorls and long labial tooth on outer margin. Usually collected in fishermen's nets in shallow water.

79. *Murex tribulus* Linnaeus, 1758.1758. *Murex tribulus* Linnaeus, *Syst. Nat.* ed. 10 : 746, (Type locality : O. Asia)1976. *Murex tribulus* Radwin & D'Attilio, *Murex Shells of the world* : 72, pl. 10, figs. 8-9, text. figs. 40-42.

1977. *Murex tribulus* : Ray, *Contribution to the knowledge of the Molluscan fauna of Maungmagan, Lower Burma* : 46.

*Material examined* : Baleshwar district : 1 ex., Chandipur, coll. B.P. & S.L.H. Cuttack district : 3 exs., Chandrafhaga near Konarak, coll. V.K.P., 11.ii.1972. Puri district : 12 exs., coll. G.R.K., 15.xi.1962. Ganjam district: 3 exs., Chatrapur, coll G.R.K., 24.xi.1962. Orissa coast. Bengal Fisheries (Golden Crown).

*Measurements* : L. 41.45 82.55; D. 19.75 - 47.10.

*Distribution* : India : Orissa (as above), very common on both the coasts. Elsewhere : Indo-west Pacific (Radwin & D'Attilio, 1976).

Genus 53. *Naquetia* Jousseume, 1880

80. *Naquetia annandalei* (Preston)

(Pl. IX, figs. 3,4)

1910. *Pteronotus annandalei* Preston, *Rec. Indian Mus.*, 5 : 118, fig. 3. (Type locality : Off Gopalpur, 55-153 M).

1968. *Pterynotus (Naquetia) annandalei* : Vokes, *J. Conch. Lond.*, 26 : 302, pl. 13, fig. 1-2 (for Synonyms).

1976. *Naquetia annandalei* : Radwin and D'Attilio, *Murex Shells of the world* : 80, pl. 15, figs. 9-10.

*Material examined* : Ganjam district : 1 ex., Off Gopalpur, 55-153 M. Holotype. coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 75.84; D. 30.60.

*Distribution* : India : Known only from type locality. Orissa (as above). Elsewhere: East Africa and Red sea; Burma, Andaman sea near Tavoy coast. (Radwin & D'Attilio, 1976).

*Remarks* : There are no subsequent records of this species from India after its original discovery.

Subfamily RAPANINAE

Genus 54. *Rapana* Schumacher, 1817

81. *Rapana rapiformis* (Born)

1778. *Murex rapiformis* var. Born, *Index Rerum Naturalium Musei Caesarei Vindobonensis* pt. 1 (Type locality : Not Known).

1817. *Buccinum bulbosum* (Solander MSS) Dillwyn, *Catalogue of Recent Shells*, 2 : 631, sp. 104.

1972. *Rapana rapiformis* : Cernohorsky, *Marine Shells of the Pacific* 2 : 124, pl. 35, fig. 6.

*Material examined* : Baleshwar district : 2 exs., Balasore Bay, coll. Bengal Fisheries (Golden Crown). Cuttack district : 1 ex., Khira Gachha Madeli, coll. N.V.S.R., 1.iii.1964; 1 ex., Lions' Rump, coll. N.V.S.R., 5.iii.1964. Puri district : 1 ex., Puri, coll. G.R.K., 15.xi.1962.

*Measurements* : L. 23.20 30.95; D. 18.64 - 24.10.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Porto Novo; Pondicherry; Gujarat. Elsewhere: Persian Gulf, Pakistan, Sri Lanka, Philippines. China, Japan.

*Remarks* : This species was reported earlier as *Rapana bulbosa* (Satyamurti, 1952). It occurs at moderate depth in inshore waters and generally caught in fishermen's nets.

Subfamily THAIDINAE

Genus 55. *Cronia* H. & A. Adams, 1853.

82. *Cronia (Ergalatax) contracta* (Reeve)

1864. *Buccinum contractum* Reeve, *Conch. Icon.*, 3 *Buccinum* sp. 53, pl. 8, fig. 53 (Type locality : Samar island, Philippines).

1875. *Sistrum undatum* Chemnitz var. *indicum* Nevill, *J. Asiat. Soc. Beng.*, 44 (2) : 83.  
 1976. *Cronia (Ergalatax) contracta* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 13 : 123, figs. 37-47 (for other synonyms).

*Material examined* : Ganjam district : 1 ex., Ganjam Coast, 44-55 M

*Measurements* : L. 20.10; D. 10.54.

*Distribution* : India : Orissa (as above). Both the coasts of India and Andaman and Nicobar Islands. Elsewhere : Persian Gulf, Sri Lanka, Pakistan : Karachi; Burma; Indo West Pacific from Japan to Australia and New Caledonia to East Africa (Radwin & D'Attilio, 1976).

*Remarks* : This species has been reported earlier under several names. It closely resembles *Cronia margariticola* (Broderip), a variable species.

### Genus 56. *Cymia* Moerch, 1861

#### 83. *Cymia lacera* (Born)

1778. *Purpura lacera* Born, *Index Rerum Naturalium Musei Casareii Vinodobonensis* : 308.  
 1822. *Purpura carinifera* Lamarck, *Hist. nat. Anim. sans. Vert.*, 7 : (241, sp. 19, (Type locality ?)  
 1914. *Thais carinifera* : Preston, *Rec. Indian Mus.*, 10 : 299.  
 1916. *Thais carinifera* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 343.  
 1922. *Cuma disjuncta* Annandale, *Mem. Asiat. Soc. Beng.*, 7 : 266, fig. 2A (Type locality : Andamans).  
 1924. *Cuma disjuncta* var. *obliterata* Annandale, *Mem. Indian Mus.*, 5 : 870 (Type locality : Barkuda, Chilka Lake).  
 1975. *Cymia carinifera* : Subba Rao & Mookherjee, *Recent Researches in Estuarine Biology* (ed.) Natarajan : 170.

*Material examined* : Baleshwar district : 6 exs., Chandipur, coll. G.R.K., 4-6.xi.1962; 1 ex., Chandipur, coll. B.P. & S.L.H. 7.iii.1939. Cuttack district : 7 exs., Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964; 19 exs., Hukitola, coll. N.V.S.R., 17.iii.1964; 1 ex., Lions' Rump, coll. N.V.S.R., 4-5.iii.1964. Puri district : Chilka Lake - 8 exs., Gopakuda Island, coll. Chilka Survey, 7-15. viii.1907; 3 exs., Barkuda island, coll. N.A., 26.i.1914 & 16.2.1914; 2 exs., Satpara, coll. Chilka Survey, Nov. 1914; 30 exs., On shore, coll. N.A. December, 1919; 1 ex., Barkuda Island, coll. N.A. 15.xii.1919; 2 exs., Breakfast Island, coll. N.A. & S.W.K.; 2 exs., Off Samal Island, coll. N.A. & S.W.K.; 3 exs., Chilka Lake; 66 exs., Gopakuda coll. H.C.R., 8.i.1955; 34 exs., Cheriyaakuda island, coll. H.C.R. 7.i.1855; 4 exs., Rambha Bay, coll. H.C.R., 6.i.1955; 4 exs., Dumkuda nr. Kallikota, coll. H.C.R., 20.i.1954; 86 exs., Cheriyaakuda Island, coll. K.S.M. 7.ii.1954; 1 ex., Kaliyugeswar nr. Balugaon, coll. V.K.P., 22.iii.1973; 21 exs., Kalidai Island, coll. G.R.K., 21.ii.1978.

*Measurements* : L. 7.35 - 46.10; D. 4.36 - 36.80.

*Distribution* : India : Orissa (as above); West Bengal; Port Canning, Sagar island, Sunderbans, Digha; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Ennur backwaters; Kerala : Cochin; Karnataka : Mangalore, Malpe, Karwar; Goa; Maharashtra: Bombay : Gujarat. Elsewhere : Persian Gulf : Pakistan Karachi; Sri Lanka.

*Remarks* : This species is commonly found attached to rocks, and jetty piles in river mouths. Subrahmanyam *et. al.* (1952) stated that "this species largely collected for eating purpose."

Cernohorsky (Personal communication) synonymised the species, *Purpura carinifera* Lamarck under the present species.

Genus 57. *Mancinella* Link, 1807

84. *Mancinella bufo* (Lamarck)

1822. *Purpura bufo* Lamarck, *Hist. nat. Anim. sans. Vert.*, 7 : 239 99, fig. 13, (Type locality : ?)

1972. *Mancinella bufo* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 123, pl. 34, fig. 8.

*Material examined* : Ganjam district : 6 exs., Gopalpur, coll. G.R.K., 12 & 29.xi.1962; 125 exs., nr. light house, Gopalpur, coll. V.K.P., 15.ii.1972. & 31.iii.1973.

*Measurements* : L. 8.80 - 40.32; D. 5.90 - 31.50

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu: Madras, Pamban; Kerala; Goa; Maharashtra : Bombay; Gujarat. Elsewhere : Widely distributed in Indo Pacific. Moderately uncommon and ranges westward from Queensland, Australia (Cernohorsky, 1972).

Genus 58. *Morula* Schumacher, 1817

*Key to species*

Shell with squarose tubercles arranged in rows; body whorl without prominent cords; axial sculpture absent.....*M. granulata*

Shell with scabrous spiral cords, tubercles not squarose; body whorl with two prominent cords; axial sculpture present .....*M. biconica*

85. *Morula biconica* (Blainville)

1832. *Purpura biconica* Blainville, *Nouv. Ann. Mus., Hist. nat.* 1 : 203, pl. 9. fig. 1 (Type locality : Not given).

1972. *Morula biconica* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 127, Pl. 35, fig. 11.

*Material examined* : Ganjam district : 1ex., Ganjam coast (44-55 M) coll. Bengal Fisheries (Golden crown).

*Measurements* : L. 13.90; D. 7.35.

*Distribution* : India : Orissa (as above), Andamans. Elsewhere : Mauritius, Maldives, Sri Lanka. Moderately common and widely distributed throughout Tropical Pacific (Cernohorsky, 1972).

*Remarks* : This species can be distinguished from *M. granulata* by the presence of two prominent rows of cords and eight to nine axial ribs on body whorl.

86. *Morula granulata* (Duclos)

1832. *Purpura granulata* Duclos, *Ann. Sci. Nat.* 2, fig. 9. (Type locality : ?)

1972. *Morula granulata* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 127, pl.36, fig. 2.

*Material examined* : Ganjam coast : 1 ex., N. of light house, Gopal pur, coll. V.K.P., 31.iii.1973.

*Measurements* : L. 15.18; D. 9.20.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Waltair, Bhimlipatnam; Tamil Nadu: Krusadai Island, Mandapam; Kerala: Kovalam; Karnataka: Kumta; Maharashtra : Bombay; Diu; Gujarat, Andaman and Nicobar Islands; Lakshadweep. Elsewhere : Persian Gulf; Maldives; Sri Lanka. Common throughout tropical Indo pacific (Cernohorsky, 1972).

*Remarks* : This species occurs on rock boulders in the intertidal region. Formerly it was reported

as *Drupa tuberculata* (Blainvill). This species can be easily distinguished from preceding one in having squarose tubercles, and in the absence of white bands.

Genus 59. *Thais* Roeding, 1798.

87. *Thais rugosa* (Born)

1778. *Murex rugosus* Born, *Index Rerum Naturalium Musei Caesarei Vinodbonensis* : 303.

1791. *Murex sacellum* : Gmelin, *Syst. Nat.* ed. 13 : 3530, sp.164 (Refers, Chemnitz, 1788 (Type locality : Nicobar island).

1952. *Thais rugosa* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 6 : 166, pl 16, fig.3.

1974. *Thais sacellum* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 11 : 176, fig. 49.

*Material examined* : Puri district : 1 ex., Black Pagoda, Konarak, coll. Bengal Fisheries (Golden Crown). Ganjam district : 1 ex., N. light house, Gopalpur; 1 ex., Chatrapur, coll. G.R.K., 24.xi.1962, coll. V.K.P. 15.ii.1972.

*Measurements* : L 31. 26; D. 22.24.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Goa; Karnataka : Bhatkal; Maharashtra: Bombay; Gujarat. Elsewhere : Pakistan: Karachi; Sri Lanka, Burma, Mergui Archipelago, Singapore, Philippines; Indonesia.

88. *Thais tissoti* (Petit)

1852. *Purpura tissoti* Petit, *J. Conch. Paris*, 3 : 163, pl. 7, figs. 4a-b (Type locality : Bombay, India).

1977. *Thais (Mancinella) tissoti* : Ray, *Contribution to the Knowledge of the Molluscan fauna of Maungmagan, Lower Burma* : 52.

*Material examined* : Cuttack district : 2 exs., Loc. Paradip coast, coll. S.K.M., 9 Sept. 1984. (Juveniles).

*Measurements* : L. 16.25-16.45; D. 10.05-10.50.

*Distribution* : India : Orissa (as above); Common on both the coasts of India except West Bengal. Elsewhere : Persian Gulf, Pakistan : Baluchistan; Sri Lanka, Burma.

*Remarks* : Generally occurs in crevices of rocks in the intertidal region. The present material includes 2 juvenile forms in which sculpture is not well developed.

Family BUCCINIDAE

Key to genera

1. Shell smooth; suture channeled, sloping inwards; columella calloused.....*Babylonia*  
Shell sculptured; suture not channeled; columella not calloused..... 2
2. Shell narrow, elongate; sculptured with tubercles; varix continuous on whorls.....  
.....*Colubraria*  
Shell broad; sculptured with ridges either axial or spiral or both; varix may or may not present, if present not continuous ..... 3
3. Spire short; body whorl ovate; umbilicus present; varix absent; outer lip not thickened.....*Cantharus*

Spire long; body whorl rounded, umbilicus absent; varix present on opposite to mouth on body whorl, outer lip thickened.....*Nassaria*

Genus 60. *Babylonia* F. Schulter, 1838

89. *Babylonia spirata* (Linnaeus)

1758. *Buccinum spiratum* Linnaeus, *Syst. Nat.* ed. 10 : 739, No. 405, (Type locality : M. Mediterraneus)  
 1952. *Babylonia spirata* : Satyamurti, *Bull. Madras Govt. Mus., new Ser.* 1 (2), pt. 6 : 175, pl.16, fig.12.  
 1977. *Babylonia spirata* : Ray, *Contribution to the Knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 55 (for other synonyms).

*Material examined* : Cuttack district : 8 exs., Khiragachha Madeli, coll. N.V.S.R. 29.ii.1964, 7 exs., Lions' Rump, Mahanadi estuary coll. N.V.S.R. 4th & 5.iii.1964; 5 exs., Off Paradip, coll. V.K.P., 31.i.1972. Puri district : 4 exs., puri, coll. G.R.K., 15.xi.1962; 1 ex., Puri behind Circuit house, coll. V.K.P., 6.ii.1972; 2 exs., Puri, coll. G.R.K., 15.ii.1962; 1 ex., Mouth of Chilka Lake, coll. K.S.M., 30.i.1954. Ganjam district : 1 ex., Gopalpur, coll. M.C. & G.R.K., 21.ii.1948; 9 exs., Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 25.65 - 52.96; D. 17.50 37.30.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Kundugal point, Pamban, Krusadai, Shingle Island, Madras; Kerala coast; Maharashtra : Bombay; Gujarat : Beyt Island (Kutch); Andamans. Elsewhere : Sri Lanka Pakistan: Karachi; Burma : Maungmagan; Malaysia : Penang; Indonesia : Timor; Philippines; Indo Pacific species.

*Remarks* : Ray (1977) mentions that the species shows a great deal of variation in its shell characters in different stages of growth and development and he treats *Eburna canaliculata* Schumcher as conspecific with *B. spirata*.

Genus 61. *Cantharus* (Bolten) Roeding, 1798

90. *Cantharus tranquebaricus* (Gmelin)

1791. *Buccinum tranquebaricus* Gmelin, *Syst. Nat.* ed. 13 : 3491, No. 86. (Type locality : Coromandel).  
 1977. *Cantharus (Cantharus) tranquebaricus* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungamagan, Lower Burma* : 56.

*Material examined* : Baleshwar district : 1 ex., Baleshwar Bay coll. Bengal Fisheries, (Golden Crown); Puri district : 2 exs., Black pagoda, Konarak, Orissa coast coll. Bengal Fisheries, (Golden Crown)

*Measurements* : L. 17.70 - 32.72; D. 12.46 - 21.30.

*Distribution* : India : Orissa (as above); Tamil Nadu; Madras, Tranquebar. Elsewhere : Sri Lanka; Mauritius, Burma: Maungmagan, Indonesia : Java, Solomon Island, Sullivan Island in Pacific.

Genus 62. *Nassaria* Link, 1807

91. *Nassaria nivea* (Gmelin)

1791. *Buccinum niveum* Gmelin, *Syst. Nat.* ed. 13 : 3495, (non p. 3509) sp. 154 (Type locality : Not given)  
 1904. *Nassaria nivea* Smith, *Ann. Mag. nat. Hist.*, (7) 13 : 464,

*Material examined* : Ganjam district : 4 exs., Ganjam coast coll. Bengal Fisheries, (Golden Crown). Puri district : 3 exs., Puri, coll. No.

*Measurements* : L. 18.85 - 29.50; D. 11.20 - 17.56.

**Distribution** : India : Orissa (as above); Andhra Pradesh, Visakhapatnam; Tamil Nadu : Tranquebar. Elsewhere : Sri Lanka, Burma : Gulf of Martaban; Malaysia : Malacca.

92. *Nassaria suturalis* (Adams)

1853. *Hindsia suturalis* A. Adams, *Proc. zool. Soc. Lond.*, 1853, pt. 21 : 183 (Type locality : Malacca).  
 1904. *Nassaria suturalis* : Smith, *Ann. Mag. nat. Hist.*, (7) 13 : 463.  
 1952. *Nassaria suturalis* : Subrahmanyam *et. al. J. Univ. Bombay* 21 (3) : 47, fig. 116.

**Material examined** : Baleshwar district : 2 exs., Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). Puri district : 1 ex., Black pagoda, Konarak, coll. Bengal Fisheries (Golden Crown); 4 exs., Puri, coll. No. Data; 6 exs. off puri, coll. Marine Survey; 1 ex., Puri, coll. M.C. & G.R.K., 20.ii.1948. Ganjam district : 2 exs., 2 exs., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 17.30 - 20.20; D. 10.30 - 12.26.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Bombay. Elsewhere : Sri Lanka, Malaysia: Philippines.

**Remarks** : Some of the shells are found encrusted with corals and serpulid tubes. This species can be distinguished from preceding species in having less number of longitudinal ribs, canaliculate suture, rounded aperture and short canal.

Genus 63. *Colubraria* Schumacher, 1817

93. *Colubraria muricata* (Lightfoot)

(Pl. IX, Figs. 1, 2)

1786. *Murex muricata* Lightfoot, *A catalogue of the Portland Museum* London:  
 1791. *Murex maculosus* Gmelin, *Syst. Nat.* ed. 13 : 3548 (Type locality : India).  
 1982. *Colubraria muricata* : Abbott and Dance, *Compendium of Sea shells* : 173, fig.

**Material examined** : Ganjam district : 1 ex., Off Gopalpur, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 9.80; D. 4.10-; HA. 5.20.

**Distribution** : India : Orissa (as above) only. Elsewhere : Philippines. It is a first record from India.

**Remarks** : Shell small, fusiform, spire elevated, consists of seven whorls including nuclear whorls, which are four in numbers, smooth, bright, rounded, body whorl and spiral whorls with single rounded varix, body whorl large, ovately rounded, aperture narrowly ovate, outer lip thick, rounded with eleven fine denticles. Columella plicated, siphonal canal short, open, recurved, sculpture with fine rounded nodules, spirally arranged, interstices with fine spiral cords extending on to varices.

Family XXXIII MELONGENIDAE

Commonly known as Crown Conchs, Whelks or False Trumpets,

Genus 64. *Pugilina* Schumacher, 1817

94. *Pugilina cochlidium* (Linnaeus)

1758. *Murex cochlidium* Linnaeus, *Syst. Nat.* ed.10 : 753, sp. 482. (Type locality : Not given).  
 1975. *Semifusus pugilinus* : Subba Rao & Mookherjee, *Recent Researches in estuarine Biology.* (ed.) Natarajan 171.  
 1982. *Pugilina cochlidium* : Abbott and Dance, *Compendium of Sea Shells* : 176, fig. coll. Bengal Fisheries (Golden Crown).

**Material examined** : Baleshwar district : 2 exs., Balasore Bay, coll. Bengal Fisheries, (Golden



Crown). Cuttack district : 7 exs., Hukitola, coll. N.V.S.R., 17.iii.1964; 1 ex., Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964; 1 ex., Off Paradip, coll. V.K.P. 31.i.1972. Puri district : 2 exs., Kaliyugeswar, Chilka, coll. R.K. Kacker, 9.iii.1974.

*Measurements* : L. 50.05 - 111.85; D. 27.05 - \*71.38 (\*including spines).

*Distribution* : India : Orissa (as above); West Bengal : Digha, Port Canning, Sagar Island; Andhra Pradesh : Visakhapatnam; Tamil Nadu: Madras, Rameswaram; Maharashtra : Bombay ; Gujarat; Andamans. Elsewhere : Persian Gulf, Sri Lanka, Malayasia: Penang, Torres Strait, Uncommon and ranges from North Australia westwards into Indian ocean (Cernohorsky, 1972).

*Remarks* : The species reported earlier under the name *P. pugilina* (Born) may belong to this species. In juveniles the tubercles may be either absent or very indistinct.

Family XXXIV NASSARIIDAE

The family includes thirteen species under three genera from Orissa.

*Key to genera*

1. Shell turreted, spire more elongated and longer than body whorl.....*Bullia*  
Shell ovate or conical, spire small and either equal or less than body whorl in length.  
..... 2
2. Shell conical, suture distinct with beaded threads just below it.....*Cyllene*  
Shell ovate, suture shallow, without beaded threads just below it..... *Nassarius*

Genus 65. *Nassarius* Dumeril, 1806

*Key to species*

1. Shell smaller in size, not exceeding 12 mm in height; columella without callous; outer lip devoid of denticles inside..... 2  
Shell large, exceeds more than 12 mm is height, columella either calloused or not; outer lip with denticles inside..... 4
2. Whorls flat and mildly sculptred..... 3  
Whorls angulate and strongly sculptured.....*N. (Pygmaeonassa) orissaensis*
3. Shell ovately conical; body whorl with constriction below suture.....  
.....*N. (Aciculina) subconstricta*  
Shell turreted; body whorl without any constriction below suture.....  
.....*N. (Aciculina) vittatus*
4. Shell usually smooth, sculpture if present consists of axial ribs confined to spiral whorls ..... 5  
Shell sculptured with axial ribs and spiral cords ..... 8
5. Suture shallow; body whorl with hump in middle; parietal callus spread posteriorly...  
..... *N. pullus*  
Suture deep; body whorl without hump; parietal callous either present or absent ..... 6

6. Suture canaliculate; parietal callus enlarged ..... *N. dorsatus*  
 Suture deep, not canaliculate; parietal callous not enlarged ..... 7
7. Shell oblong; suture channeled, inner lip less curved, plicated throughout .....  
 ..... *N. foveolatus*  
 Shell ventricose; suture not channeled; inner lip more curved, plicated anteriorly .....  
 ..... *N. comptus*
8. Shell sculptured throughout with both axial ribs and spiral cords ..... 9  
 Shell sculptured with prominent axial ribs; spiral sculpture limited to base of body  
 whorl ..... 11
9. Body whorl with nodulose ribs; ribs distant; columellar callous extends and almost  
 reaches spire ..... *N. callospira*  
 Body whorl with numerous axial ribs; ribs close; columellar callous not extending  
 beyond body whorl ..... 10
10. Parietal callous well developed; extends posteriorly; prominent presutural groove  
 separates rest of sculpture ..... *N. livescens*  
 Parietal callous less developed; no prominent sutural groove ..... *N. variegatus*
11. Axial ribs extend to base of body whorl; interstices narrow, marked with fine spiral  
 threads; suture deep ..... *N. ariel*  
 Axial ribs obsolete on lower part of body whorl; interstices broad, smooth, suture  
 shallow and wavy ..... 12
12. Shell with few spiral cords below suture; body whorl with broad chestnut bands .....  
 ..... *N. stolatus*  
 Shell without spiral cords below suture; body whorl with faint bands on upper part  
 only ..... *N. jacksonianus*

#### Subgenus *Aciculina* A. Adams, 1853

#### 95. *Nassarius (Aciculina) subconstrictus* (Sowerby)

1899. *Nassa subconstricta* Sowerby, G.B., *Proc malac. Soc. Lond.*, 3 : 301, fig. (Type locality : Port Canning).  
 1914. *Nassa denegabilis* Preston, *Rec. Indian Mus.*, 10 : 297, fig. 9, (Type locality : Lake Chilka "along marine  
 side of Lake estuary"). New synonymy.  
 1942. *Pygmaeonassa denegabilis* : Gravely, *Bull. Madras Govt. Mus. new Ser* 5 (2) : 62.

*Material examined* : Cuttack district : 1 ex., Lions' Rump, coll. N.V.S.R. 4.iii.1964; Puri  
 district : Several examples, Chilka Lake (Rambha, Manikpatna, Barnikuda, Nalbano, Satpara, Serua  
 nadi, Balugaon etc. coll. Chilka Survey; 11 exs., Barkuda, coll. K.S.M. 20.i.1954; 58 exs., Barkul  
 Dak Bunglow Chilka, coll. H.C.R.

*Measurements* : L. 5.75 - 10.40; D. 2.90 - 4.50.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning; Tamil Nadu : Ennur  
 Backwaters near Madras. Known only from India.

*Remarks* : The species described by Preston (1914) under the name *Nassa denegabilis* is similar  
 to *N. subconstricta* Sowerby and hence it is treated as a synonym of the latter.

96. *Nassarius (Aciculina) vittatus* (A. Adams)  
(pl. IX. figs. 5, 6)

1851. *Nassa (Aciculina) vittata* A. Adams, *Proc. zool. Soc. Lond.*, 1851: 114 (Type locality : Ticao Island, Philippines in 11 M).  
1853. *Nassa vittata* : Reeve, *Conch. Icon.*, 8 *Nassa* sp. 160, pl. 24, fig. 160a-b.  
1972. *Nassarius (Aciculina) vittatus* : Cernohorsky, *Rec. Auckland Inst Mus.* 9 : 188, figs. 161-162.

*Material examined* : Puri district : 5 exs., Puri coll. No data; 3 exs., Chilka Lake, coll. No data; 1 ex., Balugaon, Chilka Lake, coll. K.S.M. 21.i.1954; 30 exs., Baradi, 22 Kms. E. of Balugaon, coll. K.S.M. 22.i.1954.

*Measurements* : L. 7.89 - 10.90; 30.70 - 5.10.

*Distribution* : India : Orissa (as above) only. Elsewhere : Sri Lanka, Philippines.

*Remarks* : Shell small turreted, acuminate, shining; body whorl slightly large, aperture small, ovate; outer lip thick; columella calloused, canal short, notched; sculpture with axial ribs, strong on last whorls, wide, obsolete at base of body whorl, spiral sculpture strong at base, colour white to light brown, sometimes with dark brown band in interstices below suture, aperture white.

This species closely agrees with *N. subconstrictus* (Sowerby) but differs from it in being stumpy and in lacking subsutural constriction.

Subgenus *Hima* Gray, 1852

97. *Nassarius (Hima) stolatus* (Gmelin, 1791)

1791. *Buccinum stolatum* Gmelin, *Syst., Nad ed.* 13 : 3496, sp. no. 121 (Type locality : Tranquebar).  
1874. *Nassa (Hima)sistroidea* G.H. Nevill, *J.Asiat. Soc. Beng.*, (2) 43 : 24, pl. 1, fig. 6 (Type locality: Andmans).  
1914. *Nassa sistroidea* : Preston, *Rec. Indian Mus.*, 10 : 270.  
1915. *Nassa sistroidea* : Preston, *Rec. Indian Mus.*, 11 : 290  
1916. *Nassa sistroidea* : Annandale and Kemp, *Mem. Indian Mus.*, 5:342.  
1975. *Nassarius (Hima) stolatus* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology.* (ed. Natarajan) : 170.

*Material examined* : Baleshwar district : 32 exs., Baleshwar, coll. F.H. Gravely; 15 exs., Chandipur, coll. S.L.H. & A.G.K.M. 27.vi.1949; 20 exs., Chandipur, coll. B.P. & S.L.H. 4.iii.1939; 61 exs., Chandipur, coll. G.R.K. 4-6.xi.1962; 2 exs., Kasafal, coll. V.K.P. 10.iii.1973. Cuttack district : 80 exs. Khira Gachha Madeli, coll. N.V.S.R. 29.ii.1964; 2 exs., Hukitola, coll. N.V.S.R., 17.iii.1964. Puri district : 2 exs., Satpara, Chilka Lake, coll.? Nov., 1914; 1 ex., Stn., 124 Serua nadi, coll. Chilka Survey.

*Measurements* : L. 6.13 - 22.72; D. 3.52 - 13.00.

*Distribution* : India : Orissa (as above); West Bengal : Calcutta, Sagar Island, Digha; Andhra Pradesh : Kakinada Bay; Tamil Nadu: Tranquebar, Pamban, Madras; Maharashtra : Bombay. Elsewhere : Gulf of Aden, Persian Gulf, Red Sea to Philippines and to Japan (Subba Rao & Mookherjee, 1975).

*Remarks* : In juveniles spiral ridges are more prominent throughout body.

Subgenus *Niotha* H. & A. Adams, 1853

98. *Nassarius (Niotha) ariel* (Preston)  
(Pl. X, figs. 1, 2)

1910. *Nassa ariel* Preston, *Rec. Indian Mus.*, 5 : 118, fig. 2. (Type locality : Balasore Bay).

*Material examined* : Baleshwar district : 1 ex., Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). (Holotype) 29.xi.1909.

*Measurements* : L. 7.40; D. 4.48; HA. 3.81.

*Distribution* : India : Known from Orissa (Type locality) only.

*Remarks* : Shell small, measuring 7.40 mm. in length, ovate, spire elevated, acute, consists of seven whorls including protoconch of three whorls, which are smooth and convex, but rest are ribbed, flattened and angulate below suture; suture deep, body whorl large, axially ribbed, interstices costulate, lower part of body whorl traversed by six deep spiral grooves; aperture ovate, outer lip thick, denticulate, lirate interior; columella concave, smooth, with a prominent ridge posteriorly, calloused, but not extended, deep groove anteriorly above canal; canal short, broadly notched.

This species closely resembles *Nassarius nodiferus* (Powis) but differs from it in size, in the absence of plications on the columella and in the presence of deep groove below the suture.

#### 99. *Nassarius (Niotha) jacksonianus* (Quoy & Gaimard)

1833. *Buccinum jacksonianum* Quoy & Gaimard, *Zool. Voy. de L' Astrolabe* 2 : 452, pl. 32, figs. 28-29 (Type locality : Port Jackson, Australia ?).

1904. *Nassa siva* Preston, *Jour. malac.*, 11 : 76, N. 6, figs. 3 & 4.

1914. *Nassa labecula* : Preston, *Rec. Indian Mus.*, 10 : 297.

1916. *Nassa labecula* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 342.

1972. *Nassarius (Niotha) jacksonianus* : Cernohorsky, *Rec. Auckland Inst. Mus.* 9 : 151, fig. 53.

*Material examined* : Puri district : 25 exs., Puri, Coll. ?; 4 exs., Channel between Satpara and Manikpatna, Chilka Lake, Stn. 77, Coll. Chilka Survey.

*Measurements* : L. 9.95 - 15.55; D. 4.95 - 9.05

*Distribution* : India : Orissa (as above); Tamil Nadu : Pamban, Krusadai island, Kundugal Point, Madras; Maharashtra : Bombay. Elsewhere : Mauritius, Malaysia: Penang, Singapore.

*Remarks* : This species was reported as *N. labecula* A. Adams from Chilka Lake (Preston, 1914; Annandale & Kemp, 1916). In juvenile shells axial ribs are well developed on body whorl whereas these are obsolete in adults.

#### 100. *Nassarius (Niotha) livescens* (Philippi)

1849. *Buccinum livescens* Philippi, *Zeit. Malakozool.*, 5 : 135 (Type locality : Manila, Philippines).

1898. *Nassa (Niotha) livescens* : Melvill & Sykes, *Proc. malac. Soc. Lond.*, 3 : 38.

1906. *Nassa nevilleana* Preston, *Proc. malac. Soc. Lond.*, 7 : 34, text fig. (Type locality : Sri Lanka = Ceylon).

1972. *Nassarius (Niotha) livescens* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 9 : 143, figs. 41-42, 61.

*Material examined* : Puri district : 1 ex., Chilka Lake, coll. No data.

*Measurements* : L. 8.94; D. 4.70; HS. 5.90.

*Distribution* : India : Orissa (as above); Andaman and Nicobar Islands. Elsewhere: Sri Lanka; Philippines, Fiji, Indonesia : Borneo, Singapore, Japan.

#### 101. *Nassarius (Niotha) variegatus* (A. Adams)

1852. *Nassa variegata* A. Adams, *Proc. zool. Soc. Lond.*, 1852 : 97 (Type locality : Dalmague etc.)

1904. *Nassa gemmulata* var. Smith, *Ann. Mag. Hist.*, (7) 13 : 464.

1972. *Nassarius (Niotha) variegatus* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 9 : 140, figs. 35-37 (for details synonyms).

*Material examined* : Puri district : 9 exs., Puri, coll. No data; Ganjam district : 6 exs., Chatrapur coll. G.R.K., 24.xi.1962.

*Measurements* : L. 13.90 - 20.60; D. 7.79-13.50; HS. 7.99-11.84; HA. 7.45-11.50.

**Distribution** : India : Orissa (as above); Tamil Nadu: Madras; Karnataka : off Mangalore; Elsewhere : Gulf of Oman, Australia, Japan, Indo Pacific (Cernohorsky, 1972a).

**Remarks** : Generally found in coral and weedy sand, some times mud, intertidal and sub littoral (Cernohorsky, 1972a).

**Subgenus Plicarcularia Thiele, 1929**

**102. *Nassarius (Plicarcularia) callospira* (A. Adams)**

1852. *Nassa (Eione) callospira* A. Adams, *Proc. zool. Soc. Lond.*, 1852; 102. (Type locality : Burias Island, Philippines).

1972. *Nassarius (Plicarcularia) callospira* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 9 : 135, figs. 14 & 25.

**Material examined** : Ganjam district : 1 ex., Chatrapur, coll. G.R.K., 24.xi.1962.

**Measurements** : L. 8.32; D. 6.35 (Spire broken)

**Distribution** : India : Orissa (as above); Andamans. Elsewhere : Philippines, Common in central and western Pacific (Cernohorsky, 1972).

**103. *Nassarius (Plicarcularia) pullus* (Linnaeus)**

1758. *Buccinum pullus* Linnaeus, *Syst. nat. ed. 10* : 737, no. 396 (Type locality : Mediterranean Sea) = error (Asiatic Ocean Bruguiere, 1789).

1789. *Buccinum thersites* Bruguiere, *Encycl. Meth. Vers. 1* : 279, pl. 394, fig. 8.

1952. *Nassa thersites* : Satyamurti, *Bull. Madras Govt. Mus. new Ser. 1* (2) pt. 6: 183, pl. 17, fig. 6a-b.

1972. *Nassarius (Plicarcularia) pullus* : Cernohorsky, *Rec. Auckland Inst. Mus.* 9 : 131, figs. 10-12, 24 (for synonyms).

**Material examined** : Ganjam district : 1 ex., Chatrapur coll. G.R.K., 24.xi.1962.

**Measurements** : L. 17.06; D. 10.30.

**Distribution** : India : Orissa (as above); Tamil Nadu : Krusadai island, Kundugal Point, Pamban, Shingle Island; Pondicherry; Maharashtra : Ratnagiri, Bombay; Gujarat; Andamans. Elsewhere : Persian Gulf, Mauritius, Maldives, Sri Lanka, Burma : Mergui Archipelago. Moderately common in tropical western Pacific (Cernohorsky, 1972).

**Remarks** : This species has been reported under the name *N. thersites* (Bruguiere) by earlier authors.

**Subgenus Pygmaeonassa Annandale, 1924**

**104. *Nassarius (Pygmaeonassa) orissaensis* (Preston)**

(Pl. IX, figs. 7,8)

1914. *Nassa orissaensis* Preston, *Rec. Indian Mus.*, 10 : 299, fig. 10, 10a (Type locality : Off Balugaon, 2-3 M, Chilka Lake).

1915. *Nassa orissaensis* Preston, *Rec. Indian Mus.*, 11 : 1916, *Rec. Indian Mus.*, 12 : 28.

1916. *Nassa orissaensis* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 343.

1924. *Pygmaeonassa orissaensis* Annandale, *Mem. Indian Mus.*, 5 : 869.

**Material examined** : Several examples - Chilka Lake, coll. Chilka Survey.

**Measurements** : L. 2.50 - 5.40; D. 1.30 - 2.75; HS. 1.50 3.35; HA. 1.40 2.70; Lectotype L. 6.45; D. 3.55; HS. 3.95; HA. 3.00.

**Distribution** : India : Known only from Chilka lake & Salt lakes near Calcutta.

**Remarks** : Preston (1914) gave good description and figure. There are nine syntypes in the National Zoological Collections. As Preston (1914) did not designate any holotype we take the

opportunity to designate a lectotype, a figure (Pl.IX, fig. 7, 8) of which is given here. The largest and the best of the lot, the measurements of which are nearer to those cited by the author is selected as lectotype.

Subgenus *Zeuxis* H. & A. Adams, 1953.

105. *Nassarius (Zeuxis) comptus* (A. Adams)

1852. *Nassa compta* A. Adams, *Proc. zool. Soc. Lond.*, 107 (Type locality : Cape St. Antonio, South Africa).

1972. *Nassarius (Zeuxis) comptus* : Cernohorsky, *Rec. Auckland Inst. Mus.*, 9 : 166, figs. 108-110 (for other synonyms).

*Material examined* : 2 exs. Orissa coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 14.32-16.80; D. 7.84-8.70; HS. 9.02-10.12; HA. 7.18-8.37.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Mauritius, Oman: Muscat, Gulf of Oman; Western Australia.

*Remarks* : This species looks similar to *N. luridus* (Gould) but differs from it in having more ventricose body.

106. *Nassarius (Zeuxis) dorsatus* (Roeding)

1798. *Buccinum dorsatum* Roeding, *Museum Boltenianum* : 111, sp. 1431 (Type locality : not given).

1972. *Nassarius (Zeuxis) dorsatus* : Cernohorsky, *Marine Shells of the Pacific* 2 : 150, pl. 43, fig. 8 (for other synonyms).

*Material examined* : Cuttack district : 1 ex., Lions' Rump. coll. NVSR. 4.iii.1964; Puri district : 1 ex., Puri, coll. No data.

*Measurements* : L. 39.42-32.60; D. 21.95-18.22; HS. 21.30-17.50; HA. 21.30-17.50.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Ratnagiri; Andamans. Elsewhere : Moderately common in NE and NW Australia. (Cernohorsky, 1972). Common in Indo Pacific intertidal flats (Abbott & S.P. Dance, 1982).

*Remarks* : This species is very similar to *N. olivaceous* (Bruguiere) but differs from it in having smooth body whorl with apical whorls occasionally ribbed, apertural margin lirate. It is reported as *N. canaliculatus* from Ratnagiri (Melvill, 1928).

107. *Nassarius (Zeuxis) foveolatus* (Dunker, 1847)

1847. *Buccinum foveolatum* Dunker, *Zeit.f.Malakoool.*, 4 : 63, (Type locality : Oriental India).

1915. *Nassa marratii* : Preston, *Rec. Indian Mus.*, 11 : 290,

1916. *Nassa marratii* Annandale and Kemp, *Mem. Indian Mus.*, 5 : 342.

1975. *Nassarius foveolatus* : Cernohorsky, *Rec.Auckland Inst.Mus.*, 12 : 44, figs.51, 51a.

*Material examined* : Puri district : 1 ex., Stn, 115, Chilka lake, coll. Chilka Survey; 4 exs., Puri, coll. No data.

*Measurements* : L. 17.65-19.50; D. 3.35-9.30.

*Distribution* : India : Orissa (as above); West Bengal : Digha, Ganga Sagar; Tamil Nadu : Madras; Kerala, Calicut; Maharashtra : Bombay. Elsewhere : Mauritius; Sri Lanka, Burma: Chaduba, Akyab; Malaysia : Penang; Hong Kong.

*Remarks* : It is commonly found crawling on mudflats in river mouths. The species *N. marratii* Smith reported by Preston, (1915) from Chilka is synonym of this species (Cernohorsky, personal communication).

Genus 66. *Bullia* Gray in Griffith & Pidgeon, 1834

*Key to species*

1. Whorls convex; suture deep, followed by a spiral ridge.....*B. tranquebarica*  
Whorls not convex; suture shallow, followed by transpiral ridges..... 2
2. Body whorl without varices; transpiral ridges distinctly interrupted by spiral grooves; aperture elongately ovate; outer lip margin simple.....*B. vittata*  
Body whorl often with one or more varices; transpiral ridges continuous; aperture round; outer lip thickened forming a varix.....*B. livida*

108. *Bullia (Leiodomus) livida* Reeve

1846. *Bullia livida* Reeve, *Conch. Icon.*, 3, *Bullia* sp.10 pl. 2, fig.10a-b. (Type locality : Zanzibar).

1942. *Bullia livida* : Gravely, *Bull. Madras Govt. Mus., new Ser. 5* (2) : 59, 99.

*Material examined* : Ganjam district : 1 ex., Chatrapur, coll. G.R.K. 24.xi.1962. Puri district : 3 exs., Puri, coll. No data.

*Measurements* : L. 30.80-34.54; D. 11.46-13.15; HS. 21.06-24.28.

*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam; Tamil Nadu : Madras. Elsewhere : Tanzania : Zanzibar (Type locality).

*Remarks* : Shell more or less similar to *B. vittata* (Linnaeus) in all respects, but differs in having transpiral ridges below suture faintly interrupted by a spiral groove. suture deeper, whorls with two to three fine spiral grooves at base; body whorl often with one or two varices.

109. *Bullia (Bullia) tranquebarica* (Roeding)

1798. *Plotia tranquebarica* Roeding, *Museum Boltzenianum* : 96 (refers Chemnitz, vol 4, pl. 155, fig. 1463. (Type locality : Tranquebar).

1834. *Buccinum bellangeri* Kiener, *Icon. cog. Viv.*, 9., : 34. P; 14, fig. 48. (refers Chemnitz op. cit. pl. 155, fig. 1463. (Bengal seas and West of Sri Lanka).

1977. *Bullia (Bullia) tranquebarica* : Cernohorsky, *Auck. Mus. Conc. Sec. Bull. 2* (new series) : 26, fig. 1.

*Material examined* : Puri district : 5 exs., Puri, coll. No. data; 1 ex. Puri, coll. Saibal Dey.

*Measurements* : L. 15.35-31.50; D. 7.15-13.15.

*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam; Tamil Nadu : Madras; Maharashtra : Bombay. Elsewhere : Persian Gulf, Malagasy to Sri Lanka. (Cernohorsky, 1972).

*Remarks* : The species was reported earlier from Indian Ocean under the name *Bullia bellangeri* (Cernohorsky, 1977).

110. *Bullia (Dorsanum) vittata* (Linnaeus)

1767. *Buccinum vittatum* Linnaeus, *Syst. Nat. ed. 12* : 1206 No. 483 (Type locality : ?).

1915. *Bullia vittata* : Preston, *Rec. Indian Mus.*, 11 : 290.

1942. *Bullia vittata* : Gravely, *Bull. Madras Govt. Mus. new Ser 5* (2) : 58, 59, fig. 11a.

1968. *Bullia (Dorsanum) vittata* : Ray, *Indian Mus. Bull. 3* (1 & 2): 22, fig. 15.

1969. *Bullia vittata* : Nagabhushanam *et. al Proc. zool. Soc. Calcutta*, 22 (1) : 6.

*Material examined* : Ganjam district : 1 ex., nr. Light house, Gopalpur, coll. N.C. & G.R.K., 11.ii.1948; 147 exs., coll. G.R.K., 28-29.xi.1962; 5 exs. Light house, Gopalpur, coll. V.K.P., 28-31.iii.1973; 40 exs., Chatrapur, coll. G.R.K., 24.xi.1962. Cuttack district : 3 exs., Khira Gachha

Madeli, coll. G.R.K., 1962; 60 exs., coll. N.V.S.R., 1-3.iii.1964. Puri district: 60 exs., Konarak, coll. G.R.K., 15.ii.1975; 35 exs., coll. S. Bi. 21-28.xii.1975; Puri : 1 ex., coll S.W.K., 24-29.iii.1916; 9 exs., coll. M.C.& G.R.K., 15-20.ii.1948; 3 exs., coll. No data; 82 exs., coll. G.R.K., 9 & 10.ii.1975; 1 ex., Chilka Lake, coll. Chilka Survey.

*Measurements* : L. 6.75 -53.69; D. 2.84-19.74; HS. 4.98-36.43.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam, Bhimilipatnam; Tamil Nadu : Madras; Maharashtra : Bombay. Elsewhere : Tanzania : Zanzibar; Iran : Makran coast; Mauritius; Sri Lanka; Philippines.

*Remarks* : This species closely resembles *Bullia livida* Reeve but differs from it in having spiral grooves throughout the length of the whorl and beaded spiral cords below suture. Both the species occur along the east coast.

It is a common species on sandy coasts of continents where it prefers surf beaten intertidal zone. It has a massive foot, with the help of which it quickly burrows into the sand.

#### Genus 67. *Cyllene* Gray, 1833

##### 111. *Cyllene (Cyllene) fuscata* A. Adams.

1850. *Cyllene fuscata* Adams, *Proc. zool. Soc. Lond.*, 18: 205. (Type locality : West Africa)

1968. *Cyllene (Cyllene) fuscata* : Ray, *Indian Mus. Bull.*, 3 (1 & 2): 23, fig. 16.

*Material examined* : Baleshwar district : 1 ex., Baleshwar, coll. Bengal Fisheries (Golden Crown). Puri district : 3 exs., Puri, coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 10.60-15.30; D. 5.25-8.42.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras; Maharashtra : Bombay. Elsewhere: Iran : Makran coast, Malaysia : Malacca, Singapore, Cape & China (Ray, 1968).

#### Family XXXV FASCIOLARIIDAE

#### Genus 68. *Fusinus* Rafinesque, 1815

##### 112. *Fusinus colus* (Linnaeus)

1758. *Murex colus* Linnaeus, *Syst. Nat.* ed. 10 : 753, sp. 480, (Type locality : India).

1952. *Fusinus longicauda* : Satyamurti, *Bull. Madras Govt. Mus., new Ser.* 1 (2) pt. 6 : 167.

1952. *Fusinus colus* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 162, pl. 48, figs.1-1a (for other synonyms).

*Material examined* : Baleshwar district : 1 ex. Chandipur, coll. No data. Ganjam district : 2 exs., Off Gopalpur, coll. Bengal Fisheries (Golden Crown); 1 ex., Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 78.36-104.40; D. 18.50-23.48.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pamban; Andamans. Elsewhere : Sri Lanka. Uncommon and ranges westward from Central Pacific (Cernohorsky, 1972).

#### Family XXXVI OLIVIDAE

##### Key to genera

1. Shell thin; suture enamelled; columella twisted slightly, aperture wide.....*Amalda*  
Shell thick; suture deep; columella not twisted; aperture some times wide anteriorly 2
2. Columella not calloused posteriorly; aperture narrow throughout.....*Oliva*



Columella heavily calloused posteriorly; aperture widely anteriorly..... 3

3. Shell oblong; spire short; suture not canaliculate ..... *Olivancillaria*

Shell oviform; spire high; suture canaliculate..... *Agaronia*

Genus 69. *Oliva* Bruguiere, 1789

113. *Oliva oliva* (Linnaeus)

1758. *Voluta oliva* Linnaeus, *Syst. Nat.*, ed. 10 : 729, sp. 350 (Type locality : M. Indico).

1967. *Oliva oliva* : Cernohorsky, *Marine shells of the Pacific*, 1 : 190, pl. 48, fig. 342.

1977. *Oliva (Oliva) oliva* : Ray, *Contribution to the knowledge on the Molluscan fauna of Maugmagan, Lower Burma* : 61 (for other synonyms).

**Material examined** : Baleshwar district : 1 ex., Kasafal, N. of Balaramguri, coll. V.K.P. 23.i.1973a. Cuttack district : 3 exs., Khira Gachha Modeli, coll. N.V.S.R. 1-2.iii.1964. Puri district : 1 ex., Konarak, coll. G.R.K. 19.xi.1962; 7 exs., Chandrabhaga, N. of Konarak, Coll. V.K.P. 10 & 11.ii.1972; Puri 12 exs., coll. M.C. & G.R.K., 19 & 20.ii.1948; 14 exs., coll. P.C. Singh, June, 1909; 75 exs., coll. B. Pr. 8 vi. 1936; 275., coll. G.R.K. 10 & 11.ii.1975; 2 exs., Panth Nivas, Puri, coll. G.R.K. 15.ii.1972. Ganjam district : Gopalpur : 19 exs. coll. H.A.H. 21-22.i.1941; 144 exs., coll. G.R.K. 28 & 29.xi.1962; 55 exs. coll. V.K.P 15-18.ii.1972;

**Measurements** : L. 14.48 34.98; D. 6.32 - 17.10.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Kakinada; Tamil Nadu: Madras, Porto Novo; Maharashtra: Bombay. Elsewhere : Throughout tropical Indo Pacific and moderately common (Cernohorsky, 1967).

**Remarks** : This species carries no fewer than 14 names in the synonymy (Cernohorsky, 1967). It was reported by earlier authors under the name *O. ispidula* form east and west coasts of India.

114. *Oliva vidua* (Roeding)

1798. *Porphyra vidua* Roeding, *Museum Boltenianum* : 34, sp. 412 (Type locality : not given).

1967. *Oliva vidua* : Cernohorsky, *Marine Shells of the Pacific*, 1 : 192, pl. 48, fig. 344 & 344a.

**Material examined** : Puri district : 1 ex., Puri, coll. G.R.K. 15.ii.1972 & 28.iii.1973; 8 exs., Chatrapur, coll. G.R.K. 24.xi.1962.

**Measurements** : L. 28.35 - 38.50; D. 13.02 - 17.90.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Pamban; Andamans. Elsewhere : Maldives, Mauritius, Sri Lanka. Throughout the tropical Indo-Pacific moderately common (Cernohorsky, 1967).

**Remarks** : The figure given by Satyamurti (1952, pl. xviii, fig. 3) for *O. oliva* in fact looks like that of *O. vidua*. Both the species are common on the Indian coast, but the latter can be distinguished from the former species by the presence of a beak like structure.

Genus 70. *Agaronia* Gray, 1839

115. *Agaronia nebulosa* (Lamarck)

1845. *Oliva nebulosa* Lamarck, *Hist. Anim. sans. Vert.*, (Deshayes ed.) 10 : 628.

1982. *Agaronia nebulosa* : Abbott and Dance, *Compendium of Sea Shells* : 196, fig.

**Material examined** : Cuttack district : 1 ex., Lions' Rump, coll. N.V.S.R. 5.iii.1964. Puri district : 1 ex., Puri beach, coll. N.A., 1-2.ii.1909; 13 exs., Puri, coll. No data.

**Measurements** : L. 12.50 - 33.70; D. 4.55 - 12.54.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras, Krusadai Island, Pamban; Maharashtra : Bombay; Diu : Simbor; Gujarat : Okha. Elsewhere : Sri Lanka; Indonesia : Sumatra; India Ocean.

**Remarks** : This species has been earlier recorded from east coast by Gravelly (1942), Satyamurti, (1952) and from west coast by Subrahmanyam (1952). Uncommon on Indian coasts.

### Genus 71. *Amalda* Adams H. & A. 1853

#### 116. *Amalda ampla* (Gmelin)

1791. *Voluta ampla* Gmelin, *Syst. Nat.* ed. 13 : 3467, sp. 116. (Type locality : not known)

1952. *Ancilla ampla* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1 (2), pt. 6: 192, pl. 8, figs. 5a-b. (Synonyms)

1982. *Amalda ampla* : Abbott and Dance, *Compendium of Sea Shells* : 195, fig.

**Material examined** : Baleshwar district : 13 exs., Chandipur, coll. B. P. & S.L.H. 4-7.iii.1939; 7 exs. Chandipur, coll. S.L.H. & A.G.K.M., June., 1949; 21 exs., Talburai, coll. G.R.K. 4 & 6.xi.1962; 10 exs., Bagda, nr. Balaramguri, coll. V.K.P., 22.i.1972; 8 exs., Chandipur, 28-30.xi.1984. Ganjam district : 3 exs. Chatrapur, coll. G.R.K., 24.xi.1961.

**Measurements** : L. 10.90-33.39; D. 4.65-13.25.

**Distribution** : India : Orissa (as above); West Bengal; Digha, Ganga Sagar, Bokkhali; Andhra Pradesh : Bhimlipatnam; Tamil Nadu: Krusadai Island, Kundugal point, Pamban; Elsewhere : Red sea; Sri Lanka.

**Remarks** : Very common on beaches near river mouths, or on beaches where the sea is shallow with less vigorous wave action. It is common on the Chandipur beach and the close-by Digha beach. It is collected in large numbers and used in the preparation of necklaces and other ornaments or curios.

### Genus 72. *Olivancillaria* d' Orbigny, 1839

#### 117. *Olivancillaria gibbosa* (Born)

1778. *Voluta gibbosa* Born, *Index Rerum Naturalium Musei Caesarei Vindobonensis* : 202.

1780. *Voluta gibbosa* Born, *Testacea Musei Caesarei vindobonensis* : 215.

1977. *Olivancillaria gibbosa* : Ray, *Contribution to the knowledge on the Molluscan fauna of Maungmagan, Lower Burma* : 60.

**Material examined** : Baleshwar district : 1 ex., Chandipur, coll. S.L.H. & A.G.K.M. 27.vi.1949; 4 exs., Talburai nr. Chandipur, coll. G.R.K., 29.xi.1962; 3 exs., between Balaramguri and Chandipur, coll. V.K.P., March, 1973; 19 exs., Kasafal, Coll. V.K.P., 23.i.1975; 5 exs., Chandipur, coll. N.V.S.R., 28-30.xi.1984. Cuttack district : 2 exs., Lions' Rump, coll. N.V.S.R. 3 & 10.ii.1964; 1 ex., off Paradip, coll. S.W.K., 1916. Puri district : 1 ex., Puri, coll. M.C. & G.R.K., 20.ii.1948; 2 exs., S. of Puri, coll. G.R.K., 15.xi.1962; 1 ex., Chilka Lake, coll. K.S.M., 30.i.1954. Ganjam district : 12 exs., Chatrapur, coll. G.R.K., 24.xi.1962.

**Measurements** : L. 8.80-52.60; D. 3.56-29.14.

**Distribution** : India : Orissa (as above); West Bengal : Digha; Andhra Pradesh : Visakhapatnam, Kakinada, Pulicat; Tamil Nadu : Madras, Pamban, Krusadai Island, Palk Bay; Maharashtra : Bombay; Gujarat : Gulf of Kutch; Andaman & Nicobars. Elsewhere : East and West Africa; Sri Lanka; Burma : Akyab, Maungmagan; Gulf of Thailand, Philippines.

**Remarks** : It can easily be distinguished from other species by its gibbous nature towards upper part of body whorl, and differentiated colour zones towards anterior part.

Family XXXVII HARPIDAE

The family is represented by a single genus *Harpa*.

Genus 73. *Harpa* Roeding, 1798

118. *Harpa davidis* Roeding

1798. *Harpa davidis* Roeding, *Museum Boltenianum* : 150 No. 1878 (refers Martini *Conch. cab.* vol. 3, pl. 119, fig. 1092. (Type locality : Coromandel).

1973. *Harpa davidis* : Rehder, *Indo-Pacif. Mollusca*, 3 (16) : 248, pl. 187, fig. 4-6.

*Material examined* : Cuttack district : 2 exs., Khira Gachha Madeli, coll. G.R.K., 15.xi.62.

*Measurements* : L. 42.56-63.30; D. 27.92-44.25.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madrass, Rameswaram, Pamban, Tranquebar; Andamans & Nicobars. Elsewhere : Maldives, Burma, Thailand, Indonesia, Sri Lanka.

*Remarks* : It is an offshore species and very uncommon; rarely collected in the fishing nets.

Family XXXIX CANCELLARIIDAE

The family is represented by two genera from Orissa.

*Key to genera*

Shell ovately conical, whorls angulate; longitudinally ribbed..... *Trigonostoma*

Shell ovately fusiform; whorls not angulate; cancellate or reticulate..... *Cancellaria*

Genus 74. *Cancellaria* Lamarck, 1799

119. *Cancellaria asperella* Lamarck

1822. *Cancellaria asperella* Lamarck, *Hist Anim. sans. vert.*, 7 : 112. (Type locality : not known).

1972. *Cancellaria asperella* : Cernohorsky, *Marine Shells of the Pacific* 2 : 179. pl. 50, fig. 3.

*Material examined* : 2 exs., Puri, Coll. No data.

*Measurements* : L. 24.52-28.68; D. 16.00-19.78; HS. 10.60-15.70; HA. 17.22-19.65.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : China; Philippines; Japan : Sagamy Bay. Moderately common and ranges northwards from East Australia.

*Remarks* : Cernohorsky (1972) states that *Cancellaria elegans* Sowerby may have chronological priority as he published his volume on 30th April, 1821.

120. *Cancellaria oblonga* Sowerby

1825. *Cancellaria oblonga* Sowerby, *A Catalogue of shells contained in collection of late Earl of Tankerville containing description of many new species*, London.

1832. *Cancellaria bifasciata* Deshayes, *Encycl. Meth. Vers.*, 2 : 181.

1982. *Cancellaria oblonga* : Abbott and Dance, *Compendium of Sea Shells* : 225, fig.

*Material examined* : Puri district : 2 exs., Puri, coll. No data.

*Measurements* : L. 24.32-26.45; D. 13.78-13.90.

*Distribution* : India : Orissa (as above); Maharastra : Bombay. Elsewhere : Straits of Macassar, Indo Pacific.

*Remarks* : Shell fusiformly oblong, spire high, acute, consists of six whorls including

protoconch, rounded, body whorl large, oblong, suture deep, aperture oblongly ovate, outer lip margin crenulate, lirate inside, columella calloused with three plaits, canal short, umbilicus partly covered by callous, sculpture consists of axial ribs intercepted by spiral threads, densely decussated, colour reddish fawn encircled with two faint bands on body whorl, single band on spiral whorls, aperture white, faintly pink inside.

This species is reported for the first time from Bay of Bengal. It was earlier reported from Bombay as *C. bifasciata* by Subrahmanyam (1952) which is a synonym of this species.

#### Genus 75. *Trigonostoma* Blainville, 1827

1845. *Cancellaria lamellosa* Hinds, *Zool. Voy. Sulphur, Moll.*; 43, pl. 12, figs. 15, 16.

1856. *Cancellaria lamellosa* : Reeve, *Conch. Icon.*, 10, *Cancellaria* sp. 65, pl. 14, figs. 65 a-b.

*Material examined* : Puri district : 1 ex., Puri, coll. No data.

*Measurements* : L. 18.86; D. 11.89.

*Distribution* : India : Orissa (as above); Maharashtra : Bombay; Andamans. Elsewhere : Indian Archipelago.

#### Family XXXIX MARGINELLIDAE

The Family includes two genera viz. *Marginella* and *Persicula* from Orissa.

#### Key to genera

Outer lip margin smooth; columella with four plaits; brown bands on dorsal part.....  
.....*Marginella*

Outer lip margin dentate inside, columella with five folds; brown bands absent.....  
.....*Persicula*

#### Genus 76. *Marginella* Lamarck, 1801

##### 122. *Marginella angustata* Sowerby

1846. *Marginella angustata* Sowerby, *Thes. Conchyl.*, 1, *Marginella* : 399, pl. 77, figs. 169-170.

1952. *Marginella angustata* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 6; 199. pl. 19, fig. 5a-b.

*Material examined* : Ganjam district : 2 exs., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 10.45 15.06; D. 5.30 7.59.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Pamban, Krusadai, Tuticorin, off Coromandel coast; Pondichery; Maharashtra : Bombay. Elsewhere : Mauritius; Sri Lanka; Burma : Arakan; Indian Ocean.

#### Genus 77. *Persicula* Schumacher, 1817

##### 123. *Persicula (Gibberula) ventricosa* (Fischer)

1807. *Marginella ventricosa* Fisher, *Mus. Demidoff.*, 3 : 172.

1968. *Persicula (Gibberula) ventricosa* : Ray, *Indian Mus. Bull.*, 3 (1 & 2): 24, fig. 18 (for other synonyms).

*Material examined* : Puri district : 16 exs., off Puri, coll. S.W.K., 24.iii.1916. 1 ex., Puri, coll. Saibal Dey. Ganjam district : 1 ex., S. of light house, Gopalpur, coll. V.K.P., 28.iii.1973.

*Measurements* : L. 3.95 - 23.98; D. 2.15 - 15.15.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras Elsewhere : Iran : Mekaran Coast; Lallan Bay, Elphinstone Island, Malaysia : Penang, Malacca; Singapore; Indonesia : Sumatra (Ray, 1968).

*Remarks* : Ray (1968) mentioned that columellar folds may vary from four to six. Crichton (1940) mentioned that the shell's deep olive green colour fades to dove grey on exposure to air; shell from Puri are very minute, white and glossy.

Family XL MITRIDAE

The family is represented from Orissa by two genera viz. *Cancilla* and *Scabricola*.

*Key to genera*

1. Shell pyriform; sculptured with widely spaced, deep punctate spiral grooves, obsolete at base ..... *Scabricola*  
Shell fusiform; sculptured with angulated, narrow spiral ridges ..... 2
2. Spiral sculpture bisected by deep axial grooves; outer lip thick ..... *Neocancilla*  
Spiral sculpture not bisected by axial grooves; outer lip thin..... *Cancilla*

Genus 78. *Cancilla* Swainson, 1840

124. *Cancilla interlirata* (Reeve,)

1844. *Mitra interlirata* Reeve, *Proc. zool. Soc. Lond.*, 1844: 173 (Type locality : Island of Masbate, Philippines)

1844. *Mitra interlirata* : Reeve, *Conch. Icon.*, 2, *Mitra* pl. 10, fig.70.

1984. *Cancilla interlirata* : Subba Rao and Dey, *Rec. zool. Surv. India Occ. Pap.* 61; 36, pl. 3, fig. 28.

*Material examined* : Puri district : 1 ex., Puri (7-8 M). coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 12.85; D. 4.88.

*Distribution* : India : Orissa (as above); West Bengal: Sand Heads; Tamil Nadu : Coromandel Coast; Andamans & Nicobar.Elsewhere : Very widely distributed throughout the Indo-Pacific. Mauritius to Polynesia and Hawaiian islands (Subba Rao & Dey, 1984).

Genus 79. *Neocancilla* Cernohorsky

The genus includes single species from Orissa.

125. *Neocancilla circula* (Kiener)

1838. *Mitra circula* Kiener, *Icon. Coq. Viv.*, 3 : 21, Pl. 5, fig. 13 (Type locality : Not known).

1984. *Neocancilla circula* : Subba Rao and Dey, *Occ. Pap. Rec. zool. Surv. India*, 61 : 33, pl. 3, fig. 26.

*Material examined* : Ganjam Coast : 1 ex., Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 17.65; D. 6.70; HA. 11.45; HS. 7.15.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Krusadai Island; Andaman and Nicobar Islands. Elsewhere : Mauritius. Throughout Indo Pacific. This is the first record of this species from Orissa.

*Remarks* : This species exhibits the characters of the genus *Cancilla* in having axial grooves bisecting the ridges. It occurs in sand (Cernohorsky, 1967).

species from Orissa.

*Remarks* : This species exhibits the characters of the genus *Cancilla* in having axial grooves bisecting the ridges. It occurs in sand (Cernohorsky, 1967).

Genus 80 *Scabricola* Swainson, 1840

Subgenus *Swainsonia* H. & A. Adams, 1853

126. *Scabricola (Swainsonia) fusca* (Swainson)

1831. *Mitrella fusca* Swainson, *Zool. illust.* 2nd ser. Mitrinae, pl. 6, (Type locality : not given).

1970. *Scabricola (Swainsonia) fusca* : Cernohorsky, *Marine Shells of the Pacific*, 2 : 174, pl. 51, figs. 10.

1984. *Scabricola (Swainsonia) fusca* : Subba Rao and Dey, *Rec. zool. Surv. India Occ. Pap.*, 61 : 44, pl. 3, fig. 33.

*Material examined* : Puri district : 1 ex., Puri, coll. No. data.

*Measurements* : L. 8.63; D. 3.78.

*Distribution* : India : Orissa (as above); Tamil Nadu; Pondicherry, Elsewhere : Mauritius, Philippines.

This species is rare in Western Pacific but more common in Mauritius (Cernohorsky, 1972).

*Remarks* : Spire and outer lip are damaged in single specimen that is available for study from Orissa.

Family XLI COSTELLARIIDAE

Cernohorsky (1976) validated the family Costellaridae Macdonald, 1860 over Vexillidae Thiele, 1929 as per ICZN declaration 43 (1970).

Genus 81. *Vexillum* Roeding, 1798

Subgenus *Costellaria* Swainson, 1840

127. *Vexillum (Costellaria) mandirella* (Ray)

(Pl.X, fig.7)

1968. *Costellaria mandirella* Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 23, fig. 17, (Type locality : Off puri, depth 7-8 M).

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K. 24.iii.1916 (Holotype) 17 exs., (Paratypes).

*Measurements* : L. 5.85 - 7.00; 2.52 - 3.00.

*Distribution* : Known from (Type locality) Puri only. No subsequent record has been made after its original discovery.

*Remarks* : Cernohorsky (1972) treated the genus *Costellaria* Swainson, 1840 as subgenus under genus *Vexillum* Roeding. Hence we treated this species under the genus *Vexillum*.

Family XLII. TURRIDAE

The Family includes large number of species found either in sand or hard reef under coral rocks from intertidal zone to deep water.

*Key to genera*

1. Spire equal to body whorl and canal put together; canal long ..... 2

- Spire longer than body whorl and canal put together; canal short..... 4
2. Whorls angular in middle; sinus narrow, deep on shoulder; canal straight..... 3  
 Whorls rounded in middle; sinus not narrow, shallow 'U' shape above shoulder, canal recurved.....*Turricula*
3. Sculpture on peripheral carina simple, sharp.....*Lophiotoma*  
 Sculpture on peripheral carina gemmulate.....*Gemmula*
4. Shell usually large, exceeds more than 20 mm in height; sinus semicircular, outer lip ascending.....*Brachytoma*  
 Shell small, not exceeding 20 mm in height; sinus very shallow; outer lip not ascending..... 5
5. Whorls straight; sculptured with spiral ridges, ridges finely nodulose; interstices with fine axial threads.....*Asthenotoma*  
 Whorls angular; sculpture consists of both axial and spiral ridges..... 6
6. Columella smooth; outer lip acute; axial sculpture more prominent.....*Mangelia*  
 Columella calloused; outer lip inflexed; both axial and spiral ridges prominent ..... 7
7. Aperture narrow, sinus shallow; canal not recurved.....*Lienardia*  
 Aperture broad; sinus deep; canal recurved.....*Drillia*

Subfamily TURRINAE

Genus 82 *Lophiotoma* Casey, 1904

Subgenus *Lophioturris* Powell, 1964

128. *Lophiotoma (Lophioturris) indica* (Roeding)

(Pl. X, figs. 3, 4)

1798. *Turris indica* Roeding, *Museum Boltenianum* : 124 (refers Martini Chemnitz, pl. 145, figs. 1345, 1346 (Type locality : Not known).
1822. *Pleurotoma marmorata* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 7 : 95 (non 1816).
1964. *Lophiotoma (Lophioturris) indica* : Powell, *Indo-Pacif. Mollusca*, 1 (5) : 313, pl. 175, figs. 2,3,9,16, & pl. 242 (for other synonyms, distribution).

*Material examined* : Puri district : 2 exs., 12.8 Kms. south of Puri, 23 M. coll. Marine Survey; 1 ex., Puri, coll. No data. Ganjam district : 3 exs., Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 43.35-81.70; D. 16.22.-24.62; HS. 24.09-39.52; HA. 20.60 44.10.

*Distribution* : India : Orissa (as above); West Bengal: off Gangetic delta; Tamil Nadu: Madras; Kerala: Calicut; Lakshadweep sea; Gujarat; Andamans. Elsewhere : Persian Gulf, Sri Lanka to Australia and Fiji (Powell, 1964).

*Remarks* : This species is better known under the name *Pleurotoma marmorata* Lamarck. It shows close resemblances to *Gemmula unedo* (Kiener) but differs from it in not having gemmulations on peripheral carina and spire being longer than the total length of aperture plus canal.

Genus 83. *Gemmula* Weinkauff, 1875129. *Gemmula speciosa* (Reeve)

(Pl. X, figs. 5,6)

1843. *Pleurotoma speciosa* Reeve, *Conch. Icon.*, 1, *Pleurotoma*, sp.9, pl.2, fig.9, (Type locality : Not given).1896. *Pleurotoma carinata* : Smith, *Ann. Mag. nat. Hist.* (6) 18 : 368.1964. *Gemmula speciosa* : Powell, *Indo Pacif. Mollusca* 1 (5) : 245, pl. 186, fig. 1.*Material examined* : Ganjam district : 2 exs., Ganjam Coast, coll. Bengal Fisheries (Golden Crown); 1 ex., Chatrapur, coll. G.R.K., 24.xi.1962.*Measurements* : L. 35.56; D. 13.30; HS. 19.10; HA. 17.88.*Distribution* : India : Orissa (as above); West Bengal : Sand Heads, Gangetic delta, 119 M. Elsewhere : Arabian Sea, Gulf of Oman (Powell, 1964); Burma : Gulf of Martaban, China : Hong Kong; (Smith, 1896); Philippines.*Remarks* : Powell (1964) discussed in detail about the species.

## Subfamily TURRICULINAE

Genus 84. *Turricula* Schumacher, 1817130. *Turricula tornata tornata* (Dillwyn)

(Pl. XI, figs. 3,4)

1791. *Murex javanus* (Chemnitz) Gmelin, *Syst. Nat.* ed. 13, Vol. 1(6) : 3541 (Based on *Conch. Cab.* 4, pl. 143 figs. 1336-1338, non Linnaeus).1817. *Murex tornatus* Dillwyn, *Discriptive catalogue of Recent shells*, 2 : 715 (refers Chemnitz *Conch. Cab.* 4, pl. 143, figs. 1336-1338,1969. *Turricula tornata tornata* : Powell, *Indo-Pacif Mollusca*, 2 (10) : 232, pl. 192, figs. 1-3, pl. 193, fig. 1.*Material examined* : Puri district : 1 ex., Puri, coll. Marine survey; 2 exs., Puri, coll. No. data; Ganjam district : 3 exs., Chatrapur, coll. G.R.K., 24.xii.1962; 1 ex., Orissa coast, coll. V.K.P.,*Measurements* : L. 56.45-64.30; D. 18.65-21.70; HS. 29.08-35.21; HA. 29.86-32.95.*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam, Bhimlipatnam; Tamil Nadu : Madras; Maharashtra: Bombay. Elsewhere : Sri Lanka, Thailand. Its range extends from India to Thailand (Powell, 1969).*Remarks* : This species closely resembles *Turricula tornata fluminata* (Kiener) which commonly occurs on west coast of India, but differs from it in the absence of heavy subsutural folds, and less retractive reddish brown flames, spire either equal or higher than aperture and canal.131. *Turricula tornata fulminata* (Kiener)

(Pl. XI, figs. 1, 2)

1839-40. *Pleurotoma fulminata* Kiener, *Conquilles Vivantes*, 5 *Pleurotoma* : 21, pl. 10, fig. 2 (Type locality : Ocean Indian).1969. *Turricula tornata fulminata* : Powell, *Indo-Pacif Mollusc.* 2(10) : 233, pl. 192, fig. 4,5, pl. 193; fig. 3.*Material examined* : Puri district : 2 exs., Off Devi River, coll. Bengal Fisheries (Golden Crown).*Measurements* : L. 54.10 - 55.45; D. 19.15 - 19.56; HS. 25.00-27.36; HA. 29.66 - 30.35.*Distribution* : India : Orissa (as above); Karnataka : Karwar; Goa; Maharashtra : Bombay; Gujarat, Kutch; Lakshadweep sea. Elsewhere : Gulf of Oman, Persian Gulf, Pakistan : Karachi. It ranges from Persian Gulf, Arabian sea to west coast of Southern India (Powell, 1969). This is the first record from east coast and thus extends its distribution to Bay of Bengal.



*Remarks* : Similar to the preceding species but distinguished by the heavy sub-sutural fold and stronger, more clearcut colour pattern of retractive reddish brown flames; spire height much less than aperture plus canal, subsutural fold broad and strong, shoulder concavity less defined at its lower extremity.

132. *Turricula javana* (Linnaeus)

1767. *Murex javanus* Linnaeus, *Syst. Nat.*, 12 ed. sp. 550 : 1221 (Type locality : Not known).  
 1968. *Surcula javana* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 25, fig. 21.  
 1969. *Turricula javana* : Powell, *Indo-Pacif. Mollusca*, 2 (10) : 235, pl. 192, figs. 10, 11; pl. 201, fig. 1 (for other synonyms).

*Material examined* : Baleshwar district : 3 exs., Talburai nr. Chandipur, coll. G.R.K., 4 & 6 xi.1962; 1 ex., Chandipur, coll. No data; 3 exs., Chandipur, coll. N.V.S.R., 30.xi.1984. Cuttack district : 1 ex., Khira Gachha Madeli, coll. N.V.S.R., 1.iii.1964; 1 ex., Lions' Rump, coll. N.V.S.R., 5.iii.1964. Puri district : 1 ex., Puri, coll. M.C. & G.R.K., 20.ii.1948; 15 exs., Puri, coll. S.W.K., 24-29.iii.1916. Ganjam district : 11 exs., Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 5.38 - 56.10; D. 1.60 - 19.42; HS. 2.85-24.00 HA. 2.85 28.00.

*Distribution* : India : Orissa (as above); West Bengal : Sand heads; Tamil Nadu : Madras, Tranquebar; Kerala : Malabar coast; Goa; Maharashtra : Devgadh, Bombay; Gujarat : Gulf of Kutch; Andaman & Nicobar islands. Elsewhere : Tanzania : Dar es Salam; Persian Gulf; Pakistan : Karachi; Sri Lanka; Malacca; Penang; Thailand; China; Philippines. Ranges from South West India to Southern China (Powell, 1969).

Genus 85. *Asthenotoma* Harris and Burrows, 1891

133. *Asthenotoma vertebrata* (Smith)

1875. *Pleurotoma vertebrata* Smith, *Ann. Mag. nat. Hist.*, (4) 15 : 416, No. 10.  
 1942. *Asthenotoma vertebrata* : Gravely, *Bull. Madras Govt. Mus. new ser.* 5 (2) : 71, fig. 13a, 14.  
 1968. *Asthenotoma vertebrata* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 26, text. fig. 22.

*Material examined* : Puri district : 33 exs., Off Puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 4.10-7.95; D. 1.58-2.80.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Ratnagiri, Elsewhere : Persian Gulf, South Africa : Durban, Pakistan : Karachi, Indonesia : Madura Bay, New Zealand; Japan.

Genus 86. *Brachytoma* Swainson, 1840

134. *Brachytoma crenularis* (Lamarck)

(Pl. XII, figs. 1, 2)

1822. *Pleurotoma crenularis* Lamarck, *Hist. nat. Anim. sans. Vert.*, 7 : 92 sp. 54, pl. 7, fig. 54.  
 1931. *Brachytoma crenulare* : Thiele, *Handbuch der Systematischen Weichlierkunde* : 363, fig. 445 (Radula).  
 1952. *Brachytoma crenularis* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 7 : 200, pl. 19, fig. 4.

*Material examined* : Baleshwar district : 1 ex., Chandipur, coll. B.P. & S.L.H., 4.iii.1939; 4 exs., coll. N.V.S.R., 30.xi.1984. Puri district : 1 ex., Konarak, coll. G.R.K., 19.xi.1962. Ganjam district : 1 ex., Konarak, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 28.05-37.60; D. 10.80-13.78.

*Distribution* : India : Orissa (as above); Tamil Nadu: Krusadai Island, Tranquebar. Elsewhere : Burma : Arakan, Mergui Archipelago, Lampa island.

Genus 87. *Drillia* Gray, 1838135. *Drillia euchroes* Melvill

1912. *Drillia euchroes* Melvill, *Proc. malac. Soc. Lond.*, 10 (3) : 250, pl. 11, fig. 11 (Type locality : Persian Gulf).

1968. *Drillia euchroes* Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 25, text fig. 20.

*Material examined* : Puri district : 1 ex., off Puri, coll. S.W. Kemp, 24-29.iii.1916.

*Measurements* : L. 7.72; D. 2.31; HS. 4.92; HA. 2.85.

*Distribution* : India : Orissa (as above) only. Elsewhere : Persian Gulf; Pakistan : Gwadar.

136. *Drillia ganjamensis* Preston

(Pl. XI, figs. 5, 6 & 7)

1910. *Drillia ganjamensis* Preston, *Rec. Indian Mus.*, 5 : 117, fig. 1 (Type locality : Ganjam Coast, 5-6 M)

*Material examined* : Ganjam district : 1 ex., Ganjam coast, 5-6 M, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 17.55; D. 6.25; HS. 10.25; HA. 8.52.

*Distribution* : India : Ganjam (Type locality) only.

*Remarks* : No subsequent report has been made after its original discovery and the species is known from its Holotype only.

137. *Drillia major* (Reeve)

1843. *Pleurotoma major* (Gray MSS) Reeve, *Conch. Icon.* 1. *Pleurotoma sp.* 59, pl.7, fig. 59 (Type locality : Not given).

1968. *Drillia major* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 24, text fig. 19.

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L.7.22; D.3.12; HS.4.35; HA.3.20.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Nicobars. Elsewhere : Persian Gulf, Iran: Makran Coast; Pakistan: Karachi; Sri Lanka.

Genus 88. *Lienardia* Jousseaume138. *Lienardia (Etrema) cosmia* Winckworth,

1940. *Lienardia (Etrema) cosmia* Winckworth, *Proc.malac.Soc.Lond.*, 24 (2) : 42, fig.4 (Type locality : Madras).

1968. *Lienardia (Etrema) cosmia* : Ray, *Indian Mus.Bull.*, 3 (1 & 2) : 27, text fig.28.

*Material examined* : Puri district : 1 ex. off Puri, coll. S.W.K., 24-29.iii.1916.

*Measurements* : L.9.00; D. 3.20.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras.

139. *Lienardia (Etrema) gravelyi* Winckworth

1940. *Lienardia (Etrema) gravelyi* Winckworth, *Proc. malac. Soc. London*, 24 (2) : 42, fig. 5,

1968. *Lienardia (Etrema) gravelyi* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 27, text fig. 24.

*Material examined* : 9 exs., off Puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 5.00 - 8.60; D. 1.65 3.15.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras. Elsewhere: Pakistan : Gwadar; Iran: Makran; Malaysia: Penang; Singapore; Indonesia; Tomb island.

**Remarks** : It is similar to preceding species but shell differs in having three strong sharp carina like spiral striae on each whorl, aperture somewhat similar but anterior canal slightly longer, outer lip thickened.

Gravely (1942) considered this species along with *L. cosmia* as restricted to Madras in its distribution but the material in the National Zoological Collections include several localities indicating its wide distribution.

Genus 89. *Mangelia* Risso, 1826

Subgenus *Pseudorhaphitoma* Boettger, 1895

140. *Mangelia (Pseudorhaphitoma) fairbanki* G & H, Nevill,

1875. *Mangelia fairbanki* Nevill, G & H., *J. Asiat. Soc. Beng.*, 44 (2) : 85, pl. 7, fig. 2 (Type locality : Bombay).

1952. *Mangelia fairbanki* : Subrahmanyam, *J. Univ. Bombay*, 21 (1) : 55.

1968. *Mangelia (Pseudorhaphitoma) fairbanki* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 26 (for other references).

**Material examined** : Puri district : 3 exs. Off Puri, Coll. S.W.K. 24-29.iii.1916.

**Measurements** : L. 4.48 - 6.70; D. 1.16 - 2.45.

**Distribution** : India : Orissa (as above); Maharashtra : Bombay; Andamans. Elsewhere : Sri Lanka, Burma:Mergui Archipelago.

**Remarks** : Shell fusiform, attenuate, spire high, whorls angulate, suture impressed, aperture narrow, canal short, open, outerlip denticulate interiorly, sculpture consists of longitudinal ribs, distant, rounded, spiral striations strong, distant, three on each whorl, middle one stronger somewhat angulate, colour brown irregularly stained.

141. *Mangelia fulvocincta* G. & H. Nevill

(Pl. XII, figs. 3, 4)

1875. *Mangelia fulvocincta* Nevill, G. & H., *J. Asiat. Soc. Beng.*, 44 (2) : 85, pl. 7, fig. 1 (Type locality : Bombay).

1952. *Mangelia fulvocincta* : Subrahmanyam et al, *J. Univ. Bombay*, 21 (3) : 55.

**Material examined** : Puri district : 3 exs., Puri, coll. No data.

**Measurements** : L. 5.95 - 8.20; D. 2.10 - 2.97.

**Distribution** : India : Orissa (as above); Maharashtra : Bombay. Elsewhere : Sri Lanka.

**Remarks** : Shell small, attenuately fusiform, shining, spire elevated, consists of nine whorls including protoconch, carinate, particularly third and fourth post nuclear whorls, axially ribbed, seven on body whorl, suture impressed, spiral sculpture consists of striae, obsolete on ribs, aperture elongate, outerlip erect, sinus smooth, columella smooth, canal short, truncate; colour white, chestnut brown under sutures as well as on lower part of aperture and columella. One of the shell with coral encrustation.

Family XLIII CONIDAE

Genus 90. *Conus* Linnaeus, 1758

142. *Conus inscriptus* Reeve

1843. *Conus inscriptus* Reeve, *Conch. Icon.*, 1 *Conus*, sp. pl. 29, fig. 164 (Type locality : Not given)

1978. *Conus inscriptus* : Kohn, *J. nat. Hist.*, 12 : 312, fig. 42-44.

*Material examined* : Puri district : 1 ex., Off Puri, 22 M., coll. Marine Survey.

*Measurements* : L 43.55; D. 20.50.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Porto Novo, Tranquebar, Kanyakumari; Kerala : off Calicut; Maharashtra : Bombay, Ratnagiri; off Gujarat. Elsewhere : Red Sea, Southern Yemen:Aden, Persian Gulf, Seychelles.

*Remarks* : This species has been earlier reported from India under the name *C. planiliratus* Sowerby. Kohn (1978) states that "Juvenile specimens from off Calicut and SW of Bombay referred to *C. inscriptus* have relatively higher spires and cancellate striae, which are broader and extend over the entire body whorl"

#### Family XLIV TEREBRIDAE

Two genera which include sand burrowing forms are reported from Orissa coast.

##### *Key to genera*

Shell glossy, spiral sculpture absent; siphonal canal with deep notch.....*Hastula*

Shell sculptured with strong axial ribs; siphonal canal simple, recurved..... *Terebra*

#### Genus 91. *Terebra* Bruguiere 1789

##### *Key to species*

1. Whorls constricted in middle; each whorl with three nodulose bands, upper one largest.....*T. tricincta*

Whorls not constricted in middle; each whorl with single nodulose band below suture ..... 2

2. Sub-sutural belt wide, with distant nodules; axial ribs distant, body whorl with less and widely spaced ribs.....*T. durgella*

Subsutural belt narrow, nodules closer; axial ribs distant on spiral whorls, but more and closer on body whorl..... *T. asiatica*

#### 143. *Terebra asiatica* Ray

(Pl. XIII. fig. 1)

1968. *Terebra asiatica* Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 28, fig. 27, (Type locality : Off Puri, 7-8 M).

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K, 24-29.iii.1916.

*Measurements* : L. 7.25; D. 2.10.

*Distribution* : Known only from type locality.

*Remarks* : Shell small not exceeding 7 mm. in length; whorls less ventricose with narrow sutural belt having prominent ridges; body whorl with more number of vertical ribs than spiral whorls, interstices finely striated.

No subsequent collection was made after that of Kemp.

144. *Terebra durgella* Ray

(Pl. XIII. fig. 4)

1968. *Terebra durgella* Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 28, fig. 26. (Type locality : Off Puri depth 7-8 M).

*Material examined* : Puri district : 1 ex., Off Puri, S.W.K. 24-29.iii.1916.

*Measurements* : L. 15.50; D. 4.25 (tip broken).

*Distribution* : Known only from type locality. No subsequent report has been made after its original discovery.

*Remarks* : This species differs from *T. asiatica* in having more ventricose whorls, wide sutural belt, with distantly placed and pointed nodules, body whorl with less number of ridges, interstices broad and smooth.

Subgenus *Strioterebrum* Sacco, 1891

145. *Terebra (Strioterebrum) tricineta* Smith

1877. *Terebra tricina* Smith, *Ann. Mag. nat. Hist.*, (4), 19 : 225, (Type locality : Persian Gulf).

1968. *Terebra (Strioterebrum) tricineta* : Ray, *Indian Mus. Bull.* 3 (1 & 2) : 27, fig. 25.

*Material examined* : Puri district : 11 exs., Off puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 5.32 - 10.05; D. 1.62 - 2.50.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Ratnagiri. Elsewhere : Persian Gulf, Pakistan: Karachi, Singapore, Indonesia: Makassar (Ray, 1968).

Genus 92. *Hastula* H. & A. Adams, 1853

Key to species

1. Axial ribs broad, flattened, extends to base of whorl; white band with row of brown blotches below suture ..... *H. strigilata*  
 Axial ribs narrow, raised on whorl; obsolete at base of whorl; no band below suture ..... 2
2. Shell white, tip of spire dark brown; columella without keel at base..... *H. bacillum*  
 Shell light cream with purple bands at middle of whorl; columella with keel at base ..... *H. traillii*

146. *Hastula bacillum* (Deshayes)

(Pl. XII, fig. 5)

1859. *Terebra bacillus* Deshayes, *Proc. zool. Soc. Lond.*, 1859, 255 (Type locality : Iles Sandwich).

1860. *Terebra bacillus* Reeve, *Conch. Icon.*, 12, *Terebra* sp. 134, pl. 25, fig. 134.

*Material examined* : Cuttack district : 72 exs., Khira Gachha Madeli, coll. G.R.K., 10.xi.1962; 92 exs., Khira Gachha Madeli, coll. N.V.S.R. 1 & 2.iii.1964. Puri district : 18 exs., Puri coast, coll. G.R.K., 11.ii.1972 & 10.ii.1975; 8 exs., Puri, coll. No data. Ganjam district : 3 exs., Gopalpur, coll. V.K.P., 15.ii.1972.

*Measurements* : L. 13.15 - 18.75; D. 2.85 - 3.46.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam, Bhimlipatnam.

Elsewhere : Red Sea: Annesley Bay; Sandwich island.

147. *Hastula strigilata* (Linnaeus)  
(Pl. XII, figs. 6, 7)

1758. *Buccinum strigilatum* Linnaeus, *Syst. Nat.*, ed. 10 : 741 (Type locality : O. Asiatic).

1860. *Terebra strigilata* : Reeve, *Conch. Icon.*, 12 : *Terebra* sp. 85, pl. 18, fig. 85a,b) (Synonyms).

1967. *Hastula strigilata* : Cernohorsky, *Marine Shells of the Pacific*, 1 : 212, pl. 54, fig. 409.

*Material examined* : Cuttack district : 1 ex., Khira Gachha Madeli, coll. G.R.K., 10.xi.1962. Puri district : 2 exs., Konarak, coll. G.R.K., 19.xi.1962; 5 exs., Puri, coll. G.R.K., 15.xi.1962; 1 ex., Puri, coll. G.R.K., 10.ii.1975. Ganjam district : 2 exs., Chatrapur, coll. G.R.K., 24.xi.1962; 1 ex., Light house, Gopalpur, coll. V.K.P., 18.ii.1972.

*Measurements* : L. 25.60; D. 5.65.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras. Elsewhere : Sri Lanka, Philippines, Sadwich islands, Indonesia : New Guinea. Indo Pacific and Queensland to Western Australia (Rippingale & Mc Michael, 1961). Tropical Pacific moderately uncommon (Cernohorsky, 1967).

*Remarks* : Shell acicularly subulate, or elongate, 10-15 whorls. Whorls flat sided, sculptured with broad and flat axial ribs, interstices narrow, smooth, body whorl with peripheral white band, aperture small, columella short, slightly twisted, colour shining brownish gray, with white bands below suture, orange brown blotches round the shell on white band near suture.

148. *Hastula trailli* Deshayes  
(Pl. XII, fig. 8)

1859. *Terebra trailli* Deshayes, *Proc. zool. Soc. Lond.* : 285 (Type locality : Vasigapatnam, Ocean Indian (= Visakhapatnam)).

1860. *Terebra trailli* Reeve, *Conch. Icon.*, 12, *Terebra* sp. 142, pl. 26, fig. 142a-b.

*Material examined* : Puri district : 1 ex., east of Pantnivas, Puri, coll. G.R.K., 10.ii.1975. Ganjam district : 98 exs., Gopalpur, coll. V.K.P., 15-18.ii.1972.

*Measurements* : L. 13.35-25.92; D. 3.05-4.60.

*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam, Bhimlipatnam; Tamil Nadu : Madras.

*Remarks* : This species closely agrees with the preceding *H. bacillum* but differs from it in size, colouration and absence of dark brown patch on the apex, axial ribs not continued to base.

Order ENTOMOTAENIATA

Family XLV PYRAMIDELLIDAE

The family includes species having small sized shells (ranging from 1.7 mm to 8 mm). They occur in sandy patches. Abundant in the Chandipore beach and near river mouths or outer channel of Chilka Lake. During low tide, snails can be seen crawling on sandy beach near Chandipur. Some of these species are parasites on bivalve molluscs.

*Key to genera*

1. Shell smooth; columella with a tooth like fold..... 2  
Shell sculptured, either spirally striated or vertically ribbed, columella smooth, if

- fold present concealed in it ..... 3
2. Whorls rounded.....*Odostomia*  
Whorls flattened.....*Syrnola*
3. Shell pupiform, cancellate; columella with a concealed plait.....*Pyrgulina*  
Shell not pupiform, slender; columella smooth.....*Turbonilla*

Genus 93. *Odostomia* Fleming, 1817

149. *Odostomia babylonica* Winckworth

1940. *Odostomia babylonica* Winckworth, *Proc. malac. Soc. Lond.*, 24 (2) : 41, fig. 2 (Type locality : Madras).  
1968. *Odostomia babylonica* : Ray, *Indian Mus. Bull.* 3 (1 & 2) : 19, fig. 7.

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 4.10; D. 1.55.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras.

150. *Odostomia chilkaensis* Preston

(Pl. XIII. figs. 9,10)

1914. *Odostomia chilkaensis* Preston, *Rec. Indian Mus.*, 10 : 301, fig. 4, (Type locality : Manikpatna, Lake Chilka, 1 M depth).  
1915. *Odostomia chilkaensis* : Preston, *Rec. Indian Mus.*, 11 : 296.  
1916. *Odostomia chilkaensis* : Annandale & Kemp; *Mem. Indian Mus.*, 5 : 347.  
1924. *Odostomia chilkaensis* : Annandale, *Mem. Indian Mus.*, 5 : 856.

*Material examined* : Puri district : 2 exs., Manikpatna, 1 M, Chilka Lake, coll. Chilka Survey (syntypes); 1 ex. Mahosa, Stn. 130, Chilka lake, coll. Chilka Survey; 2 exs., Puri, coll. No data.

*Measurements* : L. 3.60 - 7.09; D. 2.10 - 3.12.

*Distribution* : India : Known from Orissa only.

Genus 94. *Pyrgulina* Carpenter, 1857

151. *Pyrgulina ecclesia* (Preston)

(Pl. XIII. figs. 7, 8)

1915. *Chrysallida (Mormula) ecclesia* Preston, *Rec. Indian Mus.*, 11 : 295, fig. 7-7a, (Type locality : Breakfast island midway between Gantasila and Chiriya island, Chilka lake, 1-2 M).  
1916. *Chrysallida (Mormula) ecclesia* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 347.  
1924. *Pyrgulina ecclesia* : Annandale, *Mem. Indian Mus.*, 5 : 856.

*Material examined* : Puri district : 1 ex., Breakfast island (type) Chilka lake, coll. Chilka Survey; 1 ex., Madarchua Bay, Coll. S.W.K.

*Measurements* : L. 3.49; D. 2.65 (Type).

*Distribution* : India : Orissa (as above) only.

152. *Pyrgulina humilis* (Preston)

(Pl. XIV, figs. 6,7)

1905. *Pyramidella (Mormula) humilis* Preston, *J. Malac.*, 12 : 6, pl. 2, fig. 27 (Type locality : Ceylon (=Sri Lanka)).

1915. *Chrysallida (Mormula) humilis* : Preston, *Rec. Indian Mus.*, 11 : 294.  
 1915. *Chrysallida (Mormula) humilis chilkaensis* Preston, *Rec. Indian Mus.*, 11 : 295 (Type locality : Serua Nadi, Chilka Lake).  
 1916. *Pyrgulina humilis* : Preston, *Rec. Indian Mus.*, 12 : 32.  
 1916. *Pyrgulina humilis chilkaensis* : Preston, *Rec. Indian Mus.*, 12 : 32.  
 1916. *Pyrgulina humilis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 347.  
 1916. *Pyrgulina humilis chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 347.  
 1924. *Pyrgulina humilis* : Annandale, *Mem. Indian Mus.*, 5 : 867, fig. 10.

*Material examined* : Puri district : 26 exs., Chilka Lake, [off Barhampur Island, S of Mahosa, W. of Satpara Island, Nalbano, Serua Nadi, between Baranikuda & Satpara, S. of Kalidai off Baranikuda] coll. Chilka Survey.

*Measurements* : L. 1.75 - 6.34; D. 0.85 - 2.04.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Kerala : Cochin backwaters. Elsewhere : Sri Lanka (Type locality).

*Remarks* : Preston (1915) reported that "the species is variable in its sculpture, convexity of whorls and size." Annandale and Kemp (1916) recorded this species all the time of the year in large numbers in outer channel in the lake, along with its variety *chilkaensis* (Preston). The variety *chilkaensis* Preston 1915, is nothing but a dwarf form of *humilis*. Anandale (1924) while revising the gastropods of Chilka Lake considered only three species under the genus, and did not mention about the variety *chilkaensis*.

### 153. *Pyrgulina nadiensis* (Preston)

(Pl. XIII. figs. 5, 6)

1915. *Chrysallida (Mormula) nadiensis* Preston, *Rec. Indian Mus.*, 11 : 296, figs. 8, 8a (Type locality : Serua Nadi, 2-3 M, Chilka Lake).  
 1916. *Chrysallida (Mormula) nadiensis* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 347.  
 1924. *Pyrgulina nadiensis* : Annandale, *Mem. Indian Mus.*, 5 : 856.

*Material examined* : Puri district : 7 exs., Serua Nadi, 2-3 M., Chilka Lake. (Holotype); 1 ex., Mahosa, Chilka Lake; 1 ex., Satpara, Chilka Lake, coll. Chilka Survey.

*Measurements* : L. 1.75 - 4.36; D. 0.90 - 1.50.

*Distribution* : Chilka Lake only.

*Remarks* : This species closely resembles *Pyrgulina humilis* but differs from it in having angulate whorls and obsolete ribs. It is found only at outer channel in the freshwater season (Annandale & Kemp, 1916).

## Genus 95. *Syrnola* A. Adams, 1860

### 154. *Syrnola dubiosa* Nevill

(Pl. XIII. figs. 2, 3)

1871. *Syrnola dubiosa* Nevill, *J. Asiat. Soc. Beng.*, 40 (2) : 5, pl. 1, fig. 19, (Type locality : Sands at Puri, Bay of Bengal).

*Material examined* : Puri district : 1 ex., Puri, coll. J. Anderson (Holotype); 58 exs., Puri, coll. No data.

*Measurements* : L. 2.80 - 7.30; D. 1.00 - 2.10.

*Distribution* : Known from Type locality only.

*Remarks* : Nevill (1871) mentioned that this species closely agrees with *S. attenuata* A. Adams



but differs from it in having more number of whorls i.e. ten and slightly less acuminate form. No subsequent material has been added after its discovery.

Genus 96. *Turbonilla* Risso, 1826

*Key to species*

1. Shell with rounded whorls, deep suture, close vertical ribs ..... 2  
Shell with straight whorls; shallow suture, distantly placed vertical ribs..... 3
2. Aperture ovately rounded, anteriorly produced towards columella .....*T. materna*  
Aperture subquadrate; not produced anteriorly..... *T. crichtoni*
3. Whorls constricted in the middle ..... 4  
whorls not constricted in middle..... 6
4. Shell turreted, acuminate; whorls more than thirteen; aperture ovately rounded, upper part narrowly constricted..... *T. prashadi*  
Shell subulate; whorls not more than ten; aperture not ovately rounded, upper part of aperture not constricted..... 5
5. Shell short, whorls not more than six; body whorl rounded at its lower part; interstices wider than ribs ..... *T. puriensis*  
Shell long, whorls more than six; body whorl mildly keeled at its lower part; ribs as broad as interstices ..... *T. prestoni*
6. Shell elongately conical, whorls more than seven; ribs straight, not bulged, columella thickened.....*T kempi*  
Shell subulate, whorls not exceeding seven; ribs oblique, bulging on subsutural and lower part; columella simple.....*T. rambhaensis*

155. *Turbonilla crichtoni* Winckworth,

1940. *Turbonilla crichtoni* Winckworth, *Proc. malac. Soc. Lond.*, 24 (2) : 42, fig.3 (Type locality : Madras).

1968. *Turbonilla crichtoni* : Ray, *Indian Mus. Bull.* 3 (1 & 2) : 19, fig.8.

*Material examined* : Puri district : 1 ex., Puri, Coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 6.05; D. 1.70.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras.

*Remarks* : There are no recent collections of the species, the latest being by Kemp (Ray, 1968).

156. *Turbonilla kempi* Ray

(Pl. XIV, fig. 2)

1968. *Turbonilla kempi* Ray, *Indian Mus. Bull.* 3 (1 & 2) : 19, fig. 9. (Type locality : Off Puri, depth 1.2 1.35 M.)

*Material examined* : Puri district : 1 ex., Off puri, coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 5.45; 1.60.

*Distribution* : Known only from type locality.

*Remarks* : Ray (1968) discussed its affinity with *T. elvira* Thiele and *T. terebra* A. Adams. No. subsequent material was collected after its original discovery.

157. *Turbonilla materna* Melvill

(Pl. XIV, fig. 4)

1912. *Turbonilla (Nisiturreis) materna* Melvill, *Proc. malac. Soc. Lond.*, 10 (3) : 247, pl. 12, fig. 13 (Type locality : Mussandam, Persian Gulf).

1968. *Turbonilla (Nisiturreis) materna* Melvill var. *melvilli* Ray, *Indian Mus. Bull.* 3 (1 & 2) : 21, text fig. 13, (Type locality : Off Puri).

*Material examined* : Puri district : 2 exs., off Puri, coll. S.W.K., 24-29.iii.1916, Holotype and Paratype.

*Measurements* : L. 5.65 7.16; D. 1.48 1.67.

*Distribution* : India : Orissa (as above); Elsewhere : Persian Gulf.

*Remarks* : The material from Puri was studied by Ray (1968). Based on a few minor characters he created a separate variety for specimens from Puri. The description by Melvill (1912) mentions that the number of whorls are generally fourteen to fifteen and there are spiral striations also. We have compared the type material with the figure given by Melvill and found that the former agrees with the latter.

158. *Turbonilla prashadi* Ray

(Pl. XIV, fig. 3)

1968. *Turbonilla prashadi* Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 21, fig. 12 (Type locality : Off Puri).

*Material examined* : Puri district : 2 exs., Off Puri, coll. S.W.K., 24-29.iii.1916, (Holotype and Paratype).

*Measurements* : L. 9.50 - 10.80; D. 1.95 - 2.05.

*Distribution* : Known only from type locality.

*Remarks* : Ray (1968) discussed its affinity towards *T. ducalis* Thiele and *T. erica* Thiele.

159. *Turbonilla prestoni* Ray, 1968

(Pl. XIV, fig. 5)

1968. *Turbonilla prestoni*, Ray *Indian Mus. Bull.*, 3 (1 & 2) : 20, text fig. 11 (Type locality : Off Puri).

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 4.58; D. 1.25.

*Distribution* : Known only from Type locality.

*Remarks* : This species agrees very closely with *T. puriensis* Ray but differs from it in being more elongate and slender. Whorls less constricted in middle, sculptured with vertical ribs, almost as broad as interstices, spiral striae wider than those of *puriensis*, spire consists of eight whorls including protoconch.

160. *Turbonilla puriensis* Ray

(Pl. XIV, fig. 1)

1968. *Turbonilla puriensis* Ray, *Indian Mus. Bull.* 3 (1 & 2) : 20 text fig. 20 (Type locality : Off Puri, 1-1.5 M. depth).

*Material examined* : Puri district : 1 ex., Off Puri, 1-1.5 M., coll. S.W.K. 24-29.iii.1916 (Holotype).

*Measurements* : L. 3.82; D. 1.40.

*Distribution* : Known only from Type locality.

*Remarks* : Ray (1968) remarks that its body whorl is like a pitcher, and it agrees with *T hertha* of East Africa.

#### 161. *Turbonilla rambhaensis* (Preston)

1914. *Terebra rambhaensis* Preston, *Rec. Indian Mus.*, 10 : 297, fig. 5 (Type locality : Rambha Bay, Chilka Lake).

1915. *Terebra rambhaensis* : Preston, *Rec. Indian Mus.*, 11 : 289.

1916. *Venesia rambhaensis* : Preston, *Rec. Indian Mus.*, 12 : 32.

1916. *Venesia rambhaensis* : Anandale and Kemp, *Mem. Indian Mus.*, 5 : 345.

1924. *Turbonilla rambhaensis* : Annandale, *Mem. Indian Mus.*, 5 : 867.

*Material examined* : Puri district : 1 ex., (Stn. 132) S.E. of Nalbano, Chilka Lake. coll. Chilka Survey.

*Measurements* : Specimen damaged, hence not given.

*Distribution* : India : Orissa (as above); Kerala : Cochin backwaters.

*Remarks* : This species was originally assigned to the family Terebridae. Later it was transferred to genus *Vanesia* of the family Turritellidae. Annandale (1924) while revising the gastropoda of Chilka Lake assigned it to present genus and stated its similarity to *Turbonilla lactea* (Linnaeus). However it differs in its anatomical features from the latter species. The type described by Preston has been lost. A single damaged specimen, collected from Stn. 132, Chilka Survey is the only material of the species available for study.

### Order CEPHALASPIDEA

#### Family XLVI RINGICULIDAE

Commonly known as helmet bubbles, these are represented by two species from Orissa.

#### Genus 97 *Ringicula* Deshayes, 1838

#### 162. *Ringicula propinquans* Hinds

1844. *Ringicula propinquans* Hinds, *Proc. zool. Soc. Lond.*, 1844, Pt. 12 : 96 (Type locality : Sual in Philippines).

1968. *Ringicula propinquans* : Ray, *Indian Mus. Bull.*, 3 (1 & 2): 29, text. fig. 29.

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 3.75; D. 2.85.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Narsapur; Tamil Nadu : Madras; Kerala : Cochin; Maharashtra : Bombay. Elsewhere : Philippines, Southern Yemen : Aden; Persian Gulf; Iran Makran Coast; Gulf of Oman; Japan.

*Remarks* : This species differs from *R. encarpiferens* de Folin in having spiral striations on lower half of body whorl and smooth outer lip margin.

*R. encarpiferens* de Folin has been recorded from Puri by Ray (1968, p. 29, fig. 28) but we could not find any material for study.

## Family XLVII ATYIDAE

*Key to genera*

Shell oval or globose, aperture broadly oval towards lower part; smooth.....*Haminoea*

Shell subcylindrical, convolute, aperture not broad towards lower part; sculptured with spiral lines both on upper and lower part .....*Atys*

Genus 98. *Atys* Montfort, 1810

Subgenus *Aliculastrum* Pilsbry, 1896

163. *Atys (Aliculastrum) cylindricus* Helbling

1779. *Bulla cylindrica* Helbling, *Einer Privat. Gesellsch in Bohmen*, 4 : 122, pl. 2, fig. 30, 31.

1928. *Atys cylindrica* : Melvill, *Proc. malac. Soc. Lond.*, 18 : 112.

1972. *Atys (Aliculastrum) cylindricus* : Cernohorsky, *Marine shells of the Pacific*, 2 : 208, pl. 59, fig. 3.

*Material examined* : Puri district : 1 ex., Puri, coll. No. data.

*Measurements* : L. 5.34; D. 3.16.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Red Sea; Persian Gulf; Seychelles; Mauritius; Sri Lanka; Australia : Torres Strait; Fiji; Common and occurs throughout the tropical Pacific (Cernohorsky, 1972).

Genus 99. *Haminoea* Turton & Kingston in Carrington, 1830164. *Haminoea crocata* Pease, 1860

1860. *Bulla (Haminea) crocata* Pease, *Proc. zool. Soc. Lond.* : 19 (Type locality : Sandwich island).

1914. *Bulla (Haminea) crocata* : Preston, *Rec. Indian Mus.*, 10 : 303.

1915. *Bulla (Haminea) crocata* : Preston, *Rec. Indian Mus.*, 11 : 297.

1916. *Bulla (Haminea) crocata* : Annandale & Kemp, *Mem. Indian Mus.*, 5 : 873, fig. 16.

*Material examined* : Puri district : 7 exs., Chilka Lake, Satpara; 1 ex., Serua Nadi, 1-3 M, coll. Chilka Survey.

*Measurements* : L. 4.10 - 12.80; 2.42 - 8.25.

*Distribution* : India : Orissa (as above); West Bengal : Ganga Sagar island; Tamil Nadu : Madras. Elsewhere : South Africa : Natal; Sri Lanka; New South Wales.

*Remarks* : When alive, foot and mantle of the animal cover most part of the shell, shell is semi transparent and light bluish in colour, but turned pale while in preservation.

## Family XLVIII RETUSIDAE

Genus 100. *Retusa* Brown, 1827165. *Retusa pyramidata* (A. Adams)

1850. *Bulla (Cyllichna) pyramidata* A. Adams, *Sowerby's Thes. Conch.*, 2 : 259, pl. 125, fig. 149.

1968. *Retusa pyramidata* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 30, fig. 30.

*Material examined* : Puri district : 1 ex., Off Puri, coll. S.W.K., 24-29.iii.1916.

*Measurements* : L. 3.15; D. 1.82.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras.

## Family XLIX CYLICHNIDAE

The family is represented by single species from Orissa.

Genus 101. *Tornatina* A. Adams, in Sowerlay, 1850.

166. *Tornatina estriata* Preston  
(Pl. XIV, figs. 8-11)

- 1914. *Tornatina estriata* Preston, *Rec. Indian Mus.*, 10 : 303, fig. 7, 7a (Type locality : Off Balugaon, Chilka Lake).
- 1914. *Tornatina soror* Preston, *Rec. Indian Mus.*, 10 : 303, fig.8, 8a (Type locality : Manikpatna, Chilka Lake).
- 1915. *Tornatina estriata* : Preston, *Rec. Indian Mus.*, 11 : 297.
- 1916. *Retusa estriata* : Preston, *Rec. Indian Mus.*, 12 : 27.
- 1916. *Tornatina estriata* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 341.
- 1924. *Didontoglossa estriata* : Annadale, *Mem. Indian Mus.*, 5 : 871.

*Material examined* : Puri district : 3 exs., 2 miles of Balugaon, Chilka Lake; coll. Chilka Survey (Type & Cotypes), 1 ex., Manikpatna, (Holotype of *T. sorror*); several examples, Satpara, Chiriya Island, Serua Nadi, off Barikuda, Berhampur Island. Nalbano, Mahosa, Kalidai ranges in depth between 1-3.5 M. coll. Chilka Survey.

*Measurements* : L. 1.40 - 3.80; D. 0.85-1.65. L. 4.15; D. 1.76 (Type *T. sorror* ).

*Distribution* : India : Orissa (as above); Kerala : Cochin backwaters only.

*Remarks* : Most of the shells from Chilka lake are found either eroded or damaged, Preston (1915) synonymised *T. soror* with the present species due to plasticity of the members of the genus and after examining large number of specimens collected from different localities in the lake Preston (1916) placed this species under genus *Retusa* as pointed out by Iredale, but in *Retusa* the spire is sunken.

Annandale & Kemp (1916) states "this is one of the commonest gastropod on a muddy bottom in the lake system; shells from outer channel tend to be a little larger than those in main area and to have less ovately cylindrical form"

Order BASOMMATAPHORA

Family ELLOBIIDAE

It includes air breathing forms. Gills are replaced by modified lungs for breathing purpose. Commonly occurs in salt marshes and mangrove swamps, estuaries and mudflats, or even hide where little moisture is present in dry lands in the vicinity of the sea.

*Key to genera*

Shell oblong oval; outer lip thickened; whorls not compressed; columella folded.....

.....  
.....  
..... *Ellobium*

Shell ovate; outer lip thin, dentate internally; whorls compressed with a varix on either side; columella plicated..... *Pythia*

Genus 102. *Ellobium* Roeding, 1798

The species of this genus inhabit salt marshes and river mouths crawling on damp mud banks and among roots of the mangrove trees.

167. *Ellobium aurisjudae* (Linnaeus)

- 1758. *Bulla aurisjudae* Linnaeus, *Syst. Nat.*, 10 ed. : 728 spp. 344 (Type locality : Not given).
- 1878. *Auricula aurisjudae* : Nevill, G., *Hand list of Mollusca in the Indian Museum*, pt. 2 : 225.

1934. *Auricularis aurisjudae* : Sewell, *Rec. Indian Mus.*, 36 : 56.

1972. *Ellobium aurisjudae* : Cernohorsky, *Marine Shells of the Pacific*, pt. 2 : 211, pl. 60, fig. 7.

**Material examined** : Baleshwar district : 1 ex., Kasafal, 13 kms. from Balaramguri, Chandipur Coll. V.K.P. 23.i.1972; 1 ex., Bagda, 8 km. from Balaramguri, Chandipur, Coll. V.K.P. 22.i.1972.

**Measurements** : L. 38.65 - 52.73; D. 19.15 - 22.25.

**Distribution** : India : Orissa (as above); West Bengal : Salt lake near Calcutta, Sagar island, Port Canning; Maharashtra : Bombay; Gujarat : Kandla; Andamans. Elsewhere : Burma : Irrawady delta, Arakan; Malaysia : Penang; Singapore. Moderately uncommon and ranges westward from the western Pacific (Cernohorsky, 1972).

#### 168. *Ellobium (Auriculina) gangeticum* (Pfeiffer)

1855. *Auricula gangetica* (Benson, MSS) Pfeiffer, *Malak. Blatt.*, 2 : 7.

1855. *Auricula gangetica* : Pfeiffer, *Novit. Conch. Moll.*, 1 (1) : 46, 136, pl. 12, fig. 13-14 (Type locality : Hooghly River, Calcutta).

1934. *Auricularia gangetica* : Sewell, *Rec. Indian Mus.*, 36 : 56.

1975. *Ellobium (Auriculina) gangeticum* : Subba Rao & Mookherjee, *Recent Researches in Estuarine Biology* (ed.) Natarajan : 172.

**Material examined** : Cuttack district : 15 exs., Khira Gachha Madeli, coll. G.R.K. 11.iii.1962, 27 exs., False Point, coll. N.V.S.R., 15.iii.1964.

**Measurements** : L. 6.20 - 31.30; D. 2.90 - 12.65.

**Distribution** : India : Orissa (as above); West Bengal : Sunderbans, Salt Lake, near Calcutta; Andhra Pradesh : Krishna estuary; Tamil Nadu : Vellar estuary; Maharashtra : Bombay. Elsewhere : Burma : Irrawady delta; Sri Lanka.

**Remarks** : This species is similar to the preceding one, but differs in having more elevated spire, which consists of seven whorls, outer lip thick, but not calloused and flattened, columella with two folds, lower one is prominent and angulate, sculpture consists of spiral rows of granules more prominent below suture and gradually obsolete downwards, shell white but covered with fawn periostracum, aperture white.

#### Genus 103. *Pythia* Roeding, 1798

Generally occur in moist places near sea, in woods; terrestrial congregating under stones, dead leaves and holes in rotten tree trunks, after shower they are seen crawling actively in the night.

#### 169. *Pythia plicata* (Gray)

1825. *Scarabus plicatus* (Ferussac) Gray, *Ann. Phil.*, 25 : 415.

1975. *Pythia plicata* : Subba Rao & Mookherjee, *Recent Researches in Estuarine Biology* (ed. Natarajan) : 171. (for other synonyms).

**Material examined** : Cuttack district : 2 exs., Lions' Rump, coll. N.V.S.R., 4 & 10.iii.1964 5 exs. False Point coll. N.V.S.R., 15.iii.1964; 1 ex., Paradip, coll. V.K.P., 30.i.1972.

**Measurements** : L. 9.12-24.19; D. 6.90-16.49.

**Distribution** : India : Orissa (as above); West Bengal : Port Canning, Sunderbans; Tamil Nadu : Madras, Porto Novo; Pondicherry. Elsewhere : Sri Lanka, Burma, Indonesia: Borneo, Java; Thailand.

**Remarks** : Shell ovate, compressed slightly, spire consists of eight whorls, acute, body whorl large, ovate, suture impressed, aperture narrow, outer lip margin reflexed, smooth, dentate inside, with six teeth, two prominent; columella plicated strongly, acutely produced anteriorly, perforate. Colour light purple with white band along outer lip.

Order SOLEOLIFERA

Family LI ONCHIDIIDAE

Slug-like animals with thick, leathery mantle covering entire dorsal part, warty, Usually occurs in marine and brackish water habitat on tree trunks in the mangrove swamps and rock crevices and under stones.

Genus 104. *Onchidium* Buchanan, 1800

170. *Onchidium verruculatum* Cuvier

1830. *Onchidium verruculatum* Cuvier, *Le Regne Animal 2nd ed.* 3 : 46.

1975. *Oncidium verruculatum* : Subba Rao and Mookherjee, *Recent Research in Estuarine Biology* (ed. Natarajan) : 172 (for other references).

*Material examined* : Observations were made in the field. No. Collections were made.

*Distribution* : India : Orissa (Mahanadi estuary, common in estuaries found on mudflats, tree trunks at supra littoral zone in marine habitats, found crawling on exposed rocks and crevices. Elsewhere : Widely distributed in Indo Pacific region extending from Red sea to New Calenonia, from Japan to Australia and Honolulu.

*Remarks* : Animals are usually large, elongately oval in shape, covered with thick and warty mantle, foot elongate, dorsal surface covered with isolated or groups of tubercles, latter more towards posterior part, vertical slit, two retractile tentacles on the ventral surface with eyes on their tips, foot transversely wrinkled.

Awati and Karandikar (1948) studied its anatomy, embryology and bionomics.

Class SCAPHOPODA

Order DENTALOIDA

Fammily LII DENTALIIDAE

Shell elongate, tapering, open at both ends, sculptured or smooth, with maximum diameter at the aperture, animal with conical foot with sheath expanded laterally, dorsally interrupted.

These animals live partly embeded in mud or sand on the sea bottom, with only small part of posterisc side protrumding out into the water.

Genus 105. *Dentalium* Linnaeus, 1758

171. *Dentalium octangulatum* Donovan

1804. *Dentalium octangulatum* Donovan, *Nat. Hist. Brit. Shells* : 5, pl. 162. (Type locality : China Sea).

1956. *Dentalium octangulatum* : Satyamurti, *Bull. Madras Govt. Mus. new ser* 1 (2), p: 7 : 3.

1971. *Dentalium octangulatum* : Kuroda, Habe and K. Oyama, *The Sea shells of Sagami Bay* : 315, pl. 65, figs. 10-11.

*Material examined* : Cuttack district : 289 exs., Khira Gachha Madeli, coll. G.R.K. 10.xi.1962; 89 exs. Lion' Rump, coll. N.V.S.R. 6.iii.1964; Puri district: 1 ex., Puri, coll. V.K.P.

*Measurements* : L. 11.64 - 22.94; D. 2.62 - 4.05.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pamban, Krusadai, Kundugal Point, Shingle Island. Elsewhere : China, Korea, Japan.

Class            BIVALVIA  
 Order            NUCULOIDA  
 Family LIII    NUCULIDAE  
 Genus 106.    *Nucula* Lamarck, 1799

*Key to species*

Shell obliquely ovate; posterior margin subangulate ..... *N. convexa*

Shell obliquely wedge shape; posterior margin rounded..... *N. mitralis*

Subgenus *Leionucula* Quenstedt, 1930

172. *Nucula (Leionucula) convexa* Sowerby

1841. *Nucula convexa* Sowerby, *Conchological Illustrations, Nucula* : 5, Fig.22 (Type locality : China).

1933. *Nucula convexa* : Prashad, *Arch. Naturgesch N.F.*, 2 :127,pl.1, Fig.3 (For synonyms).

1968. *Nucula(Nucula) convexa* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 30, Fig.31.

*Material examined* : Puri district : 1 ex., off puri, coll. S.W.K.,24-29.iii.1972; 1 valve, Puri, coll. No. data. Ganjam district : 2 valves, Gopalpur, coll.V.K.P.,30.iii.1973.

*Measurements* : L.6.30 12.50; Ht.4.85-9.68; T.2.90

*Distribution* : India : Orissa (as above); West Bengal : Hooghly River, Sandheads. Elsewhere : Burma, Cheduba; Malaysia : Malacca straits; Sri Lanka; China; Hong Kong.

*Remarks* : Adequate description was given by Prashad (1933). Prashad (1933) and Ray (1968) included this species under the subgenus *Nucula* s.str. which has characteristic crenulations on the ventral margin. But in the present material, the ventral margin is smooth, a character of subgenus *Leionucula* Quenstedt, 1930. Hence it is treated under the subgenus *Leionucula*.

Subgenus *Nucula* s.str.

173. *Nucula mitralis* Hinds

(Pl. XV, Figs. 1,2)

1843. *Nucula mitralis* Hinds, *Proc. Zool. Soc. Lond.* 1843, 11 : 97 (Type Locality : Straits of Malacca).

1871. *Nucula rabaniana* Nevill, *J. Asiat. Soc. Beng.*, 40 (2) : 9, pl.1, Fig.11a-c (Type locality : 'Pooree' (Puri)

1933. *Nucula mitralis* : Prashad, *Arch. naturgesch. NF*, 2 : 130, Pl.1, figs. 8-9.

*Material examined* : Puri district : 1 ex., puri (Holotype *N. rabaniana* Nevill, 1871) Ganjam district: 3 valves, Gopalpur, coll.V.K.P.30.iii.1973.

*Measurements* : L. 6.40-9.70; Ht. 4.60-6.65; T. 3.25.

*Distribution* : India : Orissa (as above) ; West Bengal : Hooghly River, Sand Heads; Andmans. Elsewhere : Malaysia; Straits of Malacca.

*Remarks* : Nevill (1871) described a species under the name *Nucula rabaniana* from Puri (Pooree), the type of which is available in National Zoological Collections (Regd. No. M.19000/3). The type collection agrees with the description and measurements given by Nevill, but it also bears a handwritten label *N. nevilliana* which is a nomen nudum. After its original discovery the species was not described by any other author. Prashad (1933) in his revision of the family reports *Nucula mitralis* from Puri. On examination we have found that *N. rabaniana* is similar to *N. mitralis* and hence synonymised with the latter.



Family LIV NUCULANIDAE

Genus 107. *Nuculana* Link, 1807

174. *Nuculana (Nuculana) robsoni* Prashad

(Pl. XV, figs. 3, 4)

1932. *Nucula (Nuculana) robsoni* Prashad, *The Lamellibranchia of the Siboga Exped.* Pelecypoda, pt. 2, 53 C. : 20, pl. 1 figs. 19-20 (nom. nov) [*Leda acuminata* preoccupied by Buch, 1833] Type locality = Not given.

*Material examined* : Puri district : 3 exs., Puri, coll. No. data.

*Measurements* : L. 6.85-8.55; Ht. 3.70-4.85; T. 2.68-3.70.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Sri Lanka, off Indonesia : Djangkar, Java; Malaysia : Penang. This species is recorded for the first time from Indian waters.

*Remarks* : Shell elongately oblique, polished, anterior margin rounded, posterior margin produced into a beak, more inflated in anterior part, dorsal margin angulate, faint umbonal keel runs from umbo to postero-ventral margin, strongly sculptured with concentric ribs, interior smooth, not nacreous, hinge with rows of fine oblique teeth on either side of chondrophore, each row consists of twenty in number, a characteristic feature of this species; white in colour.

Shells agree with the material (Paratype) collected from Siboga expedition Stn. No.4 (Paratype, M13292/2). Prashad (1932) while describing this species states that *N. acuminata* Sowerby, 1871 is preoccupied by Buch, 1833. Shell is characterised by strongly developed regular concentric sculpture, hinge with 20 closely placed teeth on either side of chondrophore.

*Nuculana mauritiana* (Sowerby) reported by Satyamurti (1952) from Pamban may belong to this species.

Order ARCOIDA

Family LV ARCIDAE

Commonly known as Ark Shells, the family includes seven species falling under three genera from Orissa.

*Key to genera*

1. Shell sculptured with irregular ribs, ventral margin not crenulate, byssal gape present..... *Barbatia*  
 Shell sculptured with regular ribs, ventral margin crenulate, byssal gape absent ..... 2
2. Shell thick and equivalved..... *Anadara*  
 Shell thin and inequivalved, left valve larger than right one..... *Scapharca*

Subfamily ARCINAE

Genus 108. *Barbatia* Gray, 1842

The genus includes two species under two subgenera viz. *Calloarca* and *Cucullaearca* from Orissa.

Subgenus *Calloarca* Gray. 1857175. *Barbatia (Calloarca) bistrigata* (Dunker).

(Pl. XV, figs. 7, 8)

1866. *Arca bistrigata* Dunker, *Novit. Conch.*, 2 : 87, pl. 30, figs. 4-6 (Type locality : Bombay).1972. *Barbatia bistrigata* : Stevenson, *Bull Br. Mus., Nat. Hist. (zool)*, 24 (1) : 195.

*Material examined* : Baleshwar district : 2 valves, Talburai nr. Chandipur, coll. G.R.K., 4 & 6.ix.1962. Puri district : 1 ex., Black Pagoda, (Konarak), coll. Bengal Fisheries (Golden Crown). Ganjam district : 4 exs., off Ganjam coast, coll. Bengal Fisheries; (Golden Crown).

*Measurements* : L. 21.50 - 33.34; Ht. 12.77-19.64; T. 10.94 - 13.55.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Bombay; Gujarat : Veraval. Elsewhere : China.

Subgenus *Cucullaearca* Conrad, 1865176. *Barbatia (Cucullaearca) helblingii* (Bruguiere)

(Pl. XV, figs. 5, 6)

1789. *Arca helblingii* Bruguiere, *Ency. Meth. vers.*, 1 : 99.1972. *Barbatia helblingii* : Stevenson, *Bull. Br. Mus. nat. Hist. (zool.)*, 24 (3) : 197.

*Material examined* : Ganjam district : 3 exs., Ganjam coast, coll. Bengal Fisheries, (Golden Crown).

*Measurements* : L. 18.30 - 22.00; Ht. 10.65-11.98; T. 6.76 8.25

*Distribution* : India : Orissa (as above); Andaman & Nicobar Islands. Elsewhere : Philippines, Sapeh Bay, east coast of Sumbawa. Widely distributed in the Indo-pacific ocean, often found attached to other molluscs (Prashad, 1932).

*Remarks* : This species is characterised by its trapezoidal shape and distorted nature, finely sculptured with decussate radiating ribs.

Shells are found attached with serpulid tubes and oysters on their surface.

## Subfamily ANADARINAE

Genus 109. *Anadara* Gray, 1847

The genus includes two species from Orissa.

177. *Anadara granosa* (Linnaeus)1758. *Arca granosa* Linnaeus, *Syst. Nat.* ed.10 : 694 (Type Locality : 'O, Europe, mardionalis').1916. *Arca (Anadara) granosa* : Annanadale and Kemp, *Mem. Indian Mus.*, 5 : 350.1968. *Anadara (Tegillarca) granosa* : Lim, *Proceedings of Symposium on Mollusca*, Pt. 1: 68, fig. 6A.

*Material examined* : Baleshwar district : 4 valves, Chandipur, coll. G.R.K., 5-6.xi.1962. Cuttack district : 3 valves, Khira Gachha Madeli, coll.G.R.K.,10 & 11. xi 1962; 3 valves, False point, Mouth of Mahanadi, coll.No data. Puri district: 11 valves, Puri, coll. G.R.K., 13 & 17, xi. 1962; 11 valves, Konarak, 19 & 20 xi. 1962; 19 exs, 12 valves, Chilka Lake (Barkuda, Cheryyakuda, Samal Island etc), coll. Chilka Survey. Ganjam district : 11 Valves, Rambha, Chilka lake, coll. Chilka Survey.

*Measurements* : L. 14.20 - 47.15; Ht. 10.26 - 41.00; T. 8.35 - 37.45.

*Distribution* : India : Orissa (as above); West Bengal : Gangetic Delta; Andhra Pradesh; Kakinada; Tamil Nadu : Ennur backwaters; Tranqbar, Kerala : Malabar coast; Maharashtra : Bombay.

**Remarks** : This species is commonly known as 'Ark shell' found burried in soft mud in river mouths and backwaters. It is a commercially cultured species, the soft parts of which are edible and the shell is used in lime indsutry.

**178. *Anadara rhombea* (Born)**

1780. *Arca rhombea* Born, *Test. Mus. Caesaeri Vindobnonsis* : 90.  
 1948. *Arca (Cunearca) rhombea* : Ray, *Rec. Indian Mus.*, 46 : 110.  
 1977. *Cunearca rhombea* : Ray, *Contribution to the Knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 89.

**Material examined** : Baleshwar district : I valve Chandipur, 9 valves, Talburai nr. Chandipur, coll. G.R.K., 6 & 11 .xi 1962; Cuttack district : 21 valves, Khira Gachha Madeli, coll. G.R.K., 10.xi.1962; 2 exs. Hukitola, coll. N.V.S.R., 17.iii.1964. Puri district : 12 valves, Konarak, coll. G.R.K., 10 & 20.xi. 1962; 26 valves, Puri, coll. G.R.K., 15.xi.1962 & Coll. S.B., 1975. Ganjam district : 3 valves, Chatrapur, coll. G.R.K., 24.xi.1962; 3 valves, S of light house, Gopalpur, coll. V.K.P. 30.iii.1973.

**Measurements** : L. 13.62-56.50; Ht. 12.50 - 52.62; T. 38.90-47.72.

**Distribution** : India :Orissa (as above); Tamil Nadu : Coromandal coast, Madras, Tranquebar; Maharashtra : Ratnagiri, Bombay; Gujrat : Gulf of Kutch; Andaman and Nicobar Islands. Elsewhere : Pakistan: Karachi, Sri Lanka; Indonesia : Salang, Sumatra, Java; Philippines; China sea.

**Remarks** : The species can be distinguished from *A. granosa* in having more number of ribs which are nodulose except for posterior slope and in having angulate postero-ventral margin.

**Genus 110. *Scapharca* Gray, 1847**

*Key to species*

1. Umbo low, cardinal area narrow.....*S. deyrollei*  
 Umbo elevated, cardinal area broad with chevrons shaped ligamentary grooves ..... 2
2. Shell rhomboidal, ribs more than thirty in number.....*S. inaequalvis*  
 Shell elongately oblong, ribs less than thirty in number.....*S. clathrata*

**179. *Scapharca inaequalvis* (Bruguiere)**

1789. *Arca inaequalvis* Bruguiere, *Ency. Meth. Vers.*, 1 106, pl. 305, fig 3c (Type locality : Unknown).  
 1971. *Scapharca inaequalvis* : Kuroda, Habe and Oyama, *The Sea Shells of Sagami bay* : 333, pl. 69, Fig 3&4.  
 1977. *Scapharca inaequalvis* : Ray, *Contribution to the knowledge of Molluscan fauna of Mounmagan, Lower Burma* : 89.

**Material examined** : Baleshwar district : 3 valves, mouth of Burhibalang River nr. Chandipur, coll. G.R.K. 4.xi.1964; 2 valves, Chandipur, coll.G.R.K., 7.iii. 1969; 2 valves, Balaramguri nr. Chandipur, coll. V.K.P., 1973. Cuttack district : 8 valves, False point, coll. No. data; 21 valves, Khiragachha Madeli, coll. G.R.K., 10.xi.1962. Puri district; 3 valves, Konark, coll G.R.K. 19 & 20. xii. 1962 3 valves, Puri, coll. G.R.K., 15.xi.1962. Ganjam district : 2 valves, Chatrapur, coll. G.R.K., 24.xi.1962.

**Measurements** : L. 12.15-55.28; Ht. 14.42-47.42.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras, Krusadai, Kudugal point,

Tranquebar; Kerala : Cochin; Goa; Maharashtra : Bombay; Gujarat : Pirotan Island in Gulf of Kutch. Elsewhere : Persian Gulf; Burma : Mergui-Archipelago; Singapore; Indonesia; Philippines; China; Japan. Widely distributed in Indo-Pacific region.

180. *Scapharca deyrollei* Jousseaume

1893. *Scapharca deyrollei* Jousseaume, *Le Naturaliste* 15 e annee : 191.

1948. *Arca (Arca) deyrollei* : Ray, *Rec. Indian Mus.*, 46 : 110.

1977. *Arca deyrollei* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 85.

*Material examined* : Baleshwar district : 75 valves, nr. Chandipur, coll. G.R.K., 3-6. xi. 1962. Cuttack district : 64 valves, Khira Gachha Madeli, coll. N.V.S.R., 29.ii.1964 & 2. iii. 1964. Puri district : 72 valves, Konarak, coll. G.R.K. 19-20.ix.1962; 34 valves, puri, coll.G.R.K., 14-17.xi.1962. Ganjam district: 14 valves, Chatrapur, coll. G.R.K., 24. xi.1962.

*Measurements* : L. 16.61-49.31; Ht. 11.01-28.36; T. 18.45.

*Distribution* : India : Orissa (as above); West Bengal : Sand Heads, Chandipal; Tamil Nadu : Madras, Coromandal Coast; Maharashtra ; Bombay, Alibag, Ratnagiri. Elsewhere : Sri Lanka, Burma : Tavoy; Malaysia : Penang; Indonesia : Sumatra, Java; China Sea.

*Remarks* : This species can be distinguished from the preceding species by its elongate shell and oblique keel.

181. *Scapharca clathrata* (Reeve)

(Pl. XVI, Figs. 1,2)

1844. *Arca clathrata* Reeve, *Proc.zool soc, Lond.* : 44, *Conch. Icon.*, 2, *Arca*, sp. 48, pl 7, fig, 48 (Type locality : Islands of Burias and Ticao, Philippines).

1948. *Scapharca clathrata* : Melvill and Standen, *J. Conch. Lond.*, 9 : 81.

*Material examined* : Baleshwar district : 2 valves, Chandipur. coll. S.L.H. & A.G.K.M., 7.iii.1949. Ganjam district : 1 ex., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 8.95 - 43.16; Ht. 5.50-29.46; T. 4.70.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Andamans. Elsewhere : Philippines.

Family LVI CUCULLAEIDAE

The family includes a single living genus *Cucullea* Lamarck which resembles closely the genus *Arca* but differs from it in having a strong posterior myophoric flange on its inner side, and also in the differentiation of teeth on the hinge into small transverse intermediate denticles, and long symmetrically arranged anterior and posterior.

The genus is represented by *Cucullaea labiata* from this coast.

Genus 111. *Cucullaea* Lamarck, 1801

Subgenus *Cucullaea* s.str.

182. *Cucullaea (Cucullaea) labiata* (Lighfoot)

1786. *Arca labiata* Lightfoot, *Catalogue of Portland Museum* : 185.

1801. *Cucullaea auriculifera* Lamarck, *Syst. Anim sans Vert.*, 6: 116.

1898. *Cucullaea concamerata* : Melvill and Standen, *J. Conch. Lond.*, 9 : 82.

1969. *Cucullaea (Cucullea) labiata* : Newell, in Moore (ed). *Treatise on Invertebrate Palaeontology*, Pt. N, 1 (of 3), *Mollusca* 6, Bivalvia: N260, figs. 5a-c.

*Material examined* : 1 valve, Shore along New Baxipalli and New Golabandha, coll. S.H.Rao, 28.7.1984.

*Measurements* : L.54.20; Ht. 44.20.

*Distribution* : India : Orissa (as above); Madras, Andamans. Elsewhere : China, Japan; Indo-Pacific.

*Remarks* : Shell inequivalve, subtrapezoidal, sculptured with flat radial ribs, ribs ornamented with coarse closely spaced costae, some of the ribs are finely grooved; strong oblique keel extends from umbo to posterior, umbo median, hinge straight, teeth numerous, differentiated into a few small central teeth, followed by transverse and divergent teeth on anterior and posterior margins which are finely grooved on their ventral surface; interior white, smooth except for impression of radial ribs; adductor muscle scars elongately ovate, posterior scar provided with strong longitudinal shelf running from umbo to posterior margin; inner margin finely crenulate; outer surface covered with brown periostracum.

Shell found inhabited by cirripedes of the genus *Balanus* on its surface. This species has been recorded earlier from Madras as *C. concamerata* by Melvill and Standen (1898) which is synonym of this species.

#### Family LVII NOETIIDAE

The family includes single species under the genus *Striarca* from Orissa.

#### Subfamily STRIARCINAE

#### Genus 112. *Striarca* Conrad, 1862

#### 183. *Striarca lactea* (Linnaeus)

1758. *Arca lactea* Linnaeus, *Syst. Nat.*, ed. 10 : 694, no. 143 (Type locality : 'M.Mediterraneo').

1915. *Arca (Fossularca) lactea* : Preston, *Rec. Indian Mus.*, 11 : 298.

1916. *Arca (Fossularca) lactea* : Preston, *Rec. Indian Mus.*, 12 : 35.

1916. *Arca (Fossularca) lactea* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 350.

*Material examined* : Cuttack district : 1 valve, False point, coll. No data Puri district : 3 exs., Chilka Lake, (Satpara, Barhampur) coll. Chilka Survey.

*Measurements* : L. 9.60-30.35; Ht. 6.21-18.70; T. 4.46-8.48.

*Distribution* : India : Orissa (as above); Tamil Nadu: Ennur backwaters; Maharashtra : Bombay: Gujarat. Elsewhere : Mediterranean, Suez, Red sea; Pakistan : Arakan; Singapore; Burma Philippines, Common in Europe and east Atlantic Ocean, S. Africa.

*Remarks* : It occurs abundantly along with *Barbatia bistrigata* among mud covered rocks and oyster beds, where they hide themselves in nooks and corners.

#### Family LVIII GLYCYMERIDIDAE

The family includes single species under the genus *Glycymeris* from Orissa.

#### Genus 113. *Glycymeris* Da Costa, 1778

#### 184. *Glycymeris tenuicostatus* (Reeve)

1843. *Pectunculus tenuicostatus* Reeve, *Proc. zool. Soc. Lond.* 1843. Pt. 2 : 80; *Conch. Icon.*, 1 *Pectunculus*, sp. 35, pl. 6, fig. 35 (Type locality : Australia).

1977. *Glycymeris tenuicostatus* : Ray, Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma : 90 (For other synonyms).

*Material examined* : Cuttack district : 7 valves, Paradip, coll. V.K.P. 31.1.1972; 5 valves, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962; Puri district : 1 valve, Konarak, coll. Y.C. 20.ii.1978; 4 valves, puri, coll B.P. 8.vi.1938.

*Measurements* : L. 10.30-28.15; Ht. 9.30-29.05.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras. Elsewhere Africa; Nepal; Indonesia; Samau start; Australia: Moroten Bay; Balcombian to Werrikooian in Southern Australia and new South Wales (Ray, 1977).

*Remarks* : Most of the shells are partly eroded and with variable sculpture.

#### Family LIX MYTILIDAE

Commonly known as 'Mussels' which include six species under four genera and three subfamilies from Orissa.

#### Key to genera

1. Umbo situated at the anterior end .....*Perna*  
Umbo situated behind anterior end ..... 2
2. Hinge margin thickened, striated vertically; surface with radial sculpture, absent on median area but replaced with concentric sculpture .....*Musculus*  
Hinge margin smooth; surface either smooth or radially striated ..... 3
3. Shell thin, fragile, smooth, ventral margin straight .....*Amygdalum*  
Shell comparatively thick: sculpture radially striated or some times absent, ventral margin either concave or evenly rounded .....*Modiolus*

#### Subfamily MYTILINAE

#### Genus 114. *Perna* Retzius, 1788

#### 185. *Perna viridis* (Linnaeus, 1758)

1758. *Mytilus viridis* Linnaeus. Syst. Nat. ed. 10 : 706, sp. 220 (Type locality : 'O. Meridionali').

1976. *Perna viridis* Kuriakose and Nair, Aqua. Biol., 1 : 25.

1980. *Perna viridis* : Kuriakose, Bull. Cent. mar. Fish. Res. Inst. no. 29 : 3.

*Material examined* : Baleshwar district : I valve, Chandipur, coll .G.R.K. 3.xi.1962.Puri district : I ex., Manikapatna, Chilka, coll, Chilka Lake survey.Ganjam district : 7 valves, Chatrapur, coll, G.R.K. 24.xi.1962; 18 exs., Gopalpur, Coll G.R.K. 29.xi.1962; 1 ex., Sonnapur, Ganjam, Coll. J. Hornell.

*Measurements* : L. 9.15-130.46; Ht. 7.22-56.48; T. 3.42-18.40.

*Distribution* : India : Orissa (As above); Andhra Pradesh : Visakhapatnam, Bhimilipatnam, Kakinada; Tamil Nadu : Madras, Pamban, Port Novo, Cuddalore : Pondicherry; Kerala :Cochin, Allepy, Goa; Maharashtra : Malvan, Ratnagiri, Bombay; Gujarat : Gulf of Kutch. Elsewhere : From Hongkong to Arabian Sea (Annandale and Kemp, 1916).

Subfamily CRENELLINAE

Genus 115. *Musculus* Roeding, 1798

186. *Musculus cumingianus* (Reeve)

(Pl. XVI, Figs. 3, 4)

1857. *Modiola cumingiana* Dunker, MS. Mus Cuming; Reeve, *Conch. Icon.*, 10 *Modiola*, sp. 50, pl. 9, fig. 63a-b (Type locality : Moreton bay, Australia).

1956. *Musculus cumingianus* : Satyamurti, *Bull. Madras Govt. Mus. New. Ser.* 1 (2) pt. 7 : 36, pl. 4, Fig. 4, (For other synonyms).

*Material examined* : Ganjam district : 1 ex., Off Gopalpur, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 17.84; Ht. 10.85; T. 10.50.

*Distribution* : India : Orissa (as above); Tamil Nadu : Pamban. Elsewhere : Southern Yemen : Aden; Australia.

*Remarks* : The present material is partly damaged and colouration of brown streaks are not seen towards margin as mentioned by Satyamurti (1956). "This species has an extremely delicate and characteristic swollen wedge shape."

Subfamily MODIOLINAE

Genus 116. *Modiolus* Lamarck, 1799

*Key to species*

1. Shell rhomboidal; prominent oblique rounded keel; dark chesnut brown colour above keel.....*M. philippinarum*  
Shell modioliform; keel not prominent; usually brown throughout surface..... 2
2. Ventral margin concave; surface with radial striations.....*M. striatulus*  
Ventral margin not concave, with pinkish brown undulating markings on surface.....  
.....*M. undulatus*

187. *Modiolus (Modiolus) striatulus* Hanley

(Pl. XVI, figs. 5, 8; pl. XVII, figs. 3, 4)

1844. *Modiola striatula* Hanley, *Proc. zool. soc. Lond.* 1844. pt. 7 : 14; (Type locality : Batangas, Philippines).

1910. *Modiola jenkinsi* Preston, *Rec. Indian Mus.*, 5: 36, Fig. 5 (Type of locality : Manikpatna, Lake Chilka).

1911. *Modiola annandalei* Preston, *Rec. Indian Mus.*, 6 : 40, fig. 4 (Type locality : Rambha, Chilka lake).

1911. *Modiola celator* Preston, *Rec. Indian Mus.*, 6 : 41, fig. 5 (Type locality : Puri Beach, Orissa).

1914. *Modiola emarginata* : Preston, *Rec. Indian Mus.*, 10 : 304.

1915. *Modiola taprobanensis* Preston, *Ann. Mag. nat. Hist.*, (8) 16 : 84, fig.

1916. *Modiolus (Modiolus) striatulus* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 360, Pl. 15, Figs. 7-18, Pl. 16, fig. 2.

1975. *Modiolus striatulus* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed. Natarajan) : 172.

1977. *Modiolus (Modiolus) striatulus* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 91.

*Material examined* : Cuttack district : 2 exs., False Point, coll.N.V.S.R. 15-16.iii.1964; 1 ex., Madeli creek, coll.N.V.S.R., 28.iii.1964; Puri district : Several examples, Chilka Lake (Barkul, Barkuda, Breakfast Island, Satpara, Baranikuda, Malidaikuda, Kalidai, Manikpatna), coll. Chilka

Survey; 1 ex.,nr. Balipatam, Chilka, coll. G.R.K., 1.iii 1975; 7 exs., Barkul, coll, C.A.N.R., 9.iv.1984; 57 exs., Barkul, coll. Nagendra Prasad, March, 1985. Ganjam district : Several examples, Rambha, Chilka Lake, coll. Chilka Survey.

*Measurements* : L. 5.95 - 23.28; Ht. 3.00-9.25; T. 1.82-8.15.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning, Salt Lake nr. Calcutta, Kidderpur docks, Calcutta; Tamil Nadu : Ennur backwaters nr. Madras; Kerala : Cochin; Maharastra : Bombay ; Andamans. Elsewhere : Sri Lanka; Burma; Singapore; Gulf of Thailand; Philippines; China and Japan.

*Remarks* : It is a common and highly variable species. Annandale and Kemp (1916) studied the variation of this species and clarified its identity. This species varies from *M. undulatus* in having its upper margin strongly elevated and more evenly arched, proportional depth of shell is less, posterior dorsal margin more declines and posterior extremity more narrowed.

Shells are usually found attached to rocks, stones, wooden jetties in submerged waters, and also on algal growths on stone. It is a major nuisance-causing mollusc in water works at Calcutta (Krishnamurti & Rajagopalan, 1968).

188. *Modiolus philippinarum* Hanley, 1844  
(Pl. XVIII, figs. 1, 2)

1844. *Modiola philippinarum* Hanley, *Proc. zool. Soc. Lond.*, Pt. 7 : 15. Fig. 26 (Type locality : Zebu, Philippines).

1932. *Modiolus (Modiolus) philippinarum* : Prashad, *The Lamellibranchia of Siboga Exped.* pt. 2; Pelecypods, 53C : 72 (For other synonyms).

*Material examined* : Baleshwar district : 1 left valve, Chandipur, coll. N.V.S.R. 30.ix.1984. Puri district : 1 left valve, between Satpara and Barnikuda; Chilka lake.

*Measurements* : L. 39.32-48.78; Ht. 20.90-28.26.

*Distribution* : India : Orissa (as above); Nicobars. Elsewhere : Red sea, Persian Gulf; Singapore; Philippines. It has wide distribution in Indo-Pacific and Red sea (Prashad, 1932). It is the first record from Orissa as well as from main land, India.

*Remarks* : It closely resembles *M. tulipa* Lamarck, but differs from it in having longer anterior margin and ventral margin not concave. Reeve (1858) states that "this species neatly ornamented throughout with raised thread like striae, but exist apparently only in the epidermis"

189. *Modiolus undulatus* (Dunker)  
(Pl. XVII, Figs. 1, 2, 5, 6)

1856. *Volsella undulata* Dunker, *Proc. zool. soc. Lond.*, 1856. 26: 363.

1911. *Modiola chilkaensis* Preston, *Rec. Indian Mus.*, 6 : 41, fig. 6 (Type locality : Rambha, Chilka lake).

1914. *Modiola undulata* var. *crassicostata* Preston, *Rec. Indian Mus.*, 10 : 304, fig. 15 (Type locality : Off Samal Island, Lake Chilka).

1916. *Modiola undulata* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 350, 358, pl.xv. figs. 1-6; pl. xvi, fig. 1.

*Material examined* : Puri district : Several examples, Chilka Lake (Nalbano, Cherriya Island, Satpara, Malidaikuda; Kalidai, Breakfast Island, Serua nadi, Balugaon) coll. Chilka Survey; 1 ex., Kalikdai Island, coll. H.C.R. 26. xii.1954; 13 exs. Balugaon, coll. K.S.M., 22.i.1954; Several, exs Kaliyugeswar, nr Balugaon, coll. V.K.P. 22.ii.1973. Several examples , Balugaon, coll. H.C.R. 1955 6 exs. Brahmagiri, Barakudi, Chilka, coll. C.A.N.R., 24.ii.1984. Ganjam district : 1 ex Rambha, Chilka, coll. K.S.M. 9.ii.1954; Several exs Rambha, coll. Chilka Survey.



**Measurements** : L. 7.60-35.40; Ht. 3.65-14.55; T. 2.35-8.76.

**Distribution** : India : Orissa (as above) ; West Bengal : Sunderbans. Elsewhere : Indonesia : Moluccas.

**Remarks** : Inequal valves in *M. chilkaensis* Preston might have resulted due to unequal pressure at an early stage of growth and crowded condition of the shells.

This species differs from *M. striatulus* in having thin and fragile shell with reddish undulating markings on its surface, radiating striae towards anterior and posterior parts.

Genus 117. *Amygdalum* Megerle von Mühlfeld, 1811

190. *Amygdalum watsoni* ( Smith, E.A)

(Pl. XVIII, figs. 3, 4)

1885. *Modiola watsoni* Smith, *Lamellibranchia 'Challenger' Exped.* : 275, pl. 16, figs 5a-c (Type locality : Luzon Island, Philippines).

1895. *Modiola watsoni* : Smith, *Ann. Mag. nat. Hist.*, (6) 16 : 14.

1904. *Modiola watsoni* : Smith, *Ann Mag. nat Hist.*, (7) 16 ; 11.

1932. *Modiolus (Amygdalum) watsoni* : Prashad. *The Lamellibranchia of the Siboga Exped.* pt. 2 Pelecypoda, 53C : 74, Pl. 2, figs 32-33.

**Material examined** : Ganjam district : 19 exs., 38 Kms S.E. of Gopalpur, coll. Marine Survey.

**Measurements** : L. 9.90-31.25; Ht. 5.25-15.55; T.3.68-13.06.

**Distribution** : India : Orissa (as above) ; Bay of Bengal - South of Mahanadi to Mouth of Godavari; Tamil Nadu : Tranquebar; Kerala : Arabian sea, Off Malabar coast; Off Andamans. Elsewhere : Gulf of Oman; Sri Lanka; Burma; Off Arakan coast; Indonesia : Java, and Pacific ocean (Prashad, 1932 for details).

**Remarks** : In young shells dorsal margin has a median angle towards posterior side and ventral margin is more concave. Umbonal keel is prominent. Young shells closely agree with *Modiolus undulatus* but differ in the absence of zic zic marking and in having narrower shells.

Wood Mason and Alcock (1891) remark that this species is " almost characteristic inhabitant of the mud of Bay of Bengal, as at present explored, in and near 100 fathoms." The byssus is a large bunch of fine silky threads saturated with fine mud. Usually met within the beds in the thick mud in 89 to 93 fathoms, and on sand in 98 to 102 fathoms (Smith, 1895).

Smith (1895) remarks that some of the Indian ocean specimens are of darker grey colour than the specimens obtained by 'Challenger' and the valves are also deeper in proportion to the length. " The rust like incrustation adhering to the anterior or umbonal region", noticed in the type is also present in all the Indian ocean specimens. Specimens were collected from a depth between 225 and 594 fathoms from Off Sri Lanka (Smith, 1906).

Order PTERIOIDA

Family LX PTERIIDAE

The family includes winged oysters and pearl oysters found attached by byssus to substratum and have nacreous interior of the valves. Single species under the genus *Pteria* is included from Orissa.

Genus 118. *Pteria* Scopoli, 1777191. *Pteria smithi* (Preston)  
(Pl. XVIII, figs. 5, 6)1910. *Avicula smithi* Preston, *Rec. Indian Mus.*, 5 : 35, fig. 4, (Type locality : off Gopalpur, 43 M)*Material examined* : Ganjam district : 4 exs. off Gopalpur, coll Bengal Fisheries (Golden Crown); 1 ex., Off Gopalpur coll. Bengal Fisheries (Golden Crown) (Type); 7 exs., Off Ganjam coast (43-54 M) coll. Bengal. Fisheries (Golden Crown).*Measurements* : L. 37.05-45.18; Ht. 24.96-33.68; T. 9.60-11.75.*Distribution* : India : Known from type locality only. Elsewhere : Off Sri Lanka.*Remarks* : This species is not so far reported after Preston (1910).

## Family LXI ISOGNOMONIDAE

The family includes two species of the genus, *Isognomon* from Orissa. Commonly known as Tree or Hammer Oysters.Genus 119. *Isognomon* Lightfoot, 1786191. *Isognomon legumen* (Gmelin)1791. *Ostrea legumen* Gmelin, *Syst. Nat.*, ed. 13 : 3339 (Type locality : Nicobar island).1932. *Isognomon legumen* : Prashad, *The Lamellibranchia of the Siboga Exped.* Pt. 2, Pelecypoda, 53C : 87 (For other synonyms).1971. *Isognomon legumen* : Kuroda et al, *The Sea Shells of Sagami Bay* : 355, Pl, 75 fig. 5.*Material examined* : Ganjam district : 9 exs. Off Ganjam coast, coll. Bengal Fisheries (Golden Crown).*Measurements* : L. 29.80-34.90; Ht. 20-38 - 36.46; T. 5.32-8.37.*Distribution* : India : Orissa (as above); Tamil Nadu : Pamban, Krusadai; Andamans. Elsewhere : Widely distributed from Red Sea to Pacific ocean (Prashad, 1932).193. *Isognomon isognomum* (Linnaeus)1758. *Ostrea isognomum* Linnaeus, *Syst. Nat.*, ed 10 : 699 (Type locality : Not given).1956. *Isognomon isognomum* : Satyamurti, *Bull. Madras Govt. Mus New Ser*, 1 (2). Pt. 7: 45, pl. 5, Fig. 4.*Material examined* : Ganjam district : 2 exs., Off Ganjam coast, coll. Bengal Fisheries (Golden Crown).*Measurements* : L. 13.42-40.34; Ht. 15.85-59.78.*Distribution* : India : Orissa (as above); Tamil Nadu: Pamban, Shingle island; Andamans. Elsewhere : Widely distributed throughout Indo Pacific Region (Prashad, 1932).*Remarks* : This species closely resembles the preceding one but differs in having broader shells, deep hinge margin, grooves narrowly placed on hinge.

## Family LXII PECTINIDAE

Known as scallops, these are capable of swimming by snapping their valves. Sculpture differs on opposite valves. Three species under three genera are reported from Orissa.

Genus 120. *Amusium* Roeding, 1798194. *Amusium pleuronectes* (Linnaeus)

1758. *Ostrea pleuronectes* Linnaeus, *Syst. Nat.*, ed. 10 : 696, sp. 159 (Type locality : 'Indies').

1853. *Pecten pleuronectes* : Reeve, *Conch. Icon.*, 8 : *Pecten*, sp. 48, pl. 13, fig. 48.

1941. *Amusium pleuronectes* : Crichton, *J. Bombay nat. Hist. Soc.*, 42 (2) : 331.

**Material examined** : Ganjam district : 4 exs., off Gopalpur, coll. Bengal fisheries (Golden Crown) 23-27.ix.1909; 1 ex., Mouth of Devi River, 42-46M Coll. Bengal Fisheries (Golden Crown) 15-25.iv.1909; 12 exs., Orissa coast, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 43.45-80.75; Ht. 44.85-78.80; T. 7.90-17.55.

**Distribution** : India : Orissa (as above); Bay of Bengal; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras; Andamans. Elsewhere : Southwest Pacific, Japan (Abbott, and Dance 1982), China.

**Remarks** : This species closely resembles *A. japonicum* (Gmelin) but differs in having markings of rays on the outer surface of left valve. *A. pleuronectes australe* Habe recorded from north Australia differs in having yellowish colour with brown divergent rays on outer surface. These molluscs are collected by fishing nets (trawls) from inshore and off shore waters in India.

Crichton (1941) stated, the adults of the species arrive in early February, apparently for spawning as the spat and growing shells are in evidence from early March until June. Full grown specimens upto 83 mm. both in length and height and common with other members of Pectinidae, is active in its movements. The animal is provided with a hundred or so eyes of different sizes. Eyes are round and staring like those of a doll, and are placed at upper mantle just inside the rim of the shell, One individual possessed up to 106 eyes"

Genus 121. *Chlamys* Roeding, 1798Subgenus *Argopecten* Monterosato, 1899195. *Volachlamys tranquebarica* (Gmelin)

1791. *Ostrea tranquebarica* Gmelin, *Syst. Nat.*, ed. 13 : 3328, no. 67 (Type locality : Tranquebar).

1977. *Chlamys tranquebaricus* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 98.

**Material examined** : Baleshwar district : 6 valves, Talburai, nr. Chandipur, coll. G.R.K. 5.xi.1962. Cuttack district : 4 valves, Khira Gachha Madeli, coll. G.R.K. 11.xi.1962; 2 valves, sandy shore, Pradip port, coll. V.K.P. 21.i.1972). Puri district : I Valve, Puri, coll. B.P. 8.vi.1938. Ganjam district : I valve, S. of Light House, Gopalpur, coll. V.K.P. 30.iii 1973.

**Measurements** : L. 15.05-21.38; Ht. 17.54-24.30.

**Distribution** : India : Orissa (as above) ; Tamil Nadu : Madras, Ennur, Pamban, Nagapattinam; Pondicherry; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere: Southern Yemen; Aden; Sri Lanka; Malaysia : Penang.

Genus 122. *Pecten* Mueller, 1776Subgenus *Pecten* s.str.196. *Pecten (Pecten) pyxidatus* (Born)

1778. *Ostrea pyxidata* Born, *Index Rerum Naturalium Musei Caesarei vindobonensis* : 93.

1780. *Ostrea pyxidata* Born, *Testacea Musei Caesarei Vinodobonensis* : 103 pl. 16, fig. 5, 6.

1898. *Pecten (Vola) pyxidatus* : Melvill and Sykes, *Proc. malac. Soc. Lond.*, 3 : 46.

1977. *Pecten pyxidatus* : Ray, *Contribution to the knowledge of the Molluscan fauna of Maungagan, Lower Burma* : 98.

*Material examined* : Baleshwar district : 1 valve, Talburai nr. Chandipur, coll. G.R.K. 5.xi.1962;

*Measurements* : L. 21.05; Ht. 21.00.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Tranquebar; Gujarat : Gulf of Kutch; Andamans. Elsewhere : Sri Lanka, Burma: Mergui Archipelago ; Gulf of Thailand; Malaysia : Penang.

#### Family LXII SPONDYLIDAE

This family is represented by two species under the genus *Spondylus* from Orissa.

#### Genus 123. *Spondylus* Linnaeus, 1758

##### 197. *Spondylus hystrix* Roeding

1798. *Spondylus hystrix* Roeding, *Museum Boltenianum* : 195.

1932. *Spondylus hystrix* : Prashad, *The Lamellibranchia of the Siboga Exped.* Pt.2, Pelecypoda, 53C : 110 (For other synonyms).

1949. *Spondylus hystrix* : Subrahmanyam et. al., *J. Univ. Bombay*, 17 (5) (B) : 61. Pl.13, fig. 19.

*Material examined* : Ganjam district : 1 ex., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 47.51; Ht. 61.85; T. 33.96.

*Distribution* : India : Orissa (as above); Maharashtra : Bombay; Andamans. Elsewhere : Widely distributed in Indo-pacific region (Prashad,1932).

*Remarks* : The present material is covered by coral growths and oysters concealing its actual sculpture.

##### 198. *Spondylus layardi* Reeve

1856. *Spondylus layardi* Reeve, *Conch. Icon.*, 9, *Spondylus*, sp. 66, pl. 18, Fig. 66 (Type locality : Ceylon).

1956. *Spondylus layardi* : Satyamurti, *Bull. Madras Govt. Mus. New Ser.*, 1 (2) pt. 7:62, pl. 9, Fig. 4.

*Material examined* : Puri district : 1 valve, Konarak, coll. G.R.K. 20.xi.1962.

*Measurements* : L. 34.32; Ht. 36.30.

*Distribution* : India : Orissa (as above); Tamil Nadu: Madras, Tuticorin, Krusadai, Shingle Island, Kundugal point, Pallivasal Island; Gujarat : Pirotan Island in Gulf of Kutch. Elsewhere : Sri Lanka.

#### Family LXIV ANOMIIDAE

Two genera viz. *Anomia* and *Enigomonia* occur in Orissa.

Subrahmanyam et. al (1949) states, "Anomiidae are preyed upon by carnivoran whelks like *Purpura*, *Bursa* etc." and gave the details of feeding habits of *Purpura* on these animals. The iridescent nature of the valves may have some protective significance.

Genus 124. *Anomia* Linnaeus, 1758

199. *Anomia scabra* Reeve  
(Pl. XIX, Figs. 1, 2)

1859. *Anomia scabra* Reeve, *Conch. Icon.*, 11, *Anomia*, sp. 27 pl.6, Fig.27 (Type locality : Bombay).

*Material examined* : Baleshwar district : 1 valve, Chandipur.

*Measurements* : L. 54.80; Ht. 48.36.

*Distribution* : India : Orissa (as above); Maharashtra : Bombay. this species is reported for the first time from Orissa as well as from east coast.

*Remarks* : The present material represented by a single valve (left), has all the characters as described by Reeve (1859), semifossil state.

Genus 125. *Enigmonia* Iredale, 1918

200. *Enigmonia aenigmatica* (Holten, 1803)

1795. *Tellina aenigmatica* Chemnitz, *Conch. Cab.*, 11, pl. 199, figs. 1949, (Type locality : not known) (nom. nud)

1975. *Anomia aenigmatica*. Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology*, (ed Natarajan) : 173.

1982. *Enigmonia aenigmatica* : Abbott and Dance, *Compendium of Sea Shells*, 317, fig.

*Material examined* : Cuttack district : 1 ex., Khira Gachha Madeli, coll. N.V.S.R.26.ii.1964; 1 ex., False point, coll. N.V.S.R. 13.iii.1964; Puri district : 2 exs., coll. N.A.

*Measurements* : L. 15.35-29.08; Ht. 25.22-19.55; T. 3.30-3.30

*Distribution* : India : Orissa (as above); Maharashtra; Bombay. Elsewhere: Bangladesh : Chittagong; Burma : Irrawady estuary; Singapore; Philippines; East Indies.

Family LXIV LIMIDAE

The animals are capable of swimming by flapping of valves, with valve margin disposed vertically. It includes one species under the genus *Ctenoides* from Orissa.

Genus 126. *Ctenoides* Moersch, 1853

201. *Ctenoides annulata* (Lamarck)

1819. *Lima annulata* Lamarck, *Hist. Anim. Sans vert.*, 6 : 157.

1972. *Lima (Ctenoides) annulata* : Cernohorsky, *Marine Shells of the Pacific*, 2. : 220, pl 62, fig 2.

1983. *Ctenoides ferescabra* : Patel, *J. mar. bio. Ass. India*, 20 : 167.

*Material examined* : Ganjam district : 1 ex., Ganjam coast, coll. Bengal fisheries (Golden Crown); 1 ex., Chilka Lake, coll. No. Data.

*Measurements* : L. 7.06 9.45; Ht. 9.78 13.08; T. 3.42 4.10.

*Distribution* : India : Orissa (as above); Gujarat : Gulf of Kutch (as *C. ferescabra*); Andamans. Elsewhere : Tanzania : Zanzibar; Reunion; Mauritius to Singapore (Prashad, 1932). Widely distributed in the Indian ocean, Southern Pacific, Philippines, Australia. This species is reported for the first time from east coast of India.

## Family LXVI OSTREIDAE

This family includes two subfamilies viz. Ostreinae and Lophinae from Orissa.

## Subfamily OSTREINAE

Two genera viz. *Crassostrea* and *Saccostrea* are included in this subfamily.

Genus 127. *Crassostrea* Sacco, 1897202. *Crassostrea cuttackensis* (Newton and Smith)

(Pl. XIX, Figs. 3, 4; pl. XX, Figs. 1, 2)

1912. *Ostrea gryphoides* var. *cuttackensis* Newton and Smith, *Rec. Geol. Surv. India*, 42 (1) : 13, pl. 7 & 8, fig. A,B, (Type locality : Hukitola near False point, Cuttack).  
 1916. *Ostrea madrasensis* Preston, *Rec. Indian Mus.*, 12 : 33, Fig. 11. (Type locality : Ennur backwaters).  
 1916. *Ostrea virginiana* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 348.  
 1967. *Crassostrea lugubris* : Ranson, *Rev. Trav. Inst. Peches marit.*, 31 (2) : 166, fig. 14.  
 1975. *Crassostrea gryphoides* var. *cuttackensis* : Subba Rao and Mookherjee, *Recent Researches in Estuarine Biology* (ed Natarajan) : 173 (for other synonyms).

**Material examined** : Baleshwar district : 2 valves, Chandipur, coll. S.L.N. & A.G.K.M, June, 1949; 20 valves, Talburai, nr. Chandipur, coll. G.R.K. 4-6.xi.1962; 1 ex., 15 valves, Kasafal and Burhibalang river bed, coll. V.K.P. 21-22.ii.1972. Cuttack district : 20 valves, Khira Gachha Madeli, coll. G.R.K. 10-11.xi.1962; & coll. N.V.S.R. 29.ii.1964 & 2.iii.1964; 35 exs., Hukitola, coll. N.V.S.R. 17.iii.1964 (Including Type material collected by B.L. Chowdhury). Puri district : 7 exs., 11 valves, Manikpatna, Chilka Lake, coll. J. T. Jenkins & Annandale [6 valves, outer channel, Chilka, coll. Annandale.] Ganjam district : 1 ex., 1 valve, Chatrapur, coll. G.R.K. 24.xi.1962; 5 valves, Gopalpur, coll. Hafiz, 25.i.1941; 1 valve, Gopalpur, coll. V.K.P., 27.iii.1973.

**Measurements** : L. 16.7 cm. Ht. 23.00 cm. (Type of *C. gryphoides* var. *cuttackensis*) L.13.30 cm Ht. 18.40 cm. (Cotype of Same).

**Distribution** : India : Orissa (as above); West Bengal : Sunderbans; Andhra Pradesh : Chittivalasa nr. Visakhapatnam; Tamil Nadu : Ennur backwater nr. Madras, Krusadai, Single Island; Kerala : Cochin, Calicut; Karnataka : Karwar; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Bangladesh; Burma Arakan, Mergui Archipelago; Akyab; Malaysia : Penang; Singapore; Indonesia : Sumatra, Borneo; Vietnam; Philippines; Hong Kong.

**Remarks** : Newton and Smith (1912) described subfossil form as *Crassostrea gryphoides* var. *cuttackensis* from Hukitola, near Cuttack. The shells are very heavy and bulky resembling *gryphoides* (Sclotheim), a miocene form. Durve (1968) while studying the backwater oysters of India suggests that due to environmental conditions the shape of muscle scar which is an important character for identification varies and hence instead of creating varieties, it should be treated as *Crassostrea gryphoides*, differs from *C. madrasensis* (Preston) in having white muscle scar of oblong shape, and inner margins of white colour, Stenzel (1971) considers that the name *gryphoides* Sclotheim should be retained for the extinct forms, and var. *cuttackensis* Newton and Smith should be applied for the extant forms, and it should be elevated to species level.

Ahmed (1975) in his note added in proof (p.397) states that, "Menzel (1974) refers Stenzel's (1971) hypothesis that *C. gigas*, *C. angulata* and *C. cuttackensis* (Newton and Smith) (= *C. madrasensis* Preston) of the Indian ocean here all derived from *C. gryphoides* (Sclotheim) during miocene"

Ahmed (1975, P.367) states that, "*Crassostrea madrasensis* (Preston) is a synonym of *C. cuttackensis* Newton and Smith; in Stenzel (1971) one of the species occurring in Pakistan and India

has been considered synonymous with *Crassostrea virginica* (Ahmed, 1971). It seems therefore that due to the efforts of man the species has now become more or less cosmopolitan."

While studying the collections from Chilka lake and Gopalpur we found the material identified by Ranson (1967) as *C. lugubris* (Sowerby) which infact belongs to *C. madrasensis* (Preston). Ray (1948) reported *C. arakanensis* from Coromandal Coast synonymising *C. madrasensis* with it.

Panikkar and Aiyar (1939) studied the breeding habits of this species (*C. madrasensis*), while Winckworth (1931) discussed its synonymy. *Ostrea bicolor* reported by Subrahmanyam *et. al.* (1949) may also belong to the present species.

The specimens grow to large size attaining 432 mm in height (Stenzel, 1971, P. N1027).

### 203. *Crassostrea lacerata* (Hanley)

1845. *Ostrea lacerans* Hanley, *Proc. zool. Soc. Lond.* 1845 (Type locality : Senegal ?).  
 1870. *Ostrea mytiloides* Sowerby in Reeve's *Conch. Icon.* 18, *Ostrea*, sp. 3, pl. 2, fig. 3.  
 1949. *Ostrea lacerata* : Subrahmanyam *et. al. J.Univ.Bombay*, 17B(5) : 175, fig. 19.  
 1967. *Crassostrea lacerata* : Ranson, *Rev. Trav. Inst. Peches marit.*, 31 (2) : 175, fig. 19.

*Material examined* : Baleshwar district : 3 valves, Kasafal nr. Balaramguri, coll. V.K.P. 22.i.1972; 1 valve, Chandipur, coll. G.R.K.4.xi.1962.

*Measurements* : L. 11.62-14.95; Ht. 34.65-58.40.

*Distribution* : India : Orissa (as above); Maharashtra : Bombay; Gujarat : Gulf of kutch. Elsewhere : Bangladesh : Chittangong; Guayana, South Korea; China; Malaysia: Penang; Indonesia : Java, Borneo; Singapore; Morten Bay, Australia: South America : West Indies.

*Remarks* : Animals attached in clusters to rocky substratum by their umbonal area. The material includes lower valves which are washed ashore.

## Genus 128. *Saccostrea* Dollfus and Dautzenberg, 1920

### 204. *Saccostrea cucullata* (Born)

1778. *Ostrea cucullata* Born, *Index Rerum Naturalium Musei Caesarei Vinodbonensis* : 100.  
 1780. *Ostrea cucullata* : Born, *Testacea Musei Caesarei Vinodobonensis* : 114, pl. 6, figs.11 & 12 (Type locality : Indies and Ascesion Island).  
 1916. *Ostrea cucullata* : Annandale and Kemp, *Mem, Indian Mus.*, 5 : 349.  
 1956. *Ostrea forskalli* : Satyamurti, *Bull. Madras Govt. Mus, New ser.* 1 (20)pt., 7 : 67, pl. 10. fig. 4.  
 1967. *Crassostrea cucullata* : Ranson, *Rev. Trav. Inst. Peches marit.*, 31 (2) : 185, Fig. 23.  
 1975. *Saccostrea cucullata* : Ahmed, *Advances in Marine Biology*, 13 : 381.

*Material examined* : Baleshwar district : 1 valve, Talburai nr. Chandipur, coll. G.R.K. 6.xi.1962. Cuttack district : 7 valves, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962 & 2 valves, Kirachha madeli, coll. N.V.S.R. 19.ii.1964 2 valves, South of Paradeep port , coll V.K.P 31.i.1972; 24 valves, Hukitola, coll. N.V.S.R. 17.iii.1964. Puri district : 2 exs., Chilka lake. coll. J.T. Jenkins. Ganjam district : 2 valves, Gopalpur, coll. Hafiz, 25.i.1941; 1 valve, Gopalpur, coll. V.K.P. 30.iii.1973.

*Measurements* : L. 22.65-27.82; Ht. 46.95-56.90; T. 15.45-18.68.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning; Andhra Pradesh : Bhimli patnam, Viskhapatnam; Tamil Nadu : Madras, Krusadai Island, Shingle Island, Pamban; Kerala : Malabar coast; Maharashtra : Bombay; Gujarat : Gulf of Kutch; Andaman and Nicobars. Elsewhere : Widely distributed in Indo Pacific area.

**Remarks** : This species is highly variable, growing in clusters on rocks and coral reefs. Usually marine in habitat. It is also found on backwater oysters viz. *Crassostrea cuttackensis* in Chilka Lake. *Ostrea crenulifera* reported by Subrahmanyam et al. (1949) may belong to the present species.

Ahmed (1971) states that "this species is purely marine, never forming beds in back waters and estuaries. This species occurs on elevated cliffs exposed to direct sunlight and gets submerged in surfy waters only occasionally on the coast of Sind in Pakistan. It attaches very firmly to rocks and almost blends with the colour of the substrate and is difficult to detach. This species has invaded the mangrove habitat in east Africa where it has been reported to occur in two distinct forms which Stenzel (1971) considers as ecomorphs."

#### 205. *Saccostrea deformis* (Lamarck)

1806. *Ostrea deformis* Lamarck, *Ann. Mus. Hist. Nat. Paris*, 8 : 164.

1967. *Ostrea deformis* Ranson, *Rev. Trav. Inst. Peches marit*, 31 (3) : 237, fig. 37.

**Material examined** : Baleshwar district : 1 valve, Baleshwar Bay, coll. Bengal Fisheries (Golden Crown) Puri district : 3 ex., Black Pagoda, coll. Bengal Fisheries (Golden Crown). Ganjam district : 3 exs., Off Gopalpur, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 8.40-14.68; Ht. 11.90-19.68.

**Distribution** : India : Orissa (as above); Tamil Nadu : Tranquebar; Nicobars. Elsewhere : Red sea, Seuz, Southern Yemen : Aden, Sri Lanka, East Indies, Philippines; Indonesia, Borneo, Singapore, New Caledonia, China sea, Japan, Australia : New South Wales, (Ranson, 1967).

**Remarks** : Shells collected by trawlers from deeper waters. One of the shell found attached in the mouth of gastropod (*Natica* sp.). Due to presence of fine tubercles or chomata on inner part of the shell this species has been kept in the genus *Saccostrea* as per Stenzel (1971).

#### 206. *Saccostrea futamiensis* (Seki)\*

1967. *Ostrea futamiensis* : Ranson, *Rev. Trav. Inst. Peches. marit*, 31 (3) : 236, Fig. 36.

**Material examined** : Ganjam district : 2 exs., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

**Measurements** : L. 11.30; Ht. 12.30; T. 3.65.

**Distribution** : India : Known only from Ganjam Coast, Orissa. Elsewhere : Thailand; Philippines; Singapore; Malacca; Japan; Pacific Islands (Ranson, 1967).

**Remarks** : This species has some similarity to *S. deformis* but differs from it in having small hinge with short extension, irregular margin, shallow lower valve, umbonal cavity much shallower than in *deformis*, outer valve more convex, caplike, outer surface with lamellose concentric growth lines, interior white, smooth, tubercles on margins extend from hinge to middle part only.

Subfamily LOPHINAE

It includes genus *Lopha*.

Genus 129. *Lopha* Roeding, 1798

#### 207. *Lopha (Lopha) frons* (Linnaeus)

1758. *Mytilus frons* Linnaeus, *Syst. Nat.*, ed. 10 : 704, Sp. 208 (Type locality : 'Pelagi Indici Gorgoniis').

1967. *Ostrea frons* : Ranson, *Rev. Trav. Inst. Peches marit*, 31 (2) 257, fig. 50.

\* Original reference not seen



*Material examined* : 1 ex., Orissa coast, coll. Bengal Fisheries (Golden crown).

*Measurements* : L. 14.64; Ht. 22.15; T. 7.66.

*Distribution* : India : Known from Orissa only. Elsewhere : widely distributed in Indo pacific, Atlantic oceans (For details see Ranson, 1967).

*Remarks* : It is usually found attached to rock or stems or sea whips (*Gorgonia*) on the off shore region. The present material is dredged from deep water off Orissa coast.

Family LXVII GRYPHAEDAE

Members of this family are euryhaline and stenohaline. Most of the genera never form true oyster reefs in which conspecific individuals grow mainly on one another. Animals are nonincubatory.

Genus 130. *Hyotissa* Stenzel, 1971

208. *Hyotissa hyotis* (Linnaeus)

1758. *Mytilus hyotis* Linnaeus, *Syst. Nat.*, ed. 10 : 704, no. 207, (Type locality : Pelag Gorgoniis).

1967. *Pycnodonta hyotis* : Ranson, *Rev. Trav. Inst. Peches. marit.*, 31 (2) : 139, fig. 7 (for distribution).

1971. *Hyotissa hyotis* : Stenzel, *Oysters, in Treatise on Invertebrate Paleontology*, Pt. N. Bivalvia, 3 (3) Mollusca, 6 (Moore ed.) : N1107 (for genus) fig. J85 1a-c.

*Material examined* : Baleshwar district : 2 valves, Balaramguri nr. Chandipur, coll. V.K.P. 1973. Puri district : 4 valves, Black Pagoda, 27 M. (rocky bottom); 1 ex., Manikpatna, Chilka lake, coll. N.A. and S.W.K. Ganjam district : 2 valves, Off Gopalpur; 6 exs., 1 valve, Ganjam coast, coll. Bengal Fisheries (Golden Crown), 1 ex., Orissa coast.

*Measurements* : L. 17.65-80; Ht. 27.32-86.43; T. 7.59-18.04.

*Distribution* : India : Orissa (as above) ; West Bengal : Port Canning; Andhra Pradesh : Visakhapatnam; Andaman and Nicobar Islands. Elsewhere : Sri Lanka; Burma : Mergui Archipelago, Arakan Coast; West Indies; New South wales : Port Jackson; Hong Kong. Widely distributed in Red Sea, India ocean and West Pacific (Prashad, 1932).

*Remarks* : Shell subequal, moderately thick, hinge without teeth, adductor muscle scar orbicular and nearer to hinge, margin irregular, sculptured with radial ribs on outer surface of outer valve, margin with hyotis spines, extending beyond margin, interior smooth, outer valve slightly inflated, animal without foot or byssus in adult stage, attached by their left valves to substratum, colour light purple colour.

Some of the shells from Ganjam coast are found encrusted with vermetid tubes and other serpulid tubes or barnacles on them.

Family LXVIII UNGULINIDAE

Six species under two genera are included under the family from Orissa.

*Key to genera*

Shell orbicular; anterior muscle scar sinuate, less elongate, and narrower than posterior..... *Diplodonta*

Shell lenticular; anterior muscle scar not sinuate and more elongate than posterior.....  
..... *Felania*

Genus 131. *Diplodonta* Bronn, 1831*Key to species*

1. Shell trigonal; umbo large, dorsal margin angularly arched.....*D. barhampurensis*  
Shell rounded or rhomboidal; umbo small, dorsal margin not arched ..... 2
2. Shell rounded, more inflated; umbo elevated; anterior margin short.....*D. bullata*  
Shell rhomboidal, less inflated; umbo depressed; anterior margin more produced.....  
.....*D. satparaensis*

208. *Diplodonta bullata* Dunker

1865. *Diplodonta bullata* Dunker, *Novitat. Conch. Meeresconch.*, Suppl., 2 : 76, pl. 26, fig. 1 (Type locality : Ceylon).

1932. *Diplodonta bullata* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt, 2, *Pelecypoda*, 53C : 164.

*Material examined* : Baleshwar district : 1 valve, Chandipur, coll. S.L.H. and A.G.K.M, 22.vi.1949; 1 valve, Chandipur, coll. No data; 5 valves, Chandipur, coll G.R.K., 3-5.xi.1962; 1 valve, Chandipur, Coll. N.V.S.R. 30.xi.1984. Ganjam district : 18 valves, S. of light house, Gopalpur coll. V.K.P., 30.iii.1973.

*Measurements* : L. 13.55-24.48; Ht. 11.90-22.25.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Southern Yemen: Aden; Sri Lanka; Malaysia : Penang; Indonesia : Bay of Bima an Banda Anchorage. This is the first record from India.

210. *Diplodonta barhampurensis* Preston

(Pl. XX. Figs. 5, 6)

1915. *Diplodonta barhampurensis* Preston, *Rec. Indian Mus.*, 11 : 302. fig.15, 15a-b (Type locality : Channel off Barhampur Island 3-6 M, Chilka lake).

1916. *Diplodonta barhampurensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 1 ex., stn. 104 Channel off Barhampur island, Chilka Lake (Type), coll. Chilka Survey.

*Measurements* : L. 14.50; Ht. 13.70; T. 10.10.

*Distribution* : Known only from chilka lake.

*Remarks* : This species can be differentiated from the preceding species by its trigonal shell, covered with brown periostracum.

211. *Diplodonta satparaensis* Preston

(Pl. XX, figs. 3, 4)

1915. *Diplodonta satparaensis* Preston, *Rec. Indian Mus.*, 11 : 302, fig. 14, 14a-b (Type locality : Channel between Satpara and Barhampur, 2-6 M, Chilka Lake ).

1916. *Diplodonta satparaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 2 exs., Chilka lake, channel between Satpara and Barhampur Island (Type locality : Type and cotype); 28 exs. Barhampur Island, Mahosa, Satpara and Kalidai Island in Chilka lake, coll. Chilka Survey.

*Measurements* : L. 9.56-23.72; Ht. 7.95-20.90; T. 4.02-15.00.

*Distribution* : Known only from Chilka lake.

*Remarks* : This species closely resembles *D. bullata* but differs from it in having less inflated valves. Animals live on sandy mud (Annandale and Kemp 1916).

Genus 132. *Felania* Recluz, 1851

*Key to species*

1. Shell very small not exceeding 5mm in length; obliquely ovate.....*F. ovalis*  
Shell large, exceeding 5mm in length; orbicular..... 2
2. Umbo elevated; posterior margin suddenly slopes, rounded, umbonal area light brown; outer surface olive brown ..... *F. chilkaensis*  
Umbo not elevated; posterior margin gradually slopes, making angle with ventral margin; interior white as well as outer surface ..... *F. annandalei*

212. *Felania annandalei* Preston  
(pl, XXI, Figs. 3, 4)

1914. *Diplodonta (Felania) annandalei* Preston, *Rec. Indian Mus.*, 10 : 307, fig. 20, 20a-b (Type locality : Between Barniakuda and Nalbano Islands, Chilka, 5 M);  
1915. *Diplodonta (Felania) annandalei* : Annandale and Kemp, *Rec. Indian Mus.*, 11 : 303.  
1916. *Diplodonta (Felania) annandalei* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 1 valve, Between Barnikuda and Nalbano, Chilka lake (Type); Several examples, Maludaikuda island opp. Manikpatna temple, Barnikuda, Satpara bay, Kalidai, Patsahanipur in Chilka lake, coll. Chilka Survey.

*Measurements* : L. 2.70-12.76; Ht. 2.00-11.42; T. 1.65-5.60 (Including Type).

*Distribution* : Known from Chilka Lake only.

*Remarks* : It has all characters of *Felania* which is elevated to generic rank (Chavan 1969).

Annandale and Kemp (1916) reported it as abundant in the lake at inner end of outer channel and also found in main area in neighbourhood of Nalbano, off Patsahanipur, near Kalidai and Maludaikuda. Living specimens were found only when the salinity was high in the lake and empty shells were obtained in September when the salinity falls down. There are no subsequent collections of the species.

213. *Felania chilkaensis* Preston  
(Pl. XXI, 1, 2)

1914. *Diplodonta (Felania) chilkaensis* Preston, *Rec. Indian. Mus.*, 10 : 307, fig. 21 21a-b (Type locality : Lake Chilka).  
1915. *Diplodonta (Felania) chilkaensis* : Preston, *Rec. Indian Mus.*, 11 : 303.  
1916. *Diplodonta (Felania) chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 31 exs., Chilka lake, S. of Satpara, Manikpatna, Barkul, outer bar. S.W. of mouth of Chilka, coll. Chilka Survey. Ganjam district : 1 ex., N.E. of Gopalpur I. B.,

coll. G.R.K. 27.xi.1962; 18 exs., Kushobhadra river mouth, 8 Kms, from Konarak, coll N.V.S.R., 1.xii.1977.

*Measurements* : L. 9.90-13.60; Ht. 6.64-13.90; T. 3.28-6.70

*Distribution* : India : Orissa (as above) only.

*Remarks* : It was common in the outer channel towards the seaward end.

#### 214. *Felania ovalis* Preston

(Pl. XXI, figs. 5, 6)

1914. *Diplodonta (Felania) ovalis* Preston, *Rec. Indian Mus.*, 10 : 308, (Type locality : Manikpanta, Orissa, depth 4 ft.).

1916. *Diplodonta (Felania) ovalis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 1 ex., 3 valves, Chilka lake - Manikapatna, Channel between Satpara and Barhampur and outer bar S.W. of mouth of lake, coll. Chilka Survey.

*Measurements* : L. 3.05-4.25; Ht. 2.55-3.56.

*Distribution* : Known only from Chilka Lake, India.

*Remarks* : This species closely resembles the preceding species but differs from it in shape of shell, teeth characters and in having less inflated valves.

#### Family LXIX CHAMIDAE

Two species under the genus *Chama* are included in this family from Orissa.

Genus 133. **Chama** Linnaeus, 1758

Subgenus **Chama** s.str.

1758. *Chama (Chama) lazarus* Linnaeus, *Syst. Nat.*, ed. 10 : 691, sp. 129 (Type locality : 'Mediterraneo, Americano').

1956. *Chama lazarus* : Satyamurti, *Bull. Madras Govt. Mus. New Ser.*, 1 (2) pt. 7 : 87, pl. 13, Fig. 2.

*Material examined* : Ganjam district : 1 ex., Ganjam coast, coll. Bengal fisheries (Golden Crown).

*Measurements* : L. 78.50; Ht. 76.25; T. 62.75.

*Distribution* : India : Orissa (as above); Tamil Nadu : Pamban; Maharashtra : Bombay; Elsewhere : Mauritius; Sri Lanka; Burma : Mergui Archipelago; Philippines : Owens's Island, Indo Pacific.

*Remarks* : The present material is found encrusted with serpulid tubes, vermetids and bryozoans on its inner surface.

#### 216. *Chama (Chama) reflexa* Reeve

1846. *Chama reflexa* Reev, *Conch. Icon*, 4, *Chama*, sp. 16, Pl. 4, fig. 16 (Type locality : Damley island, North Australia).

*Material examined* : Baleshwar district : 2 valves, Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). Puri district : 1 ex., Black Pagoda, coll. Bengal Fisheries (Golden Crown). Ganjam district : 8 exs., off Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 10.48-20.10; Ht. 11.35-21.05.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Shingle Island, Pamban; Maharashtra : Bombay; Gujarat : Veraval. Elsewhere : Widely distributed in tropical Pacific. Indo

pacific, off shore on rocks, moderately common (Abbott and Dance, 1982).

Family LXX KELLIIDAE

Genus 134. *Kellia* Turton, 1822  
(= *Kellya*)

217. *Kellia chilkaensis* Preston  
(Pl. XXI. Figs. 9, 10)

1915. *Kellia chilkaensis* Preston, *Rec. Indian Mus.*, 11 : 298, fig. 10, 10a-b (Type locality : Channel between Satpara and Barhampur island, 2-2.5 M, Chilka lake).

1916. *Kellia chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 351.

*Material examined* : Puri district : 4 exs., Chilka lake, localities as between Satpara and Barhampur island, south of Kalidai, Mohosa, Patsahanipur, coll. Chilka Survey.

*Measurements* : L. 3.70-4.10; Ht.2.60-4.25; T. 0.90-1.10.

*Distribution* : Known only from Chilka lake.

*Remarks* : Preston (1915) described *Kellia mahosaensis* from Mahosa in Chilka Lake, which is smaller than the present species, but more inequilateral and with prominent umbo, tumid and ventral margin slightly contracted in middle. In the absence of material we are unable to comment on that species.

Family LXXI GALEOMMATIDAE

*Key to genera*

Shell sub- elliptical; finely striated; hinge not straight, posterior margin slightly pointed than anterior.....*Galeomma*

Shell transversely oblong; smooth; hinge straight; posterior margin not pointed.....  
.....  
.....*Scintilla*

Genus 135. *Galeomma* Sowerby in Turton, 1847.

218. *Galeomma argentea* Deshayes,  
(Pl. XXI. Figs. 7, 8)

1855. *Galeomma argentea* Deshayes, *Proc. zool. Soc. Lond.*, 1855: 169 (Type locality : Samar Island, Philippines).

1874. *Galeomma argentea* : Reeve, *Conch, Icon.*, 19, *Galeomma*, sp. 7, Pl. 1, Fig. 7.

*Material examined* : Ganjam district : 1 ex., Ganjam coast, 44-45 M., coll. Bengal Fisheries (Gold Crown).

*Measurements* : L. 9.05; Ht. 4.50.

*Distribution* : India : Orissa, Ganjam coast only. Elsewhere : Philippines. This is the first record from Indian waters.

*Remarks* : Shell transversely oblong, white, thin, transparent, inequilateral, sculpture consists of fine striations; posterior margin slightly pointed than anterior, ventral margin finely crenulate with gape; valves slightly arched; hinge straight, with two small cardinals.

Genus 136. *Scintilla* Deshayes, 1856219. *Scintilla chilkaensis* Preston  
(Pl. XXII, figs. 3, 4)

1915. *Scintilla chilkaensis* Preston, *Rec. Indian Mus.*, 11 : 299, fig. 12, 12a (Type locality : Mahosa, southwards towards sandhills, 0.6 2 M).  
1916. *Scintilla chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 351, fig. 4.

*Material examined* : Puri district : 1 ex., Mahosa, Chilka lake (Type), 3 exs., of Satpara point, Chilka lake, coll. Chilka Survey.

*Measurements* : L. 5.75-7.00; Ht. 4.65-5.45; T. 2.10-2.20 (Including type).

*Distribution* : Known only from Chilka lake, India.

*Remarks* : Annandale and Kemp (1916) studied its mantle and it closely resembles to that of *S. hydatina* Deshayes but differs in its yellow colour and papillae with deep orange tips.

## Family LXXII CARDITIDAE

Commonly known as false cockles, since they resemble true cockles (*Cardium*) in appearance, but differs in being inequilateral and having unequal hinge teeth.

Genus 137. *Cardites* Link, 1807 (non Lamarck, 1801)220. *Cardites antiquata* (Linnaeus)

1758. *Chama antiquata* Linnaeus, *Syst. Nat.*, ed. 10 : 691. (Type locality : Not given).  
1819. *Cardita bicolor* Lamarck, *Hist. Nat. Anim. Sans Vert.*, 6 : 427.  
1956. *Cardita antiquata* : Satyamurti, *Bull. Madras Govt. Mus new Ser.* 1(2) pt. 7 : 71, Pl. 11, fig. 5.

*Material examined* : Cuttack district : 14 valves, Khira Gachha Madeli, coll. G.R.K. 10-11.xi.1962; 1 valves, Paradip, 9.ix.1973. Puri district : 5 valves, Puri, coll. B.P., 8.vi.1938; 14 valves, Tonda nr. Satpara rest house, coll. H.C.R. 30.vii.1954, 11 valves, Manikapatna beach, Chilka, coll. H.C.R. 1.i.1955; 17 valves, Puri, coll. G.R.K. 14-17.xi.1962; 1 valve, Pant Nivas, Puri, coll. G.R.K. 9.ii.1975; 21 valves, Konark, coll. G.R.K. 19-20.xi.1962; 1 valve, Chandrabhaga beach nr. Konarak, 17.iii.1973. Ganjam district : 15 valves, Chatrapur, coll. G.R.K. 24.xi.1962; 4 valves, S. Light house, Gopalpur, coll. V.K.P. 30.iii.1973.

*Measurements* : L. 7.24-43.90; Ht. 7.24-35.30.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pondicherry, Krusadai Island, Kundugal point, Tuticorin; Goa; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Sri Lanka.

*Remarks* : This species closely resembles *Anadara granosa* apparently but differs in hinge structure and in having widely seperated radial ribs.

## Family LXXIII CARDIIDAE

Genus 138. *Acanthocardia* Gray, 1851221. *Acanthocardia coronata* (Schroeter)

1786. *Cardium coronatum* Schroeter, *Einl. Conchyl.*, 3 : 53 sp. 4, pl. 7, fig. 13.  
1977. *Acanthocardia coronata* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 116 (for other synonyms).

*Material examined* : Baleshwar district : 1 ex., Baleshwar Bay, coll. Bengal Fisheries (Golden Crown); 1 valve, Chandipur, coll. B.P.& S.L.H. 7.iii.1939; 4 valves, Burhibalang river mouth nr.

I.B., Chandipur, coll. G.R.K. 3-4.xi.1962; 4 valves, Talburai, nr. Chandipur, coll. G.R.K. 5-6.xi.1962; 2 valves, Kasafal & Burhibalang nr. Chandipur, coll. V.K.P. 21-22.i.1972. Cuttack district : 80 valves, Khira Gachha Madeli, coll. G.R.K. 10-11.xi.1962; 2 valves, Khira Gachha Madeli, coll. N.V.S.R. 29.ii.1964; 2 valves, Paradip, port, coll. V.K.P. 31.i.1972; 25 valves, Paradip beach, coll. V.K.P. 7.xi.1973; 3 valves, False point, coll. No. data. Puri district : 37 valves, Konarak, coll. G.R.K. 19-20.xi.1962.

*Measurements* : L. 16.95-40.15; Ht. 16.55-39.74.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Kundugal point, Krusadai, Palk Bay, Mandapam; Maharashtra : Deogadh, Bombay; Gujarat: Gulf of Kutch; Nicobars. Elsewhere : Persian Gulf; Iran : Makran coast; Sri Lanka, Burma : Arakan coast, Maungmagan; Indonesia : Sumatra (for details, Ray, 1977).

*Remarks* : Ray (1977) is of the opinion that the species reported from India as *C. asiaticum* Bruguiere in fact belongs to this species. Most of the collections are represented by valves only. This species grows to fairly large size and extensively collected by fishermen from knee deep mud on the Bombay coast (Subrahmanyam, 1949).

#### 222. *Acanthocardia lata* (Born)

1778. *Cardium latum* Born, *Teste aeca. Musi. Caes. arei. Vindobonensis*, Pl. 3, fig. 9.

1956. *Cardium setosum* : Satyamurti, *Bull. Madras Govt. Mus. new ser*, 1(2) pt. 7 : 93, Pl. 16, fig. 3.

*Material examined* : Puri district : 2 valves, Satpara and Minkpatna, Chilka Lake, coll. H.C.R. 30.xii.1954 & 1.i.1955. Ganjam district : 1 valve, Chatrapur, coll. 24.xi.1962.

*Measurements* : L. 34.60-52.85; Ht. 27.25-39.45.

*Distribution* : India : Orissa (as above); Andhra Pradesh: Visakhapatnam; Tamil Nadu : Madras, Shingle Isand, Krusadai; Maharashtra : Bombay; Gujarat; Andamans. Elsewhere : Sind; Burma : Mergui Archipelago; Philippines; Australia : Cebu; Morten Bay.

*Remarks* : When alive these animals are covered with brown and hairy periostracum. Usually lives in sandy mud substratum surrounding rocks (Subrahmanyam, 1949). The present material include valves having faint impressions of the bristles and scaly margin.

### Genus 139. *Trachycardium* Moerch, 1853

#### 223. *Trachycardium variegatum* (Sowerby)

1840. *Cardium variegatum* Sowerby, *Proc. zool. Soc. Lond.*, 1840 : 107 (Type locality : Insulam Leyte, "Philippinarum.").

1841. *Cardium variegatum* : Sowerby, *Conchological Illustrations*, sp. 45; fig. 57 (Type locality : Philippines).

1845. *Cardium variegatum* : Reeve, *Conch. Icon.*, 2, *Cardium*, sp. 75, pl. 15, sp. 75.

*Material examined* : Cuttack district : 1 valve, Khiragachha Madeli, coll. G.R.K. 11.xi.1962. Puri district : 2 valves, Puri, coll. G.R.K. 15 & 17.xi.1962. Ganjam district : 5 valves, Chatrapur, coll. G.R.K. 24.xi.1962.

*Measurements* : L. 12.10-26.65; Ht. 12.95-30.65.

*Distribution* : India : Orissa (as above); Tamil Nadu; Madras : Tuticorin, Maharashtra : Bombay. Elsewhere : Aden; Sri Lanka; Burma; Hong Kong; China.

Genus 140. *Laevicardium* Swainson, 1840Subgenus *Fulvia* Gray 1853224. *Laevicardium (Fulvia) apertum* (Bruguiere)

1789. *Cardium apertum* Bruguiere, *Encycl. Methd.*, 1 : 226 (Type locality : Jamaica) (refers Chmenitz, 1782).  
 1915. *Cardium (Fulvia) rugatum* : Preston, *Rec. Indian Mus.*, 11 : 229.  
 1916. *Cardium (Fulvia) rugatum* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 351.  
 1932. *Cardium (Papyridea) apertum* : Prashad, *The Lamellibranchia of Siboga exped., pt. 2. Pelecypoda*, 53C : 282 (For other synonyms).

*Material examined* : Puri district : 1 ex., outer bar close to mouth, Chilka lake, coll. B.P. & S.L.H. 1.iii.1939.

*Measurements* : L. 7.20-9.45; Ht. 6.35-8.80; T. 4.10-5.75.

*Distribution* : India : Orissa (as above) ; Andhra pradesh : Barua beach. Elsewhere Burma : Mergui Archipelago; Philippines; Indonesia : Java, Bay of Bima, Sulu harbour, Banda anchorage, Buka, Rotti Island; Philippines; Japan (Prashad, 1932). Common in Japan to East Indies (Abbott and Dance, 1982).

## Family LXXIV MACTRIDAE

Commonly known as trough or surf clams, these are widely distributed in tropical and subtropical waters, some species are used as food; usually live in sandy mud in shallow water.

The family includes a total of eleven species under two genera from Orissa.

*Key to genera*

Shell with resilium and ligament separated by lamellae; dorsal part not gaping; pallial sinus small.....*Macra*

Shell with resilium and ligament not separated by lamellae; dorsal part gaping; pallial sinus large.....*Spisula*

Genus 141. *Macra* Linneaus, 17585-[<sup>3</sup>H]Key to species

1. Shell concentrically plicated; posterior slope ridged or keeled; strong, inequilateral and compressed..... 2  
 Shell not concentrically plicated, either smooth or finely striated; posterior slope either keeled or not, sub-inequilateral; usually inflated..... 4
2. Concentric plications present throughout the surface of the shell, plication widely separated from each other.....*M. plicataria*  
 Concentric plications restricted towards upper part only..... 3
3. Shell transversely triangular; compressed; pallial sinus deep, not ascending.....  
 .....  
 .....*M. reevesi*  
 Shell ovately triangular; inflated; pallial sinus shallow, ascending.....*M. laevis*
4. Lunule and escutcheon separated by groove ..... 5



- Lunule and escutcheon not separated by groove ..... 6
5. Shell deep violet in colour, valves thin, fragile; less inflated ..... *M. violacea*  
 Shell white in colour, valves thick, heavy; more inflated ..... *M. turgida*
6. Shell triangularly wedge shaped; compressed; anterior margin broadly rounded, posterior angulate, prominent keel running postero-ventral ..... *M. cuneata*  
 Shell either ovate or transversely triangular; inflated; keel not prominent, anterior margin narrowly rounded, posterior obtuse ..... 7
7. Shell transversely triangular; straw coloured; interior white with deep violet in umbonal area ..... *M. luzonica*  
 Shell ovately triangular; usually white in colour, umbo violet ..... 8
8. Pallial sinus shallow; valves inflated; interior white ..... *M. mera*  
 Pallial sinus deep; valves slightly compressed ..... 9
9. Dorsal margin on either side of umbo concentrically grooved; rest of shell smooth, umbonal tip violet in colour, outer surface with light brown vertical bands, interior brownish in umbonal area ..... *M. grandis*  
 Dorsal margin on either side of umbo as well as rest of the shell smooth. Umbonal tip white, outer surface without bands; interior white ..... *M. symmetrica*

Subgenus *Mactra* s.str.

225. *Mactra (Mactra) cuneata* Gmelin

1791. *Mactra cuneata* Gmelin, *Syst. Nat.*, ed. 13 : 3260 sp. 19 (Type locality : Not given).

1854. *Mactra corbiculoides* Deshayes, *Proc. zool. Soc. Lond.* : 62.

1977. *Mactra (Mactra) cuneata* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 133.

*Material examined* : Cuttack district : 1 valve, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962. Puri district : 1 valve, Konarak, coll. G.R.K. 19.xi.1962. Ganjam district : 7 valves, Gopalpur, coll. M.C. & G.R.K. 21.ii.1948; 2 valves, coll. G.R.K., 28 & 29.xi.1962; 6 valves Chatrapur, coll. G.R.K. 24.xi.1962.

*Measurements* : L. 21.90-29.86; Ht. 18.75-24.38.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Pamban, Krusadai, Kundugal point, Traquebar; Gujarat : Veraval; Nicobars.

*Remarks* : Satyamurti (1956) reported the species from Krusadai and Kundugal point but the figure given by him do not agree with the descriptions.

226. *Mactra (Mactra) grandis* Gmelin

(Pl. XXII, figs. 5, 6)

1791. *Mactra grandis* Gmelin, *Syst. Nat.*, ed. 13 : 3259, sp. 12 (Type locality : unknown).

1977. *Mactra (Mactra) grandis* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 134 (for other references.).

*Material examined* : Cuttack districted : 3 valves, Khiragachha Madeli, coll. G.R.K.

10&11.xi.1962. Puri district : 2 valves, Konarak, coll. G.R.K. 1962; 1 valve, Puri coll. G.R.K. 17.xi.1962; 1 valve, Chandrabhaga, nr. Konarak, coll. G.R.K. 15.ii.1972; 1 valve, coll. V.K.P. 11.ii.1972; 2 valves, Kaluparaghat, Chilka, coll. H.C.R. 12.i.1955. Ganjam district : 2 valves, Gopalpur, coll. M.C. & G.R.K. 21.ii.1948; 2 valves, Gopalpur, coll. V.K.P. 30.3.1973.

*Measurements* : L. 21.50-44.36; Ht. 16.12-37.60.

*Distribution* : India : Orissa (as above) only. Elsewhere : West Africa; Persian Gulf, Burma : Singapore, East Indies (Abbott, 1982). This is the first record from Indian waters.

*Remarks* : Shell triangular in shape, equilateral, moderately thick, inflated; umbo small, dorsal margin on either side of umbo gradually sloping, anterior margin broadly rounded, posterior narrower, ventral evenly rounded; surface smooth except for growth lines; hinge narrow, arrangement of teeth similar to that in the preceding species; colour light brown, umbonal region and tip violet; interior smooth, white, with violet blotch near umbonal cavity.

### 227. *Macra (Macra) luzonica* Deshayes

1854. *Macra luzonica* Deshayes, *Proc. zool. Soc. Lond.*, 1854 : 64, sp. 12 (Type locality : Luzon, Philippines).

1977. *Macra (Macra) luzonica* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 135 (for other references).

*Material examined* : Baleshwar district : Chandipur and environs : 15 valves, coll. B.P. & S.L.H., 4 & 7.iii.1939; 4 valves, coll. S.L.H. & A.G.K.M., 27.vi.1949; 9 valves, coll. No data; 2 exs, 107 valves, coll. G.R.K.; 3-6.xi.1962; 9 valves, coll. V.K.P. 21.i.1972; 26 valves, coll. N.V.S.R., 30.xi.1984. Cuttack district : 1 valve, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962. Puri district : 2 valves, Puri beach, coll. B.P., 8.vi.1938; 1 valve, Puri, coll. G.R.K. 15.xi.1962; 2 valves, Chandranhaga nr. Konarak, coll. V.K.P. 11.ii.1972. Ganjam district : 6 valves, Chatrapur, coll. G.R.K., 24.xi.1962; 27 exs. Gopalpur, Coll. N.V.S.R. 1.xii.1984.

*Measurements* : L. 10.00-35.50; Ht. 7.85-25.00 T. 3.65-16.55.

*Distribution* : India : Orissa (as above); West Bengal : Digha, Sagar island; Tamil Nadu : Madras, Gulf of Mannar; Goa; Maharashtra : Bombay; Andamans. Elsewhere : Sri Lanka; Burma; Botany Bay, Philippines; Australia : Queensland.

### 228. *Macra (Macra) mera* Deshayes

1853. *Macra mera* Deshayes, *Proc. zool. Soc. Lond.*, 1853 : 16 (Type locality : Chinese sea).

1932. *Macra (Macra) mera* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt. 2, *Pelecypoda*, 53C : 209.

*Material examined* : Baleshwar district : Chandipur & environs, 1 ex., coll. F.H. G., May 1917; 3 exs., coll. B.P. & S.L.H., 4.iii.1939; 11 exs. 7 valves, coll. S.L.H. & A.G.K.M. 24-25.vi.1949; 41 exs. 58 valves, coll. G.R.K., G.R.K., 3-6.xi.1962; 1 ex., coll. No data; 4 exs., 9 valves, Kasafal, coll. V.K.P. 21-23.i.1972; 1 valve, coll. N.V.S.R. 30.xi.1984. Puri district : 1 valve, Chandrabhaga, nr. Konarak, coll. V.K.P. 17.iii.1973. Ganjam district : 4 valves., Gopalpur, coll. V.K.P. 30.iii.1973. 3 exs. & 26 valves, Orissa coast, coll. No. data.

*Measurements* : L. 29.90-64.40; Ht. 24.25-52.55; T. 15.00-38.72

*Distribution* : India : Orissa (as above); West Bengal : Digha, Sagar island; Tamil Nadu :

Madras, Kundugal point; Maharashtra : Bombay. Elsewhere : Singapore, China sea; Indonesia; East Indies.

229. *Maetra (Maetra) symmetrica* Deshayes  
(Pl. XXII, figs. 1, 2)

1853. *Maetra symmertrica* Deshayes, *Proc. zool. Soc. Lond.*, 1853, pt. 21 : 17 (Type locality : New Caledonia).

1977. *Maetra (Maetra) symmetrica* : Ray, *Contribution to the knowledge of the molluscan fauna of Maungmagan, Lower Burma* : 135.

*Material examined* : Puri district : 1 valve, Chandrabhaga, nr. Konarak, coll. G.R.K. 15.ii.1975.

*Measurements* : L. 37.34; Ht. 26.15.

*Distribution* : India : Orissa (as above) only. Elsewhere : Red sea; Sri lanka; Burma : Maungmagan. This is the first record from Indian waters.

*Remarks* : This species appears almost similar to *M. luzonica* but differs from it in the absence of concentric grooves on its anterior part and in violet colouration.

Subgenus *Coelomaetra* Dall, 1895

230. *Maetra (Coelomaetra) turgida* Gmelin

1791. *Maetra turgida* Gmelin, *Syst. Nat.*, ed. 13 : 3260 (Type locality : 'Tranquebariae').

1956. *Maetra turgida* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1(2) pt. 7 : 140, pl. 21, fig. 3.

*Material examined* : Baleshwar district : 2 valves, Chandbali, S.E. of Bhadrak, coll. No data. Cuttack district : 2 valves, Khira Gachha Madeli, coll. N.V.S.R., 1.iii.1964. Puri district : 1 valve, Konarak, coll. G.R.K. 20.xi.1962.

*Measurements* : L. 32.65-58.18; Ht. 33.00-48.60.

*Distribution* : India : Orissa (as above); West Bengal : Sagar island. Tamil Nadu : Madras, Pamban, Kundugal point; Elsewhere : Sri lanka; Burma : Arakan, St. Thomas Island; West Indies. Indian ocean (Abbott, 1982).

231. *Maetra (Coelomaetra) violacea* Gmelin

1791. *Maetra violacea* Gmelin, *Syst. Nat.*, ed. 13 : 3260 (Type locality : 'Tranquebariae'; refers Chemnitz).

1956. *Maetra violacea* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1(2) pt. 7 : 141, pl. 21, fig. 5 (for other references).

*Material examined* : Baleshwar district : 1 valve, Chandbali, S.E. of Bhadrak, and 6 valves, Chandipur, coll. B.P. & S.L.H. 7.iii. 1939; 5 exs., and 22 valves, Chandipur & enviorns, coll. G.R.K. 3-5.i.1962.

*Measurements* : L. 34.32-80.14; Ht. 28.10-63.20; T. 15.90-19.46.

*Distribution* : India : Orissa (as above) ; West Bengal : Sagar Island, Sand heads; Tamil Nadu : Kundugal point, Pamban, Coromandal coast; Andamans. Elsewhere : Indian Ocean to Philipines (Abbott and Dance 1982).

*Remarks* : This species closely resembles *M. turgida*, but differs from it in having low umbo, shell more tranversely ovate, more thin and violet in colour. Generally occurs in fine muddy sandy in the intertidal region.

Subgenus *Maetrinula* Gray, 1853

232. *Maetra (Maetrinula) laevis* Chemnitz,

1782. *Maetra laevis* Chemnitz, *Conchy. Cab.*, 6 : 214, Pl. 21, fig. 205 & 206.

1854. *Maetra laevis* : Reeve, *Conch. Icon.*, 8, *Maetra*, sp. 27, pl. 7, fig. 27.

*Material examined* : Puri district : 1 valve, Puri, coll. No data.

*Measurements* : L. 76.28; Ht. 59.86.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Goa. Elsewhere : Indonesia, Samar island Philippines :

*Remarks* : Shell large, ovately triangular, inequilateral, inflated, posteriorly keeled, white, finely striated, plications prominent more towards umbonal area and anterodorsal part, gradually disappearing towards lower part; hinge narrow, resilium large; laterals short, cardinals small, lunule lanceolate, large; anterior margin rounded, posterior angulate; inner surface smooth.

This species differs from the preceding one in not having plications throughout, and in having more inflated and thick shell.

### 233. *Mactra (Mactrinula) plicataria* Linnaeus,

1767. *Mactra plicataria* Linnaeus, *Syst. Nat.*, ed. 12 : 1125.

1977. *Mactra (Mactrinula) plicataria* : Subba Rao, *Newsl. zool. Surv. India*, 3 (5) : 300.

*Material examined* : Baleshwar district : 2 valves, Chandipore, coll. B.P. & S.L.H. 7.iii.1939; 1 valve, Chandipur, coll. G.R.K. 4.xi.1962.

*Measurements* : L. 29.74-39.10; Ht. 22.32-75.

*Distribution* : India : Orissa (as above); West Bengal : Digha ; Tamil Nadu : Madras, Appaiah Bay; Goa; Maharashtra : Bombay, Colva beach; Great Nicobar. Elsewhere : Burma : Arakan; Indonesia, Sumatra.

*Remarks* : Subrahamanyam et al (1949) remarked that this species was rare in Bombay but common at Madras.

### 234. *Mactra (Mactrinula) reevesi* Gray

1837. *Mactra reevesi* Gray, *Ann. Mag. nat. Hist.*, (?) : 372.

1854. *Mactra reevesi* : Reeve, *Conch. Icon.*, 8, *Mactra*, sp. 92, pl 17, fig.92.

*Material examined* : Puri : 1 valve, Off Devi river mouth, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 33.32; Ht. 21.80.

*Distribution* : India : Orissa (as above); West Bengal : Sand Heads only. Elsewhere : Malacca.

*Remarks* : This species resembles *M. plicataria* in having compressed valves, but differs in not having concentric plications throughout surface of the shell and shape more transversely elongate. This species resembles *M. laevis* in its shape and sculpture, but differs from it in having less inflated, thin and fragile valves, pallial sinus not ascending. The material was found encrusted with egg mass of *Murex* sp. on its surface.

## Genus 142. *Spisula* Gray, 1837

### Subgenus *Standella* Gray, 1853

### 235. *Spisula (Standella) annandalei* (Preston)

(Pl. XXII, figs. 7,8)

1915. *Standella annandalei* Preston, *Rec. Indian.*, 11: 305, fig. 19, 19a-b (Type locality : N.E. of Nalbano, Chilka Lake).

1916. *Standella annandalei* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : Lake 355.

*Material examined* : Puri district : 3 exs. and 1 valve, Chilka lake (Nalbano, etc.); 1 valve, Chandrabaga nr. Konark, coll. V.K.P. 17.iii.1973.

*Measurements* : L. 13.20-24.05; Ht. 8.05-14.65; T.4.75-8.60.

*Distribution* : India : Known from Chilka and Konarak only.

*Remarks* : A specimen collected from near Balugaon has its siphon extended out which is brown in colour. This species differs from *S. pellucida* in having more inflated, tumid shell and pallial sinus broader and not extending beyond umbo.

Family LXXV SOLENIDAE

Commonly known as razor shells. Occurs in shallow water, buried in soft mud and fine sands. Four species are included under the genus *Solen* from Orissa.

Genus 143. *Solen* Linnaeus, 1758

*Key to species*

1. Shell broad, thick, anterior and posterior margins truncate; outer surface with pinkish marking with oblique demarcation from antero-dorsal to postero-ventral; anterior margin thickened internally.....*S. truncatus*  
 Shell narrow, thin; anterior margin oblique truncate; posterior margin rounded; no marking on outer surface; anterior margin not thickened internally..... 2
2. Shell with deep groove behind anterior margin.....*S. gravelyi*  
 Shell without groove behind anterior margin..... 3
3. Shell linear, narrow, posterior part slightly narrower than anterior; postero dorsal margin angular .....*S. kemp*  
 Shell broader, posterior part equal to anterior; postero-dorsal margin rounded .....  
 ..... *S.annandalei*

236. *Solen annandalei* Preston  
 (Pl. XXIII, figs. 1, 2)

1915. *Solen annandalei* Preston, *Rec. Indian Mus.*, 11 : 305, fig. 17 (Type locality : Satpara bay, Chilka lake).

1916. *Solen annandalei* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 355, Pl. 14, fig. 9 (Figure erroneously numbered as 8).

1941. *Solen annandalei* : Gravely, *Bull Madras Govt. Mus. new Ser.*, 5 (1) : 64.

*Material examined* : Baleshwar district : 21 exs., 4 valves, Chandipur, coll. G.R.K. 3-6.xi.1962; 4 exs., 19 valves, Kasafal N. of Balaramgudi, coll. V.K.P. 23.ii.1972; 1 ex., Talseri, N. of Chandipur, coll. A.D. & S.B., 2 exs., 2 valves, Chandipur, coll. N.V.S.R. 30.xi.1984. Puri district : 2 exs., Satpara bay, Chilka lake, coll. Chilka Survey (Including type).

*Measurements* : L.31.15 - 77.5; Ht.6.10 - 14.25; T.4.22 - 9.90; Type L. 48.42; Ht. 9.26; T. 6.15.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras only.

**Remarks** : It occurs in sandy beaches at Nalbano and Satpara along with *S. kempi*. It is a backwater species coexisting with *Neosolen aquaedulcioris* Ghosh at Madras (Gravely, 1941).

237. *Solen gravelyi* Ghosh,  
(Pl. XXIII, figs. 3, 4)

1920. *Solen gravelyi* Ghosh, *Rec. Indian Mus.*, 19 : 54, pl. 2, figs. 6-9 (Type locality : Chandipur, Balasore, Orissa).

**Material examined** : Baleshwar district : 15 valves, Chandipur, coll. G.R.K. 3-4. & 30.xi.1962.

**Measurements** : L. 23.36-31.50; Ht. 3.86-4.80.

**Distribution** : Known from Chandipur only.

**Remarks** : The shells resemble with those of the genus *Neosolen* in having deep groove behind anterior margin, but differ from it being more elongate and having elongate anterior adductor muscle. In shape it agrees with *Solen kempi* but the shell differ in being thin, and fragile and in having a groove behind anterior margin.

Ghosh (1920) studied the anatomy of this species. The type specimen (M 11658/2) has been lost and we take the opportunity of designating the present material as Topotypes.

238. *Solen kempi* Preston  
(pl. XXIII, figs. 5, 6)

1915. *Solen kempi* Preston, *Rec. Indian Mus.*, 11 : 305, fig. 18 (Type locality : S.E. Patsahanipur, Chilka Lake).

1916. *Solen kempi* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 355, pl. 14, fig. 8 (Figure erroneously numbered as 9).

1920. *Solen kempi* : Ghosh, *Rec. Indian Mus.*, 19 : 52, pl. 2, figs. 1-5.

1941. *Solen kempi* : Gravely, *Bull. Madras Govt. Mus. new Ser.* 5 (1) : 63.

**Material examined** : Baleshwar district : 1 ex., 1 valve, Chandipur, coll. S.L.H. & A.G.K.M.; 1 ex., 13 valves, Chandipur, coll. G.R.K., 3-6.xi.1962; 1 ex., 1 valve, Kasafal nr. Balaramguri, coll. V.K.P. 23.i.1972; 2 exs., Satpara & Patsahanipur in Chilka lake, coll. Chilka Survey.

**Measurements** : L. 31.10-63.38; Ht. 6.95-9.92; T. 4.50-5.80.

**Distribution** : India : Orissa (as above); West Bengal: Sagar Island; Tamil Nadu: Madras.

**Remarks** : Annandale and Kemp (1916) remarked that "the animal had distinct greenish tinge instead of colourless in the fresh specimens collected from the sand near the mouth of the lake; its siphons resemble those of *S. fonesi*;" Ghosh (1920) studied the soft parts.

239. *Solen truncatus* Wood

1815. *Solen truncatus* Wood, *General Conchology* : pl. 26, figs. 3 & 4 (Type locality : American and Indian seas).

1949. *Solen truncatus* : Subrahmanyam, *Karandikar and Murti J. Univ. Bombay*, 17B (5) no.25 : 73 pl. 4, fig. 80.

**Material examined** : Baleshwar district : 4 exs., Chandipur, coll. Gravely, May, 1916; 2 valves, Chandipur, coll. G.R.K. 23.i.1972; 1 valve, Kasafal N. of Burhibalang, Chandipur, coll. V.K.P. 23.i.1972.

**Measurements** : L. 86.60-129.20; Ht. 17.06-22.60.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Bombay; Gujarat : Kutch. Elsewhere : Pakistan : Gwadar; Sri Lanka.

*Remarks* : Animals found to live in muddy sand in deep burrows; foot elongate with thickened anterior part, club shape; burrow deep by sudden contraction and expansion of foot.

Family LXXVI CULTELLIDAE

The family is represented by three genera viz. *Pharella*, *Neosolen* and *Siliqua* from Orissa.

*Key to genera*

- 1 Shell linear, subcylindrical, dorsal and ventral margins parallel, internal ridge absent, pallial sinus small and shallow ..... 2  
 Shell oblong, dorsal margin nearly straight, ventral margin rounded; internal ridge present towards anterior part; pallial sinus wide and deep.....*Siliqua*
2. Shell small not exceeding 30mm in length; thin, transparent; anterior margin truncate, deep furrow behind; hinge with single long tooth.....*Neosolen*  
 Shell large, exceeding 30mm in length; thick, covered by periostracum, both ends rounded, deep furrow absent on anterior margin; ventral margin slightly sinuate in middle; hinge with more than one tooth ..... *Pharella*

Genus 144. *Pharella* Gray, 1854

240. *Pharella javanica* (Lamarck)

1818. *Solen javanicus* Lamarck, *Hist. Anim sans Vert.*, 5 : (Type locality : Java)  
 1874. *Cultellus javanicus* : Sowerby, in *Reeve's Conch. Icon.*, 19, *Cultellus*, sp. 28, pl. 7, fig. 28.  
 1977. *Pharella javanica* : Subba Rao, *Newsl. zool. surv. India*. 3 (5) : 299.

*Material examined* : Baleshwar district : 1 ex., 2 valves, Talseri, S. of Subarnamukhi river mouth, coll. A. Dey, 5.xi.1983.

*Measurements* : L. 25.30-55.05; Ht. 7.58-13.14; T. 7.85.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning, Digha. Elsewhere : Malaysia Penang; Singapore; Indonesia: Java; Philippines : Cebu.

*Remarks* : The animals are usually found in muddy bottoms. Earlier this species has been recorded from Digha and Port Canning. The present record extends its distribution further south on the east coast.

Genus 145. *Neosolen* Ghosh, 1920

241. *Neosolen aquae-dulcioris* Ghosh  
 (Pl. XXIII, figs. 7, 8)

1916. *Solen ? fonesi* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 354, text fig. 5, pl. 16, fig. 7 (Type locality : off Samal Island, Chilka lake.)  
 1916. *Solen fonesi* : Ghosh, *Mem. Indian Mus.*, 5 : 368, figs. 1-3.  
 1920. *Neosolen aquae-dulcioris* Ghosh, *Rec. Indian Mus.*, 19 (2) : 57, pl. 2, fig. 12, pl. 3, figs. 13-14.  
 1941 *Solen aquae-dulcioris* : Gravely, *Bull. Madras Govt. Mus.*, 5 (1) : 64.

*Material examined* : Puri district : 50 exs., Off Samal island, Chilka lake (syntypes) coll. Chilka survey; 40 exs., Chilka lake (Off Balugaon, off Samal island, off Barkuda island) coll. Chilka Survey, 4.xi.1922. Ganjam district : 12 exs., Rambha, coll. Chilka Survey.

**Measurements** : Lectotype : L. 20-25; Ht. 5.75; Paralectotype L. 9.40-26.05; Ht. 3.35-7.10; T. 1.65-4.25.

**Distribution** : India : Orissa (as above); Tamil Nadu : Ennur backwaters; Kerala : Cochin backwaters.

**Remarks** : The body is considerably abbreviated antero-posteriorly in comparison with that of the species of *Solen*. Ghosh (1916) studied the anatomy including mantle lobes, siphon, foot, labial palps, gills, digestive system, nervous system, vascular system, excretory system and reproductive system of this species. The type collection mentioned by Ghosh (1920) and bearing Regd. No. M 9981/2 consists of 50 syntypes. One of the tube in the bottle contains a label indicating that the specimen was examined by Ghosh. However, the specimen is not in good condition. Hence we take the opportunity to select and designate Lectotype and Paralectotype from among the syntypes mentioned by Ghosh 1920. The species *Solen truncatus* reported by Preston (1914) from Chilka lake belongs to the Present species.

#### Genus 146. *Siliqua* Megerle von muhlfeld, 1811

##### Key to species

1. Shell white in colour; inflated; anterior and posterior ends rounded..... *albida*  
Shell violet in colour; compressed; with white radiating bands on surface, posterior end angled or rounded..... 2
2. Dorsal margin evenly curved; posterior margin narrow, angled with ventral margin; shell with less than four radiating bands ..... *fasciata*  
Dorsal margin straight; posterior margin rounded, shell with four radiating bands.....  
..... *radiata*

#### Subgenus *Siliqua* s.str.

##### 242. *Siliqua (Siliqua) radiata* (Linnaeus)

1758. *Solen radiatus* Linnaeus, *Syst. Nat.*, ed. 10 : 673, sp. 28 (Type locality : "O. Asiatico").

1977. *Siliqua radiata* : Ray, *Contribution to the knowledge on Molluscan fauna of Maungmagan, Lower Burma* : 141 (for distribution).

1980. *Siliqua radiata* : Rajagopal Mookherjee and Mitra., *Bull. zool. Surv. India*, 2 (2 & 3) : 227, Pl. 5, fig. A & B.

**Material examined** : Baleshwar district : 1 ex., Chandipur, coll. B.P. & S.L.H., 7.iii.1939; 2 exs., Chandipur, coll. G.R.K. 10.xi.1962. Cuttack district : 9 exs., Khira Gachha Madeli, coll. G.R.K. 10.xi.1962. Puri district : 1 valve, Konarak, coll. G.R.K. 20.xi.1962; 1 ex., 1 valve, Chandrabhanga nr. Konark, coll. V.K.P. 11.ii.1972; 56 exs., Chandrabhanga, coll. G.R.K. 15.ii.1975; 2 exs., Puri, coll. N.A. 18-19.i.1908; 12 exs., Puri, coll. V.K.P. 13.iii.1973; 1 ex., Mouth of Chilka Lake, coll. K.S.M., 30.i.1954; 4 valves, Tonda nr. Sand Hills nr. Satpara rest house, coll. H.C.R. 30.xii.1954.

**Measurements** : L. 18.75-94.04; Ht. 6.66-33.95; T. 2.85-19.62.

**Distribution** : India : Orissa (as above); West Bengal : Sunderbans, Sagar island, Digha; Andhra Pradesh : Visakhapatnam, Kakinada; Tamil Nadu : Madras, Pamban, Tiruchendur, Tranquebar; Kerala : Malabar coast; coast; Goa; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : South Africa Durban; Sri Lanka; Burma; Indonesia : Sumatra, Java, Celebes, Moluccas; common in shallow mud area in the Indian Ocean (Abbott and Dance, 1982).



**Remarks** : Commonly known as 'Sunset' shells; dead shells get washed ashore on muddy shores.

**243. *Siliqua (Siliqua) albida* (Dunker\*)**

(Pl. XXIV, figs. 1, 2)

1874. *Cultellus albidus* : Sowerby, in Reeve's *Conch. Icon.*, 19 *Cultellus*, sp. 16, pl. 5, fig. 16 (Type locality : Catanuan, Philippines).

1949. *Siliqua albida* : Subrahmanyam, Karandikar and Murti, *J. Univ. Bombay*, 17B (5) : 73.

**Material examined** : Baleshwar district : 5 exs., Chandipur, coll. No data; 3 exs., Chandipur, coll. G.R.K., 3-4.xi.1962; 2 exs., Chandipur, coll. N.V.S.R. 30.xi.1984.

**Measurements** : L. 16.60-21.40; Ht. 8.92-10.20; T. 3.48-5.00.

**Distribution** : India : Orissa (as above); West Bengal : Muriganga estuary, Sagar Island, Sand heads; Maharashtra : Bombay. Elsewhere : Bangladesh; Philippines.

**Remarks** : It differs from the preceding species in not having radial bands and much narrower posterior margin.

**244. *Siliqua (Siliqua) fasciata* (Spengler)**

(Pl. XXIV, figs. 3, 4)

1794. *Solen fasciata* Spengler, *Skrivt. Nat. Selsk. Copenhagen*, 4 : no. 12.

1870. *Siliqua fasciata* : Moersch, *Malak. Blatt.*, 17 : 109.

1977. *Siliqua Fasciata* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 142 (for other references).

**Material examined** : Baleshwar district : 2 valves, Chandipur, coll. A.K. Chankravarti, 1984. Ganjam district : 1 valve, Gopalpur, coll. V.K.P. 30.iii.1973.

**Measurements** : L. 10.02-15.30; Ht. 4.98-8.38.

**Distribution** : India : Known from Gopalpur and Chandipur only. Elsewhere : Burma : Maungmagan; Japan. This is the first record from Indian waters thus extending its distribution from Pacific to Bay of Bengal.

**Remarks** : Shell small, oblong, thin, compressed; dorsal margin evenly curved, anterior part short, with rounded margin, posterior longer and gradually sloping with narrow margin, angled with ventral margin; outer surface finely striated concentrically, with faint white radial bands extending from umbo to ventral margin on violet background, four in number, interior deep violet; strong vertical ridge towards anterior part, pallial sinus deep, rounded; teeth similar to that of the preceding species.

This species apparently looks like *S. radiata* but differs from it in having acuminate posterior margin, and thicker and smaller valves.

Family LXXVII TELLINIDAE

Commonly known as Tellin shells. These are usually found in muddy, sandy bottom from shallow to deep water. Thirteen species and four genera in two sub families viz. Tellininae and Macominae are included in this family from Orissa.

---

\* Original reference not seen

*Key to genera*

1. Shell with one lateral tooth at least in one valve..... 2  
Shell without lateral tooth..... 3
2. Sculpture with oblique riblets on anterior part .....*Strigilla*  
Sculpture with concentric striae .....*Tellina*
3. Shell sub-trigonal; posterior end twisted; pallial sinus dissimilar, large in one valve, smaller in other .....*Macoma*  
Shell sub-orbicular; posterior end not twisted; truncated bluntly; pallial sinus similar in both valves .....*Apolymetis*

## Subfamily TELLININAE

Genus 147. *Tellina* Linnaeus, 1758

The genus includes seven subgenera viz. *Tellinides*, *Phraonella*, *Omala*, *Arcopagia*, *Homalina*, *Angulus* and *Dallitellina* from Orissa.

*Key to species*

1. Shell elongate; sculptured with concentric ridges; prominent keel..... 2  
Shell not elongate; sculptured with concentric ridges or fine growth lines; keel absent..... 3
2. Shell thick, umbo with oblique keel on either side, keel with row of spines; posterior margin rostrate..... *T. rostrata*  
Shell thin; umbo with keel on posterior side, with one spine; posterior margin angulate .....*T. lanceolata*
3. Shell large, exceeds more than 15 mm., subquadrate; umbo small, almost middle; mild oblique ridges on posterior side, pallial sinus large, occupies most part .....  
.....*T. sinuata*  
Shell small measuring less than 15 mm., oblong or ovate; umbo not in middle; oblique ridge absent; pallial sinus not large..... 4
4. Shell suborbicular; right valve with two laterals, posterior bilobed; surface smooth, glossy.....*T. casta*  
Shell not orbicular; right valve with single lateral or wanting; sculptured with concentric striae..... 5
5. Shell ovately oblong; umbonal region pink in colour. .... *T. iridescens*  
Shell not ovate; umbonal region white..... 6
6. Shell semioval, right valve with deltoid lateral teeth..... *T. myaeformis*  
Shell elongately ovate; right valve with simple lateral teeth, left valve without lateral .....*T. texturata*

Subgenus *Arcopagia* Brown, 1827

245. *Tellina (Arcopagia) casta* Hanley

1844. *Tellina casta* Hanley, *Proc. zool. Soc. Lond.*, : 63 (Type locality : Singapore, from sandy mud).  
 1916. *Tellina vadorum* Preston, *Rec. Indian Mus.*, 12 : 98, fig. 17, 17a (Type locality : Bambooflat Bay, Andamans).  
 1932. *Tellina (Arcopagia) casta* : Prashad, *The Lamellibranchia of the Siboga Exped., Pt. 2, Pelecypoda*, 53C : 187.  
 1968. *Tellina (Arcopagia) casta* : Dey, *Studies on Indian Tellinids*, Ph.D. Thesis : Ranchi Univ. : 81, pl. 8, fig. 2, pl. 10, figs. 1-2, pl. 13, figs. 5-6, pl. 15, fig. 1.

*Material examined* : Puri district : 1 ex., Off puri, coll. S.W.K. 2-29.iii.1916.

*Measurements* : L. 7.68; Ht. 6.70; T. 3.56.

*Distribution* : India : Orissa (as above); Andamans (Type locality of *T. vadorum*). Elsewhere : Singapore; Mauritius to Indonesia.

Subgenus *Pharaonella* Lamy, 1918

246. *Tellina (Pharaonella) iridescens* (Benson)

(Pl. XXIV, figs. 5, 6)

1842. *Sanguinolaria iridescens* Benson, *Ann. Mag. nat. Hist.*, (1) 9 : 490 (Type locality : Said to inhabit canals Tschu Siart, China ).  
 1915. *Tellina chilkaensis* Preston, *Rec. Indian Mus.*, 11 : 306; fig. 20 (Type locality : Channel of Barhampur, Chilka lake).  
 1916. *Tellina chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 356.  
 1981. *Tellina (Pharaonella) iridescens* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 143, pl. 19, fig. 2, pl. 21, figs. 3-5.

*Material* : Puri district : 1 ex., channel off Barhampur, Chilka lake, coll. Chilka Survey (Type); 1 ex., Chilka lake, coll. No data; 8 exs., Puri, Coll. No data.

*Measurements* : L. 6.75-15.40; Ht. 4.45-9.65; T. 2.00-5.70.

*Distribution* : India : Orissa (as above); West Bengal : Muriganga estuary, Sagar Island; Andhra Pradesh : Bhimilipatnam, Visakhapatnam, Kakinada; Gujarat : Koteswar, Mandvi (Kutch). Elsewhere : Seychelles, Philippines, China, Japan.

*Remarks* : Commonly known as 'nail polish shells', it can be distinguished by its ovate oblong shape and glossy, pink coloured umbonal region.

Subgenus *Omala* Schumacher, 1817

247. *Tellina (Omala) texturata* Sowerby

(pl. XXIV, figs. 7, 8)

1867. *Tellina texturata* Sowerby, in Reeve's *Conch. Icon.* 17, *Tellina*, sp. 233, Pl. 41, fig. 233, Pl. 45, fig. 233b (Type locality : Not given).  
 1914. *Tellina confusa* Preston, *Rec. Indian Mus.*, 10 : 309., fig. 18 (Type locality : Lake Chilka).  
 1916. *Tellina confusa* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 356.  
 1968. *Tellina confusa* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 32.  
 1981. *Tellina (Omala) texturata* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 267.

*Material examined* : Puri district : 2 valves, Chilka lake (Cotypes); 1 ex., Chilka lake, coll. Chilka Survey; 1 ex., Off puri, coll. S.W.K. 24-29.iii.1916.

*Measurements* : l. 7.00-9.70; Ht. 4.26-6.20; T. 2.13-3.60.

*Distribution* : India : Orissa (as above) only. Elsewhere : Singapore.

**Remarks** : *Tellina confusa* Preston agrees with *T. texturata* in its general shape, sculpture etc, and hence it is treated as a synonym of the latter (Dey, 1981).

Subgenus **Homalina** Stoliczka, 1870

248. *Tellina (Homalina) myaeformis* Sowerby

1867. *Tellina myaeformis* Sowerby, in Reeve's *Conch, Icon.*, 17, *Tellina*, sp. 268, pl. 45, fig. 268 (Type locality : Pulicat lake, Coromandal).  
 1981. *Tellina (Homalina) myaeformis* : Dey, *Studies on Indian Tellinids*, Ph.D.Thesis, Ranchi Univ. : 170, pl. 24, fig. 2, pl. 25, fig. 6.

**Material examined** : Puri district: 4 exs., 2 valves, Puri, coll. Raban.

**Measurements** : L. 6.41-18.05; Ht. 6.80-13.14; T. 3.35-7.30.

**Distribution** : India : Orissa (as above); West Bengal : Chingrighatta nr. Calcutta. Port Canning; Tamil Nadu: Pulicat lake nr. Madras.

**Remarks** : The species can be distinguished by its semioval shape, presence of deltoid lateral teeth in the right valve.

Subgenus **Dallitellina** Afshar, 1969

249. *Tellina (Dallitellina) rostrata* Linnaeus

1758. *Tellina rostrata* Linnaeus, *Syst. Nat.*, ed. 10, sp. 43 : 675 (Type locality : 'O' Eurioee et Indico).  
 1791. *Tellina spengleri* Gmelin, *Syst. nat.*, ed. 13 : 3234 (Refers Chemnitz).  
 1969. *Tellina (Dallitellina) rostrata* : Afshar, *Mem. Geol. Soc. Am.*, 119 : 38, pl 10, figs 5-9.  
 1981. *Tellina (Dallitellina) rostrata* : Dey, *Studies on Indian Tellinids*, Ph. D., Thesis. Ranchi Univ. : 197, Pl 31, fig. 2, pl. 33, fig. 3.

**Material examined** : Cuttack district : 2 valves, Paradip, coll. V.K.P. 31.i.1972; 2 valves, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962.

**Measurements** : L. 53.15-58.14; Ht. 22.05-18.65.

**Distribution** : India : Orissa (as above); Tamil Nadu : Madras, Tuticorin; Andaman and Nicobar Islands. Elsewhere : Thailand; Malaysia; Singapore; Indonesia : Java; Philippines.

**Remarks** : This species can be distinguished by its elongate, narrow form with concentric ridges and oblique keels on either side of umbo, as well as gaping on posterior part; anterior part shorter and its margin rounded with an angle to dorsal margin, posterior part narrows down gradually, rostrate, margin angulate.

Subgenus **Tellinides** Lamarck, 1818

250. *Tellina (Tenninides) sinuata* Spengler

1758. *Tellina sinuata* Spengler, *Nat. Selsk. Skrivt.*, 4 : 109 (Type locality : Not known).  
 1949. *Angulus sinuata* : Subrahmanyam, Karandikar and Murti, *J. Univ. Bombay*, 17B (5) : 72, Pl. 5, fig. 70.  
 1981. *Tellina (Tellinides) sinuata* : Dey, *Studies on Indian Tellinids*, Ph.D.Thesis, Ranchi Univ. : 165, Pl. 23, figs. 1-2, pl.25, figs. 4-5.

**Material examined** : Baleshwar district : 1 ex., Chandipur, coll. K.N. Reddy, 12.viii.1976. Puri district : 1 valve, Konarak, coll. G.R.K. 15.ii.1975.

**Measurements** : L. 34.51-36.70; Ht. 21.50-24.30; T. 5.08.

**Distribution** : India : Orissa (as above); West Bengal : Digha; Tamil Nadu : Porto Novo, Tranquebar, Tuticorin, Palk Strait; Goa; Maharashtra : Ratnagiri, Bombay; Gujarat : Kandla; Andaman and Nicobars. Elsewhere : Malagasy; Pakistan : Karachi; Sri Lanka; Indonesia; Philippines.

Subgenus **Angulus** Megerle von Muehlfeld, 1811

251. *Tellina (Angulus) lanceolata* Gmelin,

1791. *Tellina lanceolata* Gmelin, *Syst. Nat.*, ed. 13 : 3236 (Refers Chemnitz's pl. 11, fig. 103, (Type locality: East Indian sea ).  
 1981. *Tellina (Angulus) lanceolata* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 193, pl. 31, fig. 1, pl. 33, fig. 2.

*Material examined* : Puri district : 1 ex., Puri coll. S.W.K. 24-29.iii.1916.

*Measurements* : L. 28.71; Ht. 13.14; T. 4.50.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Philippines.

Genus 148. *Strigilla* Turton, 1822

Subgenus *Aeretica* Dall, 1900

252. *Strigilla (Aeretica) splendida* (Anton)

1839. *Tellina splendida* Anton, *Verz.Conch.*, : 5 (Type locality : Isle of Samar, Philippines).  
 1908. *Strigilla denestriata* Preston, *Rec. Indian Mus.*, 2 : 210 (Type locality : (Andamans).  
 1981. *Strigilla (Aeretica) splendida* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 205, Pl. 32, figs. 1-3, Pl. 33, figs. 4-6.

*Material examined* : Baleshwar district : 1 valve, Chandipur, coll. K.N.Reddy, 12.viii.1976; 19 exs., Chandipur, coll. N.V.S.R. 30.xi.1984 & 1.xii.1984.

*Measurements* : L. 6.98-12.95; Ht. 5.45-11.00; T. 5.75.

*Distribution* : India : Orissa (as above); West Bengal : Digha, Sagar Island, Bokkhali, Muriganga estuary, Kakdwip; Andhra Pradesh : Kakinada Bay; Andamans. Elsewhere : Indonesia, Philippines.

*Remarks* : This species can be distinguished by its sculpture, light pink colour on umbonal area but variable colouration on the surface.

Subfamily MACOMINAE

Genus 149. *Macoma* Leach, 1819

The genus includes three species under two subgenera viz. *Psammacoma* and *Psammotreta* from Orissa coast.

*Key to species*

1. Shell smooth; ligament external; umbo situated towards anterior part; pallial sinus confluent..... 2  
 Shell concentrically sculptured; ligament sunken; umbo situated in middle; pallial sinus partly confluent ..... *M. ala*
2. Shell elongately oval; pallial sinus large, occupies entire shell, reaching anterior scar ..... *M. birmanica*  
 Shell ovately trigonal; pallial sinus occupies half of the area..... *M. truncata*

Subgenus *Psammacoma* Dall, 1900

253. *Macoma (Psammacoma) birmanica* (Philippi)

1949. *Tellina birmanica* Philippi, *Abbil. Besch.*, 3 : 27, 55 no.1 (Type locality : Mergui Archipelago).  
 1981. *Macoma (Psammacoma) birmanica* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 211, Pl. 34, fig.1.

*Material examined* : Baleshwar district : 2 exs., Talesari, coll. A. Dey, 5.ix.1983.

**Measurements** : India : Orissa (as above); West Bengal : Digha, Chemaguri nr. Sagar island, Port Canning; Andhra Pradesh : Kakinada Bay, Elsewhere : Burma.

**Remarks** : In the live condition its siphons are long and have golden yellow colour It buries in loose, slushy and muddy substrata at a depth of about 15 to 30 cms.

**254. *Macoma (Psammacoma) truncata* (Jonas)**

1844. *Tellina truncata* Jonas, Philippi, *Abbil. Besch.*, 1 (3), Pl. 1, (fig. 2 (Type locality : Manila).

1844. *Tellina gubernaculum* Hanley, *Proc. zool. soc. Lond.* 1844 : 142 (Type locality : West Coast of America).

1981. *Macoma (Psammacoma) truncata* : Dey, *Studies on Indian Tellinids*. Ph. D. Thesis, Ranchi Univ. : 216, Pl. 35, figs. 1-2, pl. 36, figs. 1-2, pl. 39, fig. 3.

**Material examined** : Cuttack district : 1 valve, Mahanadi estuary, coll. N.V.S.R. 29.ii.1964. Puri district : 1 valve, Kaluparaghat, nr. Chilka, coll. H.C.R., 12.i.1955.

**Measurements** : L. 44.48-48.66; Ht. 34.80-35.98.

**Distribution** : India : Orissa (as above); Pondicherry: Karaikal; Maharashtra : Bombay; Gujarat : Kandla Port. Elsewhere : Red sea; Persian Gulf; Pakistan: Karachi; Indonesia; Philippines.

**Subgenus *Psmmotreta* Dall, 1900**

**255. *Macoma (Psmmotreta) ala* (Hanley),**

1844. *Tellina ala* Hanley, *Proc. zool. Soc. Lond.*, 1844: 165 (Type locality : Ceylon ?).

1844. *Macoma (Psmmotreta) ala* : Dey, *Studies on Indian Tellinids*, Ph.D. thesis, Ranchi Univ. : 234, Pl 38, fig. fig. 1, pl. 39, fig. 6.

**Material examined** : Puri district : 1 ex., 3 valves, Puri. coll. No data.

**Measurements** : L. 23.20-31.50; Ht. 15.95-23.98; T. 5.75.

**Distribution** : India : Orissa (as above); Andhra Pradesh : Kakinada; Tamil Nadu : Tuticorin; Maharashtra : Bombay; Gujarat : Bhadreswar, Kandla, Balapur, Beyt island; Andamans. Elsewhere : Pakistan : Karachi; Sri Lanka; Burma; Philippines; Japan.

**Genus 150. *Apolymetis* Salisbury, 1929**

**256. *Apolymetis edentula* (Spengler)**

1794. *Tellina edentula* Spengler, *Nat. Selsk. Ser.*, 4 : 96 (non Broderip and Sowerby, 1829) (refers, Chemnitz, 1782)

1981. *Apolymetis edentulus* : Dey, *Studies on Indian Tellinids*, Ph. D. Thesis, Ranchi Univ. : 246, Pl. 43, fig.1, Pl. 45, fig. 4.

**Material examined** : Baleshwar district : 1 ex., Chandipur, coll. S.L.H. & A.G.K.M. 24.i.1949; 1 ex. Burhibalang river bed, coll. V.K.P. 21.i.1972; 3 exs., 2 valves, Chandipur, coll. N.V.S.R. 30.xi.1984. Cuttack district : 2 valves, False Point, coll. No data; 1 valve, Paradip Port, coll. V.K.P. 31.i.1972. Puri district : 2 valves, Konarak, Coll. G.R.K. 15.ii.1975.

**Measurements** : L. 45.35 51.95; Ht. 35.08-37.95; T. 16.65-17.66.

**Distribution** : India : Orissa (as above); West Bengal : Digha; Tamil Nadu : Porto Novo, Palk Strait, Nagapattinam; Pondicherry : Karaikal; Kerala; Karnataka : Karwar; Maharashtra : Bombay; Gujarat : Bhadreswar, Salaya, Mandvi (Kutch). Elsewhere : Red Sea : Malagasay; Sri Lanka; Thailand; Indonesia; Philippines; Fiji.

**257. *Tellina barhampurensis* Preston**

1915. *Tellina barhampurensis* Preston, *Rec. Indian Mus.*, 11 : 307, fig. 21, 21a (Type locality : Channel between Satpara and Barhampur, 2-6M., Lake Chilka, Orissa).

*Material examined* : 1 valve, Channel between Satpara and Barhampur, Chilka Lake, Orissa (Type), coll. Chilka Survey.

*Measurements* : L. 20.50; Ht. 14.42. (Preston, 1915).

*Distribution* : Known from Type locality only.

*Remarks* : The only material available for study is the type which however is not in good condition. The nature of cardinal teeth suggests that it may perhaps belong to the family Semelidae (Dey, 1981).

Family LXXVIII DONACIDAE

The family is represented by a single genus *Donax* which is known as 'wedge clam' It usually burrows in sandy and muddy substratum in shallow waters.

Genus 151. *Donax* Linnaeus, 1758

The genus includes five species under four subgenera viz. *Donax*, *Latona*, *Hecuba* and *Serrula*.

*Key to species*

1. Shell thick; strongly sculptured with concentric and radial ribs; prominent keel extends from umbo to postero-ventral margin.....*D. scortum*  
Shell thin; sculptured with radial ribs; prominent keel absent ..... 2
2. Shell transversely elongate..... 3  
Shell trigonal..... 4
3. Posterior part with strong radial ribs; pallial sinus small, rounded .....*D. aperittus*  
Posterior part with concentric ribs; pallial sinus large, deeply rounded...*D. pulchellus*
4. Shell interior violet, umbonal area white; pallial sinus deep, rounded, ascending .....  
.....  
.....*D. lubricus*  
Shell interior white; chocolate brown patch towards posterior part; pallial sinus shallow, not ascending.....*D. incarnatus*

Subgenus *Donax* s.str.

**258. *Donax (Donax) pulchella* Hanley**

1843. *Donax pulchella* Hanley, *Proc. zool. Soc. Lond.* 1843 : 6, (Type locality : West Indies).

1915. *Donax pulchella* : Preston, *Rec. Indian Mus.*, 11 : 303.

1986. *Donax (Donax) pulchella* : Subba Rao & Dey, *Rec. zool. Surv. India Occ. Papp.* 91 : 4, figs. 1-3, 14-19.

*Material examined* : Puri district : 1 valve, outer channel, Chilka lake, coll. No data; 18 exs., Puri, coll. No data.

*Measurements* : L. 4.46-11.82; Ht. 2.48-5.85; T. 1.50-3.98

*Distribution* : India : Orissa (as above); Andhra Pradesh : Masulipatnam, Nizampatnam; Tamil

Nadu : Adyar nr. Madras, Tuticorin; Pondicherry : Karaikal, Kerala : Cannanore, Calicut, Cochin, Vypeen Island; Karnataka : Suratkal, Mangalore; Goa. Elsewhere : Pakistan and Burma.

Subgenus *Hecuba* Schumacher, 1817

259. *Donax (Hecuba) scortum* (Linnaeus, 1758)

1758. *Venus scortum* Linnaeus, *Syst. Nat.*, ed. 10 : 685, no. 103 (Type locality : American).  
 1928. *Donax (Hecuba) scortum* : Melvill, *Proc. malac. soc. Lond.*, 18 : 115.  
 1986. *Donax (Hecuba) scortum* : Subba Rao and Dey, *Rec. Zool. Surv. India Occ. Pap.* 91 : 7, figs. 4, 20-21.

*Material examined* : Baleshwar district : 11 exs., Chandipur, coll. G.R.K. 4-6.xi.1962; 1 ex., coll. N.V.S.R. 1.xii.1984. Cuttack district : 2 exs., 1 valve, Khira Gachha Madeli, coll. G.R.K., 10.xi.1962; 2 valves, coll. N.V.S.R. 2.iii.1964. Puri district : Puri - 1 exs., coll. N.A. ; 1 valve, coll. B.P., 8.vi.1938; 1 valve, coll. No data; 2 valves, coll. G.R.K. 15-17.xi.1962. Ganjam district : 3 valves, Chatrapur, coll. G.R.K. 10.xi.1962.

*Measurements* : L. 24.90-73.24; Ht. 17.90-45.80.

*Distribution* : India : Orissa (as above); West Bengal: Digha; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Krusadai island, Shingle island, Kundugal point; Pondicherry; Kerala : Malabar coast; Maharashtra; Bombay; Gujarat : Gulf of Kutch. Elsewhere : Persian Gulf; Pakistan : Karachi; Sri Lanka; Burma; Indonesia. Widely distributed in Indo Pacific (Ray, 1948.)

*Remarks* : Most of the shells were found washed ashore and with rounded holes near umbo made by predators.

Subgenus *Latona* Schumacher, 1817

260. *Donax (Latona) incarnatus* Gmelin

1791. *Donax incarnata* Gmelin, *Syst. Nat.* ed. 13 : 3265, sp. 14 (refers Chemnitz's *Conch. Cab.*, 26, fig. 259, (Type locality : Tranquebar).  
 1854. *Donax dysoni* Deshayes, *Proc. zool. Soc. Lond.*, 22 : 353.  
 1908. *Donax trigonalis* Preston, *Rec. Indian Mus.*, 2 : 208, pl. 16, fig. 57 (Type locality : Andaman Islands).  
 1986. *Donax (Latona) incarnatus* : Subba Rao and Dey, *Occ. Pap. Rec. Zool. Surv. India*, 91 : 16, fig. 8, 9, 34, 35.

*Material examined* : 15 exs., Chandipur, coll. No data.

*Measurements* : L. 13.20-17.05; Ht. 10.95-13.28; T. 5.84-7, 75.

*Distribution* : India : Orissa (as above); West Bengal : Digha; Tamil Nadu : Tranquebar, Pamban; Pondicherry : Karaikal; Maharashtra : Bombay, Ratnagiri; Gujarat : Kuda. Elsewhere : Burma, Malaysia : Malacca; Hong Kong; Japan.

261. *Donax (Latona) lubricus* Hanley

1845. *Donax lubrica* Hanley, *Proc. zool. Soc. Lond.* 1845 : 17 (Type locality : unknown).  
 1986. *Donax (Latona) lubricus* : Subba Rao and Dey, *Rec. zool. Surv. India, Occ. Pap.* 91 : 19, fig. 10, 36-39.

*Material examined* : Baleshwar district : 8 exs., Talburai nr. Chandipur, coll. G.R.K. 6.xi. 1962.

*Measurements* : L. 8.65-18.90; Ht. 6.25-14.30; T. 3.20-7.45.

*Distribution* : India : Orissa (as above); West Bengal : Digha; Tamil Nadu : Mandapam, Pamban, Krusadai island; Kerala : Calicut, Cannanore, Ernakulam; Karnataka : Kumta, Mangalore; Goa; Maharashtra : Ratnagiri. Elsewhere : Sri Lanka; Burma : Arakan.



Subgenus **Paradonax** Cossman & Peyrot, 1910

262. *Donax (Paradonax) aperittus* Melvill,

1897. *Donax aperittus* Melvill, *Mem. Proc. Manchestr. Lit. Phil. Soc.*, 41 (7) : 24, pl. 7, fig.33 (Type locality : Karachi).  
 1928. *Donax (Serrula) aperittus* : Melvill, *Proc. malac. Soc. Lond.*, 18 : 115.  
 1968. *Donax (Serrula) aperittus* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 31, fig. 32.  
 1968. *Donax (Paradonax) aperittus* : Subba Rao and Dey, *Rec. Zool. Surv. India, Occ. Pap.* 91 : 22, figs. 11, 28-31.

*Material examined* : 2 exs., Off Puri, coll. S.W.K., 24-29. iii. 1916.

*Measurements* : L. 5.50-6.80; Ht. 3.15-3.15; T. 2.00.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Pamban. Elsewhere : Iran : Makran coast, Pakistan : Karachi.

Family PSAMMOBIIDAE

The family includes four species under two genera from Orissa. Commonly known as 'gari clams' and 'sanguin clams'. Occurs in muddy bays.

*Key to genera*

Shell inflated; gap on posterior side may be small or absent; posterior end broader than anterior..... *Gari*

Shell compressed; gap on posterior side usually more; posterior end narrower than anterior .....*Sanguinolaria*

Subfamily PSAMMOBIINAE

Genus 152. *Gari* Schumacher, 1817

Subgenus *Gari* s.str.

263. *Gari (Gari) maculosa* (Lamarck)  
 (Pl. XXV, figs. 1, 2)

1818. *Psammobia maculosa* Lamarck, *Hist. Anim Sans Vert.*, 5 : 513.  
 1932. *Gari (Gari) maculosa* : Prashad, *The Lamellibranchia of the Siboga Exped. pt. 2, Pelecypoda*, 53C : 298 (for other synonyms).

*Material examined* : Cuttack district : 1 valve, S. of Paradip port, coll. V.K.P. 31.i.1972.

*Measurements* : L. 20.34; Ht. 11.30.

*Distribution* : India : Orissa (as above); Andamans. Elsewhere : Sri Lanka; Bangladesh : Cox Bazar; China; Japan; (Abbott, and dance 1982). Very wide range in Indo-Pacific (Prashad, 1932).

*Remarks* : Prashad (1932) synonymised Deshayes's *P. ornata*, *P. corrugata*, *P. marmorea* and *P. rubicunda*, which are either colour variations or specimens with slightly coarser sculpture on the posterior region of the shell.

It closely resembles *P. arakanensis* Smith but differs from it in having a rounded margin.

*Psammobia bipartita* reported by Gravelly (1941) from Madras may also be referred to this species.

Subgenus *Psammobia* Lamarck, 1818264. *Gari (Psammobia) mahosaensis* Preston  
(pl. XXV, figs. 3, 4)

1915. *Psammobia mahosaensis* Preston, *Rec. Indian Mus.*, 11 : 303, figs. 16, 16a-b (Type locality : Southwards from Mahosa, 1.5-2M., Chilka lake).  
1916. *Psammobia mahosaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 353.

*Material examined* : Puri district : 1 ex., Southwards of Mahosa, Chilka lake, coll. Chilka Survey (Type); 7 exs., 3 valves, Chilka lake (Mahosa, Barhampur, Satpara, Barnikunda) coll. Chilka Survey.

*Measurements* : L. 3.35-8.90; Ht. 5.00-6.00; T. 2.35.

*Distribution* : Known from Chilka lake only.

*Remarks* : This species differs from the preceding one in its quadrangular shape; surface with concentric striae, subinequilateral, pallial sinus extends beyond umbonal axis.

## Subfamily SANGUINOLARIINAE

Genus 153. *Sanguinolaria* Lamarck, 1799Subgenus *Soletellina* De Blainville, 1824265. *Sanguinolaria (Soletellina) acuminata* Deshayes  
(Pl. XXV, figs. 5, 6)

1857. *Soletellina acuminata* Deshayes, in Reeve's *Conch. Icon.*, 10; *Soletellina*, sp. 12, pl. 3, fig. 12 (Type locality : Philippine Islands).  
1977. *Sanguinolaria (soletellina) acuminata* : Subba Rao, *Newsl. zool. Surv. India*, 3 (5) : 300.

*Material examined* : Baleshwar district : 3 exs., 5 valves, Chandipur, coll. G.R.K 4-5.xi.1962; 1 ex., coll. N.V.S.R. 30.xi.1984. Puri district : 1 ex., Puri, coll. No data. Ganjam district : 1 valve, Chatrapur, coll. G.R.K. 24.xi. 1964.

*Measurements* : L. 41.15-134.70; Ht. 16.20-61.20; T.26.40.

*Distribution* : India : Orissa (as above); West Bengal : Digha, Sagar Island; Kerala : Astamudi nr. Tranvacore. Elsewhere : Pakistan : Karachi.

266. *Sanguinolaria (Soletellina) diphos* (Linnaeus)

1771. *Solen diphos* Linnaeus, *Mantiessa Plantarum*, 2 : 544 (Type locality : India).  
1791. *Solen diphos* : Gmelin, *Syst. Nat.*, ed, 13 : 3226, sp. 13.  
1977. *Sanguinolaria (Soletellina) diphos* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 139.

*Material examined* : Puri district : 1 ex., Puri, coll. No data.

*Measurements* : L. 91.20; Ht. 45.00; T. 19.40.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Gulf of Mannar, Cuddalore, Annamalai, Nagapattinam; Kerala : Astamudi backwaters nr. Tranvacore; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Sri Lanka; Malaysia : Malacca; Philippines and Japan.

Family LXXX SEMELIDAE

*Key to genera*

Shell oval; smooth, translucent; compressed; posterior part without keel; pallial sinus deep.....*Theora*

Shell rhomboidal; concentrically striated, not translucent; not compressed; posterior part with mild keel; pallial sinus confluent .....*Cumingia*

Genus 154. *Theora* H. & A. Adams, 1856

Subgenus *Theora* s.str.

267. *Theora (Theora) opalina* (Hinds)

1843. *Neaera opalina* Hinds, *Proc. zool. Soc. Lond.*, 1843 : 78 (Type locality : Island of Samar, Philippines).  
 1914. *Theora opalina* : Preston, *Rec. Indian Mus.*, 10 : 310.  
 1915. *Theora opalina* : Preston, *Rec. Indian Mus.* 11 : 308.  
 1916. *Theora opalina* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 357, fig. 6.  
 1968. *Theora opalina* : Ray, *Bull. Indian Mus.*, 3 (1 & 2) : 31, fig. 33.

*Material examined* : Puri district : Several examples, Chilka Lake (Balugoan, Satpara, Kaluparaghat, Barkuda, Nalbano) coll. Chilka Survey; 72 exs., Off Puri, coll. S.W.K. 24-29. iii. 1916.

*Measurements* : L. 4.25-15.75; Ht. 2.35-8.92; T. 1.10.

*Distribution* : India : Orissa (as above); West Bengal : Muriganga estuary, Sagar Island, Port Canning; Tamil Nadu : Ennur, Madras; Kerala : Malabar coast, Cochin; Maharashtra : Bombay. Elsewhere : Indonesia : Molluccas; Philippines.

*Remarks* : Annandale and Kemp (1916) gave an interesting note of this species. It is an abundant bivalve mollusc in the inner area of the lake. It occurs more sparingly in the inner part of the outer channel. The shell lie superficially burried in mud or muddy sand, and siphons are capable of elongation to at least three times its length. The animal is capable of giving sudden leaps by ejecting water. It probably occurs in all estuaries and backwaters on the Indian coasts, at any rate it is fairly common in those of Bengal, Madras and Cochin.

Subba Rao et. al. (1983) studied the population density of this species from Muriganga estuary and found 1.6-10/m<sup>2</sup> on an average. Juveniles were observed during January and April.

Genus 155. *Cumingia* Sowerby, 1833

268. *Cumingia hinduorum* Preston

1915. *Cumingia hinduorum* Preston, *Rec. Indian Mus.*, 11 : 308, fig. 22 (Type locality : Main channel W. of Satpara island, Chilka lake).  
 1916. *Cumingia hinduorum* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 357.

*Material examined* : Puri district : 1 ex., Main channel W. of Satpara, coll. Chilka Survey (Type); 5 exs., Chilka lake, (Mahosa, Satpara, Patsahanipur etc.) coll. Chilka Survey.

*Measurements* : L. 4.85-10.72; Ht. 3.68-6.74; T. 1.65-4.90.

*Distribution* : India : Known from Chilka lake only.

*Remarks* : Living specimens were obtained off Parikuda in the main area of Chilka Lake in November in water of very low salinity, where the bottom was somewhat sandy (Annandale and Kemp. 1916).

## Family LXXXI TRAPEZIIDAE

Genus 156. *Trapezium* Megerle von Mühlfeld, 1811Subgenus *Neotrapezium* Habe, 1951269. *Trapezium (Neotrapezium) sublaevigatum* (Lamarck)  
(pl. XXVI, figs. 1, 2)

1819. *Cardita sublaevigata* Lamarck, *Hist. Anim. Sans. Vert.*, 6 : 26 (Type locality : Not given).  
 1915. *Petricola esculpturata* Preston, *Rec. Indian Mus.*, 11 : 301, fig. 13 (Type locality : Stn. 114, Manikpatna, oyster beds, Chilka).  
 1916. *Petricola esculpturata* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 352.  
 1954. *Trapezium (Neotrapezium) sublaevigatum* : Solem, *Proc. malac. Soc. Lond.*, 31 (2) : 71, pl. 6, figs. 4, 5, 8, 9, 13-15.  
 1977. *Trapezium (Neotrapezium) sublaevigatum* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 109.

*Material examined* : Puri district : 6 exs., Manikpatna oysterbeds, Chilka (Types); coll. Chilka Survey; 2 exs., 1 valve, Chilka lake, coll. Chilka Survey.

*Measurements* : L. 8.40-47.05; Ht. 5.05-26.50; T. 2.70-17.55.

Type of *Petricola esculpturata* Preston (1915) L. 23.30; Ht. 12.90; T. 7.80.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Coromandel coast, Ennur, Madras; Maharashtra : Bombay; Gujarat : Gulf of Kutch; Andamans. Elsewhere : Red Sea; Malagasy; Persian Gulf; Pakistan : Karachi; Arakan, Maungmagan; Burma; Singapore; Philippines, Japan.

*Remarks* : They are commonly found living in the crevices of rocks and boulders.

## Family LXXXII VENERIDAE

The family includes clams, which are commonly known 'venus clams' and are found burrowing into sand or mud in littoral region. It is the largest family and includes a number of economically important genera and species. Twenty five species under 13 genera are reported from Orissa.

*Key to genera*

1. Shell with ligament deeply excavated; usually flattened or feebly inflated ..... *Sunetta*  
 Shell with ligament not excavated; usually inflated of different degrees ..... 2
2. Shell rounded as high as broad; lunule heart shape, deep; surface concentrically striated ..... *Dosinia*  
 Shell either oval, oblong or trigonal; lunule may be present or absent, when present not deep; surface smooth or sculptured either concentric, radial or both ..... 3
3. Shell small, not exceeding 5mm; smooth, nymph bifid or trifid, hinge margin minutely denticulate ..... *Tivela*  
 Shell large, exceeds more than 5mm.; usually oblong in shape, hinge margin smooth ..... 4
4. Pallial sinus either entire or shallow ..... 5  
 Pallial sinus deep, rounded, usually ascending ..... 6

5. Surface with divaricate radial ribs; lunule flattened; pallial sinus entire; lateral teeth on left valve and corresponding groove smooth in right valve.....*Gafrarium*  
Surface smooth; pallial sinus shallow; lunule indistinct; lateral teeth in left valve and corresponding groove in right valve finely denticulate.....*Meretrix*
6. Shell thin, fragile; lunule indistinct, depressed; hinge without laterals..... *Clementia*  
Shell thick; lunule distinct, not depressed; hinge with laterals..... 7
7. Shell trigonal in shape; surface sculptured..... 8  
Shell elongate, ovate or quadrate; surface either smooth or concentrically sculptured ..... 10
8. Shell margin crenulate; surface strongly sculptured ..... 9  
Shell margin smooth; surface finely sculptured ..... *Pelecypora*
9. Surface with wide concentric lamellae, lamellae recurved.....*Bassina*  
Surface without wide concentric lamellae, lamellae represented as nodes on radial ribs, fine striations in between.....*Timoclea*
10. Shell quadrate; radial ribs crossed by undulating concentric folds giving reticulate appearance; margin crenulate ..... *Anomalocardia*  
Shell either oval or elongate; surface not reticulate; margin smooth..... 11
11. Shell elongate, compressed; lunule narrow, elongate.....*Paphia*  
Shell ovate, inflated; lunule broad ..... 12
12. Cardinal teeth bifid; laterals absent; pallial sinus horizontal.....*Marcia*  
Cardinal teeth not bifid; laterals present; pallial sinus ascending.....*Pitar*

Subfamily CIRCINAE

Genus 157. *Gafrarium* Roeding, 1798

270. *Gafrarium pectinatum* (Linnaeus)

1758. *Venus pectinata* Linnaeus, *Syst. Nat.*, ed. 10 : 689, sp. 120 (Type locality : India).  
1932. *Gafrarium pectinatum* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt. 2, *Pelecypoda*, 53C : 228;  
1948. *Gafrarium divaricatum* : Ray, *Rec. Indian Mus.*, 46 : 118.  
1975. *Gafrarium pectinatum* : Fisher Piette, *J. Conch. Paris*, 112 : 5, pl. 1, fig.1.  
1976. *Gafrarium pectinatum* : Fisher Piette, *Rec. zool. Surv. India*, 70 : 236.

*Material examined* : Puri district : 1 valve, Konarak, coll. G.R.K. 19 xi. 1962.

*Measurements* : L. 13.45; Ht. 11.80.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Palk Bay, Gulf of Mannar, Pamban, Krusadai Island, Shingle Island; Kerala : Cannanore, Cochin; Karnataka : Karwar, Kumta, Anjadive Island, St. Mary Island; Goa; Maharashtra : Bombay; Gujarat : Gulf of Kutch; Andamans. Elsewhere : Persian Gulf; Red Sea; Malagasy; Tanzania : Zanzibar; South Africa : Natal; Sri Lanka; Burma : Maungmagan; Hong Kong; Philippines.

This is the most common species of the genus and its range extends from Red sea to Japan.

Subfamily SUNETTINAE

Genus 158. *Sunetta* Link, 1807

*Key to species*

1. Surface of the shell smooth..... 2  
Surface of the shell sculptured with concentric ribs either entire or part..... 3
2. Shell elongately ovate; more inequilateral..... *S. scripta*  
Shell broadly ovate; equilateral ..... *S. excavata*
3. Sculptured partly anterior part being smooth; escutcheon deep ..... *S. donacina*  
Sculptured throughout; escutcheon shallow ..... 4
4. Ribs rounded, distant; postero-ventral margin rounded ..... *S. effosa*  
Ribs flat, narrow; postero-ventral margin angulate..... *S. meroe*

Subgenus *Sunetta* s.str.

271. *Sunetta (Sunetta) scripta* (Linnaeus)

1758. *Donax scripta* Linnaeus, *Syst. Nat.*, ed. 10 : 683, sp. 88 (Type locality : M. Mediterraneo).

1914. *Meroe chilkaensis* Preston, *Rec. Indian Mus.*, 10 : 304 (vide Prashad, 1939).

1914. *Meroe satparaensis* Preston, *Rec. Indian Mus.*, 10 : 305, fig. 12, 12a (Type locality : shore at Satpara, Chilka Lake).

1976. *Sunetta scripta* : Fischer Piette, *Rec. zool. Surv. India*, 70 : 238 (for other synonyms).

*Material examined* : Baleshwar district : 5 valves, Chandipur, coll. G.R.K. 4-6.xi.62. Cuttack district : 84 valves, Khira Gachha Madeli, coll. G.R.K., 10-11.xi.1962. 3 exs., coll. N.V.S.R., 1-2.iii.1964; 3 valves, Paradip port, coll. V.K.P., 31.i.1972. Puri district : Konark - 78 valves, coll. G.R.K., 19-20.xi.1962; 2 exs., 7 valves, coll. V.K.P. 11.ii.1972; 4 valves, coll. Y.C. 20.ii.1972; 53 valves, coll. V.K.P., 17.iii.1973; Puri : 2 exs., 6 valves, coll. M.C. & G.R.K. 19-20.ii.1948, 56 valves, coll. B.P. 8.vi.1938; 1 ex., 14 valves, coll. N.A.; 1 ex., 184 valves, coll. G.R.K., 17.xi.1962; Chilka lake - 1 valve, Satpara, coll. Chilka survey (Type of *Meroe satparaensis* Preston); 2 valves, Outer channel, Barkuda, coll. Chilka Survey; 122 valves, Arakuda, nr. mouth, Manikpatna, Tonda, coll. H.C.R. 30.xii.1954 & 1.i.1955. Ganjam district : Gopalpur - 2exs. coll. H.A.F., 25.i.1941; 71 valves, coll. M.C. & G.R.K.; 11 exs., coll. G.R.K. 28. xii.1962; 6 exs., coll. V.K.P., 15-18.ii.1972; 10 valves, coll. V.K.P. 28-30.iii.1973, 16 valves, Chatrapur, coll. G.R.K. 24.xi.1962.

*Measurements* : L. 8.50-32.50; Ht. 6.23-24.51 Type of *Meroe satparaensis* L. 22.40, Ht. 16.41.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras; Tuticorin, Pamban, Kerala : Tranvancore; Karnataka : Suratkal, St. Mary Island, Mangalore; Goa; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Sri Lanka, Indonesia; Burma : Maungmagan; Philippines. Moluccas.

*Remarks* : It closely resembles *S. excavata* in having a smooth shell surface, but differs from it being more elongate.

272. *Sunetta (Sunetta) donacina* (Gmelin)

1791. *Venus donacina* Gmelin, *Syst. Nat.*, ed. 13 : 3295, no. 142 (Type locality : unknown).

1837. *Donax seminuda* Anton, *Arch. Naturges*, 3 : 283.

1970. *Sunetta donacina* : Fischer Piette, *Rec. zool. Surv. India*, 70 : 239 (for synonyms).

1977. *Sunetta (Sunetta) donacina* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 121.

*Material examined* : Cuttack district : 1 valve, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962.

Puri district : 2 valves, Kaluparaghat, coll. H.C.R. 12.i.1955; 8 valves, Balugaon, coll. H.C.R. 25.xii.1954.

*Measurements* : L. 24.64-42.50; Ht. 19.18-30.12.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Waltair, Bhimilipatnam; Karnataka : Mangalore; Maharashtra : Bombay; Gujarat : Gulf of Kutch. Elsewhere : Persian Gulf, Red sea, Sri Lanka; Burma : Maungmagan; Mergui Archipelago; Indonesia : Sumatra, Moluccas.

### 273. *Sunetta (sunetta) effosa* (Hanley)

1842. *Cytherea effosa* Hanley, *Proc. zool. Soc. Lond.*, 1842 10 : 123 (Type locality : Unknown).

1977. *Sunetta (Sunetta) effosa* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 120.

*Material examined* : Cuttack district : 3 valves, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962. Puri district : 3 valves, Puri, coll. B.P. 8.vi.1938. Ganjam district : 2 valves, Light house, Gopalpur, coll. V.K.P. 30.iii.1973.

*Measurements* : L. 21.00-28.40; Ht. 16.18-22.05.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Maharashtra : Bombay. Elsewhere : Persian Gulf; Red sea; Aden; Sri Lanka; Burma and Philippines.

*Remarks* : It closely resembles *S. meroe*, but differs from it in having an elongately triangular shape, slightly truncated posterior margin and more rounded ribs.

### 274. *Sunetta (Sunetta) meroe* (Linnaeus)

1758. *Venus meroe* Linnaeus, *Syst. Nat.*, ed. 10 : 687, sp. 107 (Type locality : 'O Australiore').

1914. *Meroe chilkaensis* (Part) Preston, *Rec. Indian Mus.*, 10 : 304, fig. 13, 13a (Type locality : On shore at Satpara, Chilka Lake).

1939. *Sunetta meroe* : Prashad, *J. Conch. Paris*; 3 : 46, pl. 2, fig.1.

1970. *Sunetta meroe* : Fischer Piette, *Rec. zool. Surv. India*, 70 : 238 (for other synonyms).

*Material examined* : Balleshwar district : Chandipur 14 exs., coll. G.R.K. 5.xi.1962; 13 exs., coll. No data. Cuttack district : Khira Gachha Madeli 73 valves, coll. G.R.K. 10-11.xi.1962; 1 valve, coll. N.V.S.R. 4.iii.1964; 17 exs., Pradip Port, coll. V.K.P. 31.i.1972. Puri district : Chilka Lake - 1 valve, Satpara, coll. Chilka Survey (Type : *Meroe chilkaensis* Preston); 40 valves, Manikpatna beach, coll. H.C.R., 1.i.1955. Konarak 62 valves, coll. G.R.K., 19-20.xi.1962; 3 valves, coll. Y.C. 20.iii.1973; Chandrabhaga beach nr. Konarak, 8 valves, coll. V.K.P., 11.ii.1972; 8 valves, coll. V.K.P. 17.iii.1973. Puri - 1 valve, coll. B.P. 8.vi.1938, 63 valves, coll. G.R.K., 14-17. xi.1962. Ganjam district : 22 valves, Chatrapur, coll. G.R.K. 24.xi.1962; Gopalpur 3 valves, coll. H.A.F., 25.i.1941; 7 valves, coll. V.K.P. 28-30.iii.1973.

*Measurements* : L. 13.45-45.82; Ht. 9.95-31.70 Type (*Meroe chilkaensis*) L. 25.35; Ht. 16.69.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Bhimilipatnam, Waltair; Tamil Nadu :

Porto Novo, Pondicherry, Tranquebar; Maharashtra : Bombay. Elsewhere : Indian Ocean.

Subgenus *Cyclosunetta* Fischer-Piette

275. *Sunetta (Cyclosunetta) excavata* (Hanely)

1842. *Cytherea excavata* Hanley, *Proc. zool. Soc. Lond.*, 10 : 123 (Type locality : Unknown).  
 1939. *Sunetta (Cyclosunetta) excavata* : Fischer-Piette, *J. Conch. Paris*, 83 : 188, 202-204.  
 1977. *Sunetta (Cyclosunetta) excavata* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 121.

*Material examined* : Baleshwar district : 3 exs, 6 valves, Chandipur.

*Measurements* : L. 10.60-25-30; Ht. 8.32-19.60; T. 9.25.

*Distribution* : India : Orissa ( as above); Andhra Pradesh : Visakhapatnam, Tamil Nadu: Madras; Maharashtra : Bombay : Elsewhere : South Africa : Natal, Sri Lanka; Burma : Maungmagan; Australia; New Holland; Japan.

*Remarks* : The species closely resembles *Sunetta donacina*, but differs from it in the absence of concentric sculpture.

Subfamily MERETRICINAE

Genus 159 *Meretrix* Lamarck, 1799

276. *Meretrix meretrix* (Linnaeus)

1758. *Venus meretrix* Linnaeus, *Syst. Nat.*, ed. 10. : 686, sp. 102 (Type locality : 'O. Indico').  
 1916. *Meretrix meretrix* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 351.  
 1976. *Meretrix meretrix* : Fischer- piette, *Rec. zool. Surv. India*, 70 : 240 (for distribution).

*Material examined* : Baleshwar district : 5 valves, Talburai nr. Chandipur, coll. G.R.K. 5-6.xi.1962; 1 ex., 1 valve, Chandipur, coll. N.V.S.R., 4.iii.1964; 1 valve, Paradip, coll. V.K.P. 9.ix.1973. Puri district : 1 valve, Konarak, coll. G.R.K. 19.xi.1962, 1 valve, outer Channel, Satpara, oyster Isaland, coll. Chilka survey : 11 exa. 1 valve, Satpara island, coll. H.C.R., 29.xii.1954; 4 exs., 1 valve, Arakuda, coll. H.C.R. 1.i.1955. Ganjam district : 12 valves, Chatrapur, coll. G.R.K., 24.xii.1962.

*Measurements* : L. 6.85-73.25; Ht. 5.95-66.42; T. 3.35.

*Distribution* : India : Orissa (as above); commonly occurs in river mouths and backwaters on both coasts of India. Elsewhere : Sri Lanka.

*Remarks* : It can be distinguished from *M. casta* by its ventricose form and more compressed, narrow hinge, and very distinct anterior cardinal teeth on left valve, It is also highly variable in its shape and colouration which lead to description of several varieties viz. *morphina*, *impudica*, *zonaria*, *castanea* and *aurora*.

277. *Meretrix casta* (Gmelin)

(Pl. XXVII, figs. 1, 2)

1791. *Venus casta* Gmelin, *Syst. Nat.*, ed. 13 : 3278, sp 42 (refers to Chemnitz, 1782 (Type locality : India).  
 1914. *Corbicula (Velorita) satparaensis* Preston, *Rec. Indian Mus.*, 10 : 306, fig. 22, 22a (Type locality : On shore at Satpara, chilka lake, Orissa).  
 1915. *Meretrix ovum* : Preston, *Rec. Indian Mus.*, 11 : 300.  
 1915. *Meretrix casta* : Preston, *Rec. Indian Mus.*, 11 : 300 (not larger valve).  
 1916. *Meretrix casta* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 351 (not *M. ovum* which is *M. meretrix impudica* juv.).  
 1976. *Meretrix casta* : Fischer- Piette, *Rec. zool. Surv. India*, 70 : 240 (for other refernces).



**Material examined** : Cuttack district : 1 valve, False point, coll. No data; 1 valve, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962; 3 valves, Paradip, coll. V.K.P. 9.ix.1973. Puri district : 8 valves, Konarak, coll. G.R.K. 19.xi.1962; Puri, 12 valves, coll. B.P. 8.xi.1938, 4 valves, coll. N.A.; 28 valves, coll. G.R.K. 19.xi.1962; Chilka Lake - 2 valves, Samal island, coll. N.A., 11.xi.1919, 1 ex., Cheriya island, coll. N.A., 4.ix.1919; 2 exs., 5 valves, outer channel, coll. Chilka Survey; 2 exs., Berhampur Island, coll. Chilka Survey; 2 valves, Kalupara ghat, coll. H.C.R.; 3 exs., 24 valves, Tonda, Balygaon, Manikpatna, Arakuda; coll. H.C.R. 20-27.xii.1954-1-11.i.1955. Ganjam district : 6 valves, Rambha, Chilka Lake, coll. Chilka Survey; 15 valves, Chatrapur, coll. G.R.K., 24.xi.1962; 5 valves, Rambha, coll. H.C.R. 11.i.1955.

**Measurements** : L. 12.50-55.95; Ht. 10.80-53.58.

**Distribution** : India : Orissa (as above); occurs in both coasts of India in Backwaters and connecting canals. Elsewhere : Sri Lanka; Burma : Arkan; Singapore; Malaysia : Malacca.

**Remarks** : It is variable in its shape, colouration and thickness, Hornell (1917), who revised the Indian species of *Meretrix* remarked that 'typical' form occurs from Chilka Lake to Capecomorin on east coast and a variety *satparaensis* occurs in subfossil condition in shell deposits in Chilka Lake, Sonapur, Pulicat and Sadras backwaters, shell pits in Mandapam, Korampalem near Tuticorin and no living individuals appear to assume this form.'

#### Genus 160. *Tivela* Link, 1807

##### 278. *Tivela dillwyni* (Deshayes)

1853. *Trigona dillwyni* Deshayes, In Gray, *Catalogue of the Conchifera or Bivalve shells in the collection of the British Museum* : Pt. 1 : 49.

1864. *Cytherea dillwyni* : Reeve, *Conch. Icon.*, 14, *Cytherea*, sp. 24, pl. 7, fig. 24.

1916. *Tivela dillwyni* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 352.

**Material examined** : Puri district : 1 ex., Seruanadi, Chilka Lake, coll. Chilka Survey.

**Measurements** : L. 3.30; Ht. 3.05; T. 1.50.

**Distribution** : India : Known from Chilka Lake, Orissa only. Elsewhere : Indian Ocean (Reeve, 1864).

**Remarks** : Annandale and Kemp (1916) stated "a single live specimen was collected from Chilka Lake during freshwater season."

#### Subfamily PITARINAE

#### Genus 161. *Pitar* Stewart, 1930

##### 279. *Pitar alabastrum* (Reeve)

(Pl. XXVII, Figs. 7, 8)

1863. *Dione alabastrum* Reeve, *Conch. Icon.*, 14, *Dione* sp. 42, pl. 10, fig. 42 (Type locality : Not given).

1894. *Cytherea (Caryatis) pudicissima* Smith, *Ann. Mag. nat. Hist.*, (6) 14 : 169, pl. 5, figs.3-4 (Type locality : Sun 81, off Gopalpur, 152-170 M).

1906. *Meretrix (Caryatis) pudicissima* : Smith, *Ann. Mag. nat. Hist.*, (7) 13 : 260.

1976. *Pitar alabastrum* : Fischer-piette, *Rec. zool. Surv. India*, 70 : 243.

1977. *Pitar alabastrum* : Ray, *Contribution to the knowledge of the Molluscan fauna of Maugmagan, Lower Burma* : 120.

**Material examined** : 1 ex., off Gopalpur, coll. Marine Survey (Type).

**Measurements** : L. 13.00; Ht. 10.45; T. 7.40.

**Distribution** : India : Orissa (as above); Tamil Nadu : Pamban, Porto Novo; Arabian sea.

Elsewhere : Gulf of Oman; Burma : Maungmagan. King Island, Singapore.

*Remarks* : Holotype of *Cytherea (Caryatis) pudicissima* Smith (Regd. No.4126/7) has been compared with *Pitar albastrum* (Reeve) and found agreeing in all respects with the latter. As Smith (1906) himself had remarked the Type is a juvenile specimen.

#### Genus 162. *Pelecypora* Dall, 1902

Two species are represented from Orissa. The two species were hitherto treated under the genus *Dosinia* but we have placed them under *Pelecypora* as they have ovately trigonal and inflated shell with a faint lunule and a long pallial sinus.

#### *Key to species*

Shell more inflated, ligamental area less excavated.....*P. trigona*

Shell less inflated, ligamental area deeply excavated.....*P. excisa*

#### 280. *Pelecypora (Pelecypora) excisa* (Schroeter)

1788. *Venus excisa* Schroeter, in Martini Chemnitz *Conchyl. Cab.*, Namen Register 10 : 112.

1976. *Dosinia (Sinodia) excisa* : Fischer-Piette, *Rec. zool. Surv. India*, 70 : 243.

*Material examined* : Baleshwar district : 1 valve, Chandbali, coll. No data. Cuttack district; 3 valves, Paradip, coll. V.K.P., 31.i.1972; 4 valves, Khira Gachha Madeli, coll. G.R.K. 11.xi.1962; 1 valve, Khira Gachha Madeli, coll. N.V.S.R. 29.ii.1964. Puri district : 1 valve, Chandrabhaga nr. Konarak, coll. V.K.P. 11.ii.1972; 1 valve, Puri, coll. No data.

*Measurements* : L. 11.25-34.70; Ht. 10.00-33.60.

*Distribution* : India : Orissa (as above); Tamil Nadu : Tranquebar; Maharashtra : Bombay. Elsewhere : Burma : Mergui Archipelago.

*Remarks* : The species agrees with the characters of the genus *elecypora* and hence treated under the genus.

#### 281. *Pelecypora (Pelecypora) trigona* (Reeve)

1850. *Artemis trigona* Reeve, *Conch. Icon.*, 6, *Artemis*, sp. 42, pl.7, fig.42 (Type locality : Red Sea).

1956. *Dosinia trigona* : Satyamurti, *Bull. Madras Govt. Mus. new ser.* 1 (2) pt. 7: 118, Pl. 17, fig. 6a-b (for other Synonyms).

1968. *Dosinia trigona* : Cheriyan, *Proceedings on Symposium on Mollusca*, Pt. 1 : 129.

*Material examined* : Baleshwar district : 2 exs., Talburai nr. Chandipur, coll. G.R.K. 5.xi.1962; 1 valve. Ganjam district : Chatrapur, coll. G.R.K. 24.xi.1962.

*Measurements* : L. 31.10-33.68; Ht. 30.60-32.10; T. 19.40-21.86.

*Distribution* : India : Orissa (as above); West Bengal: Digha; Tamil Nadu : Pamban; Kerala: Cochin. Elsewhere : Red Sea.

*Remarks* : This species differs from preceding species in having more inflated form and less excavated ligamental area.

Subfamily DOSININAE

Genus 163. *Dosinia* Scopoli, 1777

Subgenus *Asa* Basterot, 1825

#### 282. *Dosinia (Asa) fibula* (Reeve)

1850. *Artemis fibula* Reeve, *Conch. Icon.*, 6, *Artemis*, sp. 26, Pl. 5, fig. 26 (Type locality : Mouth of the Gambia, West Africa).

1976. *Dosinia (Asa) fibula* : Fischer-Piette, *Rec. zool. Surv. India*, 70 : 245 (For other synonyms).

*Material examined* : Puri district : 2 valves, Kaluparaghat, Chilka Lake, coll. H.C.R. 12.i.1955; 1 valve, Manikpatna, coll. H.C.R. 1.i.1955.

*Measurements* : L. 30.06-31.18; Ht. 31.00-31.75.

*Distribution* : India : Orissa (as above); Andhra Pradesh: Waltair; Tamil Nadu : Porto Novo. Elsewhere : West Africa.

### 283. *Dosinia (Asa) tumida* (Gray)

1838. *Cytherea tumida* Gray, *Analyst.*, 8 : 309.

1976. *Dosinia (Asa) tumida* : Fischer-Piette, *Rec. zool. Surv. India*, 70 : 246 (for other references).

*Material examined* : Baleshwar district : 1 ex., Chandipur, coll. No data; 1 valve, Chandbali S.E. of Bhadrak, coll. No. data. Cuttack district : 2 valves, Paradip Port, coll. V.K.P. 31.i.1972. Puri district : 1 valve, Manikpatna, Chilka lake, coll. H.C.R. 1.i.1955; 1 ex., Satpara Bay, Chilka Lake, coll. Chilka Survey. Ganjam district : 1 valve, Gopalpur, coll. M.C. & G.R.K. 21.ii.1948; 8 valves, Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 21.00-39.35; Ht. 20.60-38.18; T. 12.10.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Tuticorin, Tranquebar; Karnataka : Karwar; Goa; Maharashtra : Bombay. Elsewhere : Gulf of Aden; Suez Canal; Sri Lanka; Burma: Maungmagan; New Holland; Australia : Morten bay, Philippines; Japan;

*Remarks* : Fischer-Piette (1976) gave a detailed synonymy of this species. This species has been reported in India as *D. pubescens* (Subrahmanyam *et al.*, 1949).

Subfamily CLEMENTIINAE

Genus 164. *Clementia* Gray, 1842

### 284. *Clementia vatheleti* Mabilie (Pl. XXVII, figs. 3-6)

1901. *Clementia vatheleti* Mabilie, *Bull. Soc. Philom. paris*, (9), 3 : 57 (Type locality : Japan).

1914. *Clementia annandalei* Preston, *Rec. Indian Mus.*, 10 : 306, fig. 14 (Type locality : Off Balugaon, 2-2.5M, Lake Chilka).

1916. *Clementia annandalei* : Annandale and Kemp, *Mem. Indian Mus.*, 5: 352.

1972. *Clementia vatheleti* : Fischer Piette and Vakudinovic, *J.Conch. Paris*, 109 (4) : 159, figs. 18-22.

*Material examined* : Puri district : 1 ex., Off Balugaon, coll. Chilka Survey (Type); Several examples, Chilka Lake (Balugaon, Nalbano, Barnikuda and other stations) coll. Chilka Survey.

*Measurements* : L. 5.75-14.65; Ht. 5.35-13.60; T. 2.90-10.25; Type L. 17.40 Ht. 16.20 (Damaged).

*Distribution* : India - Orissa (as above); West Bengal : Port canning. Elsewhere : Japan.

*Remarks* : The type of *Clementia annandalei* Preston was compared with the figure of *C. vatheleti* given by Fischer Piette and Vakudinovic (1972). Preston's *C. annandalei* from Chilka Lake is nothing but the juvenile form of the latter species (Fischer Piette and Vakudinovic, 1972).

It is one of the commonest molluscs, occurring in mud along with *Theora opalina* all over the main area of the lake and less abundant in inner part of outer channel. Living specimens were dredged at all times of the year and dead shells are relatively abundant at the end of freshwater season. The

genus is characteristic of estuarine waters in the tropics of Africa and Asia. (Annandale and Kemp, 1916).

Subfamily TAPETINAE

Two genera viz. *Marcia* and *Paphia* are recorded from Orissa.

Genus 165. *Marcia* H. & A. Adams, 1857

Subgenus *Marcia* s.str.

285. *Marcia (Marcia) pinguis* (Schroeter)

1788. *Venus pinguis* Schroeter, *Namen Register in Conch. Cab.*, 10 : 112 (Type locality : East Indian seas).  
 1915. *Tapes pinguis* : Preston, *Rec. Indian Mus.*, 11 : 300.  
 1915. *Tapes ceylonensis* Preston, *Rec. India Mus.*, 11 : 301.  
 1916. *Tapes pinguis* : Annandale and Kemp, *Mem. Indan Mus.*, 5 : 352.  
 1916. *Tapes ceylonensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5: 352.  
 1948. *Katelysia opima* : Ray, *Rec. Indian Mus.*, 46 : 118.  
 1956. *Catelysia opima* : Satyamurti ; *Bull. Madras Govt. Mus. New. ser. 1 (2) Pt. 7*; 128, pl. 19, fig. 6a-c.  
 1976. *Marcia pinguis* : Fischer-Piette, *Rec.zool.Surv. India*, 70 : 248 (for other references).

**Material examined** : Cuttack district : 1 valve, Paradip, coll. No. data. 7.ix.1973. Puri district : 4 exs., and 5 valves, Kushabhadra river mouth, nr.Konarak, coll N.V.S.R. 1 xii.1979; 17 exs., 4 valves, Chilka lake (Satpara, outer chanel, Mahosa) coll. Chilka Survey; 36 exs., 9 valves, Chilka Lake, (Manikpatna, Arakuda, Tonda and Mirzapur) coll. H.C.R. 30.xii.1954, 1.i.1955. Ganjam district : 6 valves, Gopalpur, coll. H.A.F. 25.i.1941; 3 exs. 4 valves, coll. V.K.P., 16.ii.1972 and 27.iii.1973.

**Measurements** : L. 7.58-55.35; Ht. 5.25-46.20; T. 3.46-31.35.

**Distribution** : India : Orissa (as above); common in back waters and river mouths on both coasts of India. Elsewhere : Persian Gulf; Gulf of Aden; Sri Lanka; Burma; Philippines and Australia.

**Remarks** : It is very common in backwaters and is well known as *Katelysia opima* (Gmelin) of authors. Juvenile forms are more elongate than adults. Annandale and Kemp (1916) stated that "this species occurs fairly in Chilka Lake along with *Meretrix meretrix* and *Meretrix casta* in March " Virabhadra Rao (1951) studied the growth rate, while Mane (1974) studied its adaptation to the salinity fluctuations.

286. *Marcia (Marcia) recens* (Dillwyn)

1795. *Venus recens* Chemnitz, *Syst. Conch. Cab.*, 11 : 229, pl. 202, fig. 1979 (Type locality : Inhabits coasts of Coromandel).  
 1817. *Venus recens* : Dillwyn, *Descriptive Catalogue of Recent shells* : 182 (refers Chemnitz's pl. 202, fig. 1979).  
 1818. *Venus marmorata* Lamarck, *Hist. Anim. Sans Vert.*, 5 : 610 (600) (Type locality : Australia).  
 1976. *Marcia recens* : Fischer-Piette, *Rec. zool. Surv. India*, 70 : 249 (for other references).

**Material examined** : Puri district : 1 valve, Puri, coll. G.R.K., 17.xi.1962. Ganjam district : 1 valve, Chatrapur, coll. G.R.K. 24.xi.1962; 1 valve, Gopalpur, coll. H.A.F., 25.i.1941.

**Measurements** : L. 30.25-34.95; Ht. 23.54-23.90.

**Distribution** : India : Orissa (as above); Tamil Nadu : Pulicat Lake; Madras : Coromandel coast; Kerala : Cochin; Maharashtra : Bombay. Elsewhere : Karachi; Sri Lanka; Seychelles; Burma : Mergui Archipelago; Indonesia : Philippines; Java : Gulf of Thailand; Australia.

*Remarks* : The species *M. recens* resembles the genus *Paphia* when young, but when fully grown it becomes thicker and gibbose and assumes the typical form of *Marcia*. The shell surface is more or less concentrically grooved and gives a varnished look. The tip of the umbo is some times pink or blue (Subrahmanyam *et al.*, 1949).

Fischer-Piette (1976) refers this species to Chemnitz. Since Chemnitz's work was included in the official list of rejected works in Zoology by ICZN, 1958, next immediately available author of the species is Dillwyn, 1817.

Genus 165. *Paphia* Roeding, 1798

287. *Paphia malabarica* (Schroeter)

1788. *Venus malabarica* Schroeter, *Namen Register*, in *Conch. Cab.* 10 : 112 (refers Chemnitz) (Type locality: Malabar).

1976. *Paphia malabarica* : Fischer-Piette, *Rec. zool. Surv. India*, 70 : 247 (for other synonyms).

*Material examined* : Baleshwar district : Chandipur, 3 valves, coll. No data. Puri district : 2exs., Puri, coll. N.V.S.R., 1.xii.1985.

*Measurements* : L. 22.75-45.70; Ht. 17.34-34.00; T. 10.95.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam, Tamil Nadu : Madras, Porto Novo, Pamban, Tranquebar; Kerala : Malabar-coast; Maharashtra : Bombay; Gujarat : Gulf of Kutch and Andamans. Elsewhere : Persian Gulf; Gulf of Aden; Pakistan : Karachi; Sri Lanka; Burma : Mergui; Archipelago; Malayasia : Penang; Indonesia : Sumatra; Philippines; Hong Kong and China.

*Remarks* : This species occurs in estuaries and backwaters of India and is used as food by Bombay fishermen. Material collected from Chandipur by one of us (NVS R) with fine wavy markings in colour gray and with dark gray lunule.

288. *Paphia undulata* (Born)

1788. *Venus undulata* Born, *Index Rerum Naturalium Musei Caesarei Vindobonensis* : 54.

1780. *Venus undulata* Born, *Testacea Musei Caesarei Vindobonensis* : 67.

1949. *Paphia undulata* : Subrahmanyam *et. al.*, *J. Univ. Bombay*, 17 (5) : 68.

1976. *Paphia undulata* : Fischer Piette, *Rec. zool. Surv. India*, 70 : 247.

*Material examined* : Ganjam district : 2 valves, Chatrapur, coll. G.R.K. 24.xi.1962.

*Measurements* : L. 27.28-30.08; Ht. 16.85-18.90.

*Distribution* : India : Orissa (as above); West Bengal : Hooghly; Tamil Nadu : Madras, Porto Novo, Tuticorin; Maharashtra : Bombay. Elsewhere : Wide range in the Indo Pacific.

*Remarks* : This species closely resembles *P. tatrix*, a common species, but differs in having irregular sculpture on anterior part and lower half of the shell; It also differs from *P. malabarica* in having smooth external shell surface.

Subfamily CHIONINAE

Genus 167. *Anomalocardia* Schumacher, 1817

Subgenus *Anomalodiscus* Dall, 1902

289. *Anomalocardia (Anomalodiscus) squamosa* (Linnaeus)

1758. *Venus squamosa* Linnaeus, *Syst. Nat.*, ed. 10 : 688, (Type locality : 'O. Indico').

1916. *Anomalocardia squamosa* Preston, *Rec. Indian Mus.*, 12 : 36.

1932. *Anomalocardia (Anomalodiscus) squamosa* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt. 2, *Pelecypoda*; 53C : 260 (for other synonyms).

*Material examined* : Puri district : 1 valve, Konark, coll. G.R.K., 19.xi.1962. Ganjam district : 2 valves, Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 10.80-12.46; Ht. 8.92-9.84.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam; Tamil Nadu : Ennur backwaters nr. Madras. Elsewhere : Sri Lanka; Burma : Mergui Archipelago; Singapore; Philippines and China. Wide range in the Indo Pacific but has not been found west of Sri Lanka (Prashad, 1932).

#### Genus 168. *Bassina* Jukes-Browne, 1914

##### 290. *Bassina calophylla* (Philippi)

1836. *Venus calophylla* Philippi, *Archiv. Naturgesch.*, 1 : 229, pl. 8, fig. 2.

1956. *Chione calophylla* : Satyamurti, *Bull. Madras Govt. Mus. new ser.*, 1 (2) pt. 7 : 125, pl. 19, fig. 3, 3a.

1932. *Chione (Clausinella) calophylla* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt. 2, *Pelecypoda*, 53C : 258 (for other synonyms).

1982. *Bassina calophylla* : Abbott and Dance, *Compendium of Sea Shells* : 367, fig.

*Material examined* : Cuttack district : 2 valves, Khira Gachha Madeli, coll. G.R.K. 10.xi.1962; 2 valves, Paradip, coll. V.K.P., 31.i.1972.

*Measurements* : L. 10.06-12.70; Ht. 9.58-12.85.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Pamban; Maharashtra : Bombay; Andamans. Elsewhere : Persian Gulf; Gulf of Oman; Arabian sea; Indonesia : Madura strait, Macassar; Singapore. It has wide range in the Indo Pacific (Prashad, 1932).

#### Genus 168. *Timoclea* Brown, 1827

##### *Key to species*

1. Shell triangularly ovate; sculpture coarse with radial and concentric ribs; pallial sinus deep 'V' shape..... 2  
 Shell longer than high; sculpture fine, reticulate; anterior and posterior with strong radials; pallial sinus 'U' shape..... *T. arakana*
2. Radial ribs strong, distant, concentric ribs thin, crested.....*T. imbricata*  
 Both radial and concentric ribs strong, radial ribs divaricate.....*T. scabra*

##### 291. *Timoclea arakana* (G. & H. Nevill)

1871. *Cryptogamma arakana* Nevill, G. & H., *J. Asiat. Soc. beng.*, 49 (2) : 10, pl. 1, fig. 16 (Type locality : Arakan).

1968. *Timoclea arakana* : Ray, *Indian Mus. Bull.*, 3 (1 & 2) : 31 (for other synonyms).

1977. *Timoclea arakana* Ray, *Contribution to the knowledge of Molluscan fauna of Manugmagan, Lower Burma* : 126.

*Material examined* : Cuttack district : 1 valve, Paradip, coll. V.K.P., 31.i.1972. Puri district : 2 valves, Konarak, coll. G.R.K., 19.xi.1962. Ganjam district : 1 valve, Chatrapur, coll. G.R.K., 24.xi.1962.

*Measurements* : L. 12.66-16.08; Ht. 9.49-11.56.

*Distribution* : India : Orissa (as above); Tamil Nadu : Pulicat lake, Madras, Pamban. Elsewhere :

Malagasy; Sri Lanka; Burma : Arakan (Type locality), Maungmagan; Indonesia : Sullivian Id.; Malaysia: Penang; Singapore; South Africa : Cape Natal, Port Alfred.

292. *Timoclea imbricata* (Sowerby)

1853. *Venus imbricata* Sowerby, *Thesaurus Conchyliorum*, pt. 2 : 715, sp. 36, pl. 156, figs. 81-82.  
 1853. *Venus cochinensis* Sowerby, *Thesaurus Conchyliorum*, pt. 2 : 716, pl. 156, figs. 79-80 (Type locality : Cochin).  
 1916. *Chione imbricata* : Preston, *Rec. Indian Mus.*, 12 : 36.  
 1976. *Timoclea cochinensis* : Fisher-Piette, *Rec. zool. Surv. India*, 70 : 236.

*Material examined* : Baleshwar district : 9 valves, Burhibalang nr. Chandipur, coll. G.R.K., 4.xi.1962; 9 valves, Chandipur, coll. N.V.S.R. 30.xi.1984. Cuttack district : 6 valves, Khira Gachha Madeli, coll. G.R.K., 10-11.xi.1962. Puri district : 34 valves, Konarak, coll. G.R.K., 19-20.xi.1962; 3 valves, Chandrabhaga, coll. V.K.P., 11.ii.1972; 3 valves, Puri, coll. B.P., 8.vi.1938; 3 valves, Puri, coll. G.R.K. 17.xi.1962. Ganjam district : 22 valves, Chatrapur, coll. G.R.K., 24.xi.1962; 8 valves, Gopalpur, coll. V.K.P., 28-30.iii.1973.

*Measurements* : L. 7.72-16.92; Ht. 6.86-14.35.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras, Krusadai Island, Tranquebar, Porto Novo; Kerala : Cochin; Karnataka : Mangalore; Goa. Elsewhere : Sri Lanka, China.

*Remarks* : Sowerby (1853) described two species, *Venus imbricata* and *V. cochinensis*, which are not different from each other. Reeve (1863) gave priority to the name *V. imbricata* and synonymised *V. cochinensis* with it. The earlier reports from India, mentioned only *Chione imbricata*. However, Fischer-Piette (1976) reported *T. cochinensis* from India without ever mentioning *imbricata*.

293. *Timoclea scabra* (Hanley)

1844. *Venus scabra* Hanley, *Proc. zool. Soc. Lond.*, pt. 12 : 161 (Type locality : Catabalunga, Philippines).  
 1932. *Chione (Timoclea) scabra* : Prashad, *The Lamellibranchia of the Siboga Exped.*, pt. 2. *Pelecypoda*, 53C : 257.  
 1977. *Timoclea scabra* : Ray, *Contribution to the knowledge of Molluscan fauna of Maungmagan, Lower Burma* : 126 (for other synonyms).

*Material examined* : Puri district : 2 exs. and 1 valve, Puri, coll. No data.

*Measurements* : L. 6.38-12.46; Ht. 6.06-10.40.

*Distribution* : India : Orissa (as above); Tamil Nadu : Pulicat Lake, Madras, Krusadai Island, Shingle Island. Elsewhere : From Persian Gulf to Japan.

Family LXXXIII GLAUCONOMIDAE

Two species under the genus *Glaucanome* are recorded from Orissa under this family.

Genus 170. *Glaucanome* Gray, 1828

294. *Glaucanome sculpta* Sowerby  
 (pl. XXVIII, figs. 1, 2)

1894. *Glaucanome sculpta* Sowerby, *Proc. malac. Soc. Lond.*, 1 : 40, (Type locality : Bay of Bengal).  
 1977. *Glaucanome sculpta* : Subba Rao, *Newsl. zool. Surv. India*, 3 (5) : 301.

*Material examined* : Baleshwar district : 16 exs. Burhibalang nr. Chandipur, coll. B.P. & S.L.H., 9.iii.1939; 2 valves, Chandipur, coll. G.R.K., 3-4.xi.1962; 3 exs., Talscri N. of Chandipur, coll. A. Dey, 5.xi.1983; 4 exs., Chandipur, coll. N.V.S.R., 1.xii.1984.

*Measurements* : L. 30.10-53.20; Ht. 13.00-21.60; T. 8.50-16.30.

*Distribution* : India : Orissa (as above); West Bengal : Muriganga estuary, Sagar Island in Sunderbans. Elsewhere : Bay of Bengal.

*Remarks* : It occurs in hard muddy substratum in the river mouths with adults partly exposing their bodies above surface level. Population density, ecology and breeding habits of this species were studied from Sunderbans by Subba Rao *et. al.*, (1987).

The animals are found at a depth of 7-15 cms. in the mudflats and are dominant between midwater mark to low water mark in the intertidal region. Young shells are found at a depth of 10-15 cms. whereas adults are at superficial layer. Maximum number of these animals dominated by young ones are found during the month of November.

295. *Glaucanome angulata* Reeve  
(pl. XXVIII, figs. 3, 4)

1844. *Glaucanome angulata* Reeve, *Proc. zool. Soc. Lond.* 1844 : 20 (Type locality : Mouth of small river at Jinigram, Island of Negros, Philippines)

1844. *Glaucanome angulata* : Reeve, *Conch. Icon.*, 2, *Glaucanome*, sp. 5, pl. 1 fig. 5.

*Material examined* : Baleshwar district : 2 exs. and 1 valve, Talesari, nr. Chandipur, coll. A. Dey, 5.ix.1983.

*Measurements* : L. 16.60-24.70; Ht. 10.80-17.65; T. 5.92-10.20.

*Distribution* : India : Orissa (as above) Elsewhere : Philippines. This is the first record from India.

*Remarks* : Shell ovately squarose, inflated, moderately thick, covered with green periostracum; concentrically striated, inequilateral, anterior part suddenly sloping, margin broadly rounded; posterior gradually sloping, margin angulate; keel prominent, extends from umbo to postero-ventral margin; interior smooth, pallial sinus deep, narrow, oblique, rounded.

It differs from *G. sculpta* in having much shorter, broader form and angulate posterior margin.

Order MYOIDA

Family LXXXIV CORBULIDAE

Single species under the genus *Corbula*.

Genus 171. *Corbula* Bruguiere, 1797

296. *Corbula rotalis* Hinds

1843. *Corbula rotalis* Hinds, *Proc. zool. Soc. Lond.*, 1843 : 56 (Type locality : Calapan, Mindora, Philippines).

1844. *Corbula rotalis* : Reeve, *Conch. Icon.*, 2, *Corbula*, sp. 34, pl. 5, fig. 34.

*Material examined* : Puri district : 4 exs., and 1 valve, Puri, coll. Raban; 3 exs. Off Devi River, coll. Bengal Fisheries (Golden Crown), 28.xi.1909.

*Measurements* : L. 7.05-10.50; Ht. 5.20-7.24; T. 3.90-5.45.

*Distribution* : India : Orissa (as above); West Bengal : Sand Heads; Tamil Nadu : Tuticorin. Elsewhere : Singapore; Philippines.

*Remarks* : Shell valves unequal; left valve smaller than right one, with concentric striae and elevated vertical lines, fits firmly into right; right valve with strong concentric ribs.



Family LXXXV GASTROCHAENIDAE

The animals usually burrows into rocks or other substratum in the shallow waters. Single species is recorded from Orissa.

Genus 171. *Gastrochaena* Spengler, 1793

297. *Gastrochaena indistincta* Deshayes

1854. *Gastrochaena indistincta* Deshayes, *Proc. zool. Soc. Lond.*, 22 : 328 (Type locality : Singapore).

1956. *Gastrochaena indistincta* : Satyamurti, *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 7 : 164, pl. 24, fig. 9 (for other synonyms).

*Material examined* : Ganjam district : 1 ex., Ganjam coast, coll. Bengal Fisheries (Golden Crown).

*Measurements* : L. 8.21; Ht. 4.10; T. 4.10.

*Distribution* : India : Orissa (as above); Tamil Nadu : Krusadai Island. Elsewhere : Singapore; Philippines.

Family LXXXVI PHOLADIDAE

The members of the family are popularly known as 'Piddocks' They burrow into soft mud and submerged wooden structures in the sea water thus causing damage to the jetties.

Subfamily PHOLADINAE

Two genera viz. *Pholas* and *Barnea* are included in this subfamily.

*Key to genera*

1. Shell without protoplax; umbonal reflection absent; valve with oblique furrow towards anterior part .....*Martesia*  
Shell with protoplax; umbonal reflection present; valve without an oblique furrow.. 2
2. Umbonal reflection septate; anterior part with strong radial ribs, ribs nodose; posterior part with concentric growth lines.....*Pholas*  
Umbonal reflection simple; sculptured with both radial and concentric ridges throughout.....*Barnea*

Genus 173. *Pholas* Linnacus, 1758

Subgenus *Monothyra* Tryon, 1862

298. *Pholas (Monothyra) orientalis* Gmelin

1791. *Pholas orientalis* Gmelin, *Syst. Nat.*, ed. 13 : 3216, sp. 7, (Type locality : Singapore).

1956. *Pholas orientalis* : Satyamurti, *Bull. Madras Govt. Mus., new Ser.* 1 (2) pt. 7; 167, pl. 25, fig. 1 (for synonyms).

*Material examined* : Baleshwar district : 1 valve, Chandipur, coll. B.P. & S.L.H. 7.iii.1939; 2 valves, Bagda nr. Balaramguri, coll. V.K.P., 22.i.1972.

*Measurements* : L. 51.88-108.50; Ht. 17.35-34.95.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras; Kerala : Cochin. Elsewhere : Indo Pacific.

*Remarks* : The present material is represented by partly damaged valves only.

Genus 174. *Barnea* Leach in Risso, 1826

Sub-genus *Barnea* s.str.

299. *Barnea (Barnea) candida* (Linnaeus)

1758. *Pholas candida* Linnaeus, *Syst. Nat.* ed. 10 : 669 (Type locality : Europe and Americae').

1949. *Pholas backeri* : Subrahmanyam, Karandikar and Muri *J. Univ. Bombay*, 17 (5) : 74.

1982. *Barnea candida* : Abbott and Dance, *Compendium of sea shells* : 371, fig.

*Material examined* : Baleshwar district : Chandipur : 1 valve, coll. B.P. & S.L.H., 7.iii.1939; 1 valve, coll. N.V.S.R., 30.xi.1984.

*Measurements* : L. \*41.05; Ht. 18.88; \* shell damaged.

*Distribution* : India : Orissa (as above); West Bengal : Sundarbans, Sagar Island, Digha; Maharashtra : Bombay. Elsewhere : Atlantic and Indo Pacific.

*Remarks* : Animals are found in soft mud banks which burrow into about 15 to 20 cms. below surface, and get exposed during low tide.

Subfamily MARTESIINAE

Genus 175. *Martesia*

Subgenus *Martesia* s.str.

300. *Martesia (Martesia) striata* (Linnaeus)

1758. *Pholas striata* Linnaeus, *Syst. nat.*, ed. 10 : 669 (Type locality : 'Europae').

1916. *Martesia striata* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 356.

1968. *Martesia (Martesia) striata* : Subba Rao, *Proceedings of Symposium on Mollusca*, pt. 1 : 92.

1980. *Martesia (Martesia) striata* : Das and Dev Roy, *Rec. zool. Surv. India*, 77 : 184.

*Material examined* : Puri district : 4 exs., Chilka Lake. Cuttack district : 53 exs., Khira Gachha Madeli, coll. N.V.S.R. 1.iii.1964; 2 exs., Orissa coast, coll. No data.

*Measurements* : L. 10.10-16.00; Ht. 6.38-8.36.

*Distribution* : India : Orissa (as above); West Bengal : Kidderpore docks, Port Canning; Andhra Pradesh : Visakhapatnam, Godavary and Krishna estuaries; Tamil Nadu : Madras, Poto Novo, Tuticorin, Krusadai Island, Pamban; Kerala : Cochin, Kayankulam; Karnataka : Mangalore; Maharashtra : Bombay; Gujarat : Gulf of Kutch; Andamans. Elsewhere : Eastern Pacific; Indo Pacific, West Atlantic; Cosmopolitan in Temperate and tropical waters.

*Remarks* : Daniel and Subba Rao (1982) studied the distribution pattern of this species in the Inidan estuaries. Generally it attacks the floating wood and summerged timber. Annandale (1922) reported its attack of brick work in the Calcutta port. It can tolerate a wide range of salinity, and burrow into soft clay, sand stone and wood etc.

301. *Martesia delicatula* Preston  
(pl. XXVIII, figs. 5, 6)

1910. *Martesia delicatula* Preston, *Rec. Indian Mus.*, 5 : 119, fig. 4 (Type locality : Mouth of Devi River, Orissa coast, 42-45M, in sodden wood).

**Material examined** : Puri district : 1 ex. and 1 valve, Mouth of Devi river, coll. Bengal Fisheries (Golden Crown). (Type).

**Measurements** : L. 9.50-11.30; Ht. 6.60-6.60.

**Distribution** : Known from type locality only.

**Remarks** : It differs from preceding one in having distinct concentric and radial sculpture on the shell and its delicate nature. There are no further collections or records after its original discovery by Preston (1910).

#### Family LXXXVII TEREDINIDAE

Commonly known as wood-borers, occurs in temperate and tropical waters, world wide in distribution.

Two subfamilies are known from Orissa.

#### Subfamily TEREDININAE

Four genera are included under this subfamily, viz. *Bactronophorus*, *Dicyathifer*, *Lyrodus*, and *Teredora*.

#### Key to genera

1. Pallets composed of numerous segments ..... 2  
 Pallets single solid piece, not divided into segments..... 4
2. Pallets oval; stalk short; blade thin, convex on outer surface, concave on inner surface ..... *Nototeredo*  
 Pallets elongate; stalk long; segments on blade either closely packed or free at distal end..... 3
3. Pallets with closely packed, fused elements, cone-like built on stalk; distal part of blade papillose..... *Nausitora*  
 Pallets with free elements, cone shape, built on central stalk which extends throughout the length of blade..... *Bankia*
4. Pallets asymmetrical, basal part triangular with shallow cup from which pustulose, dagger-shape blade arises..... *Bactronophorus*  
 Pallets symmetrical, simple; pustulose dagger shape element absent..... 5
5. Pallets calcareous at base; periostracal cap easily separated from base, variously shaped at distal margin ..... *Lyrodus*  
 Pallets almost entirely calcareous, simple; periostracal cap absent ..... 6
6. Pallets triangular, stalk long; inner face of blade flat, outer surface convex; cup shallow, divided by median longitudinal ridge..... *Dicyathifer*  
 Pallets broadly oval, stalk short; blade thick at base, thin at distal margin; inner surface concave, outer surface convex with deep thumb nail-like depression with marked growth lines ..... *Teredora*

Genus 176. *Bactronophorus* Tapparone-Canefri, 1877302. *Bactronophorus thoracites* (Gould)

1859. *Teredo thoracites* Gould, *Proc. Boston Soc. Nat. His.*, 6 : 15 (Type locality : Tavoy, Burma).  
 1966. *Bactronophorus thoracites* : Turner, *A Survey and illustrated Catalogue of the Teredinidae* : 126 (for synonyms).  
 1968. *Bactronophorus thoracites* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt.1 : 86.

*Material examined* : Cuttack district : 17 exs., Khira Gachha Madeli, coll. N.V.S.R., 1.iii.1964.

*Distribution* : India : Orissa (as above); West Bengal : Sunderbans; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras; Maharashtra : Bombay : Andamans. Elsewhere : Indopacific.

*Remarks* : A common wood borer, generally attacks mangroove vegetation in estuaries, and secretes thin calcareous tube in the burrows. It is dull white in colour when freshly excavated, pallets are spoon shaped with ring like prominence at junction of the blade and stalk.

Specimens were collected from the woods locally called as 'Rai, Kherua' and Sundari.

Genus 177. *Dicyathifer* Iredale, 1932303. *Dicyathifer manni* (Wright)

1866. *Kuphus manni* Wright, *Trans. Linn. Soc. Lond.*, 25 (3) : 565, pl. 65, figs. 1-6 (Type locality : New Harbour, Singapore).  
 1966. *Dicyathifer manni* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 109, pl. 36, fig. D.  
 1968. *Dicyathifer manni* : Subba Rao, *Proceedings of the Symposium of Mollusca*, pt. 1 : 87.

*Material examined* : Cuttack district : 2 exs., Khira Gachha Madeli, coll. N.V.S.R., 26.xi.1964; 11 exs. False point, coll. N.V.S.R., 21.iii.1964; 53 exs., Light House area, coll. N.V.S.R., 12 to 18.iii.1964.

*Distribution* : India : Orissa (as above); West Bengal : Sunderbans; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Pulicat, Kilakkarai; Kerala : Cochin; Karnataka : Karwar; Maharashtra : Bombay; Andamans. Elsewhere : Indo-Pacific.

*Remarks* : Rajagopal (1970) gave good account of field ecology of this species.

Specimens were collected from 'Rai, Kherua, Gamma and Sundari' woods.

Genus 178. *Lyrodus* Gould, 1870.304. *Lyrodus pedicellatus* (Quatrefages)

1849. *Teredo pedicellatus* Quatrefages, *Ann. Sci. Nat. zool.* 2 (3) : 26, pl. 1, fig. 2 (Type locality : Labaie des Passages, Guipuscoa, Spain).  
 1966. *Lyrodus pedicellatus* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 116, pl. 1, A.D.E.  
 1968. *Lyrodus pedicellatus* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 87.

*Material examined* : Cuttack district : 3 exs., Khira Gachha Madeli, coll. G.R.K., 10.xi.1962; 3 exs., Lions' Rump, coll. N.V.S.R., 4.iii.1964.

*Distribution* : India : Orissa (as above); Tamil Nadu : Tondi, Madras, Adirampatnam; Kerala : Kayankulum; Andamans.

*Remarks* : Pallets consist of a calcareous base with large periostracal cap. small, specimens were collected from 'Sundari' wood along with *Bankia campanellata* and 'Karanja' wood.

Genus 179. *Teredora* Bartsch, 1921

305. *Teredora princesae* (Sivicks)

1928. *Teredo princesae* Sivicks, *Philippine Jour. Sci.*, 37 : 291, pl. 2, fig. 11 (Type locality : Puerto Princesa, Palawan, Philippi).  
 1966. *Teredora princesae* : Turner, *A Survey and Illustrated catalogue of the Teredinidae* : 118, pl. 34, fig. B.  
 1968. *Teredora princesae* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 87.

*Material examined* : Cuttack district : 17 exs., Khira Gachha Madeli, coll. N.V.S.R., 1.iii.1964.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras. Elsewhere : Philippines; North Pacific; Hawaii; Johnston; Wake Islands.

*Remarks* : Specimens were collected from 'Bamboo' stump. Nair (1956) reported its occurrence in wood of *Cedrelatonna*, *Terminalia* and *Aegele*.

Genus 180. *Bankia* Gray, 1842

*Key to species*

1. Margin of cups on pallets simple..... 2  
    Margin of cups on pallets dentate..... 3
2. Stalk of pallet equal to length of blade; sides of cups drawn into awans curved upwards.....*B. carinata*  
    Stalk of pallet less than length of blade; cups inverted 'cone' shape, sides of cup horizontal, except in lower most one, which is concave.....*B. campanellata*
3. Cups moderately spaced, deeply notched; awans greatly extended on its sides .....  
    .....  
    .....*B. fimbriatula*  
    Cups compactly arranged; awans less extended on its sides.....*B. rochi*

306. *Bankia carinata* (Gray)

1827. *Teredo carinata* Gray, *Phil. Mag. (N.S.)*, 2 : 411 (Type locality : Sumatra).  
 1915. *Xylotrya stutchburyi* : Preston, *Rec. Indian Mus.*, 11 : 306.  
 1916. *Xylotrya stutchburyi* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 356.  
 1966. *Bankia carinata* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 93, pl. 46A, 46E (for other synonyms).  
 1968. *Bankia carinata* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 90.

*Material examined* : Cuttack district : 10 exs., Khira Gachha Madeli, coll. G.R.K., 10.xi.1962.

*Distribution* : India : Orissa (as above); West Bengal : Calcutta; Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras, Adirampatnam; Kerala : Cochin; Maharashtra : Bombay. Elsewhere : Mediterranean; Philippines; Indonesia; Japan; Carribean sea.

*Remarks* : Specimens were collected from 'Karanja' wood.

307. *Bankia campanellata* Moll and Roch

1931. *Bankia campanellata* Moll and Roch, *Proc. malac. Soc. London*, 19 (4) : 215, pl. 25 (Type locality : Not known).  
 1966. *Bankia campanellata* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 92, pl. 48A (for other synonyms).

1968. *Bankia campanellata* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 90.

*Material examined* : Cuttack district : Khira Gachha Madeli, 26 exs., coll. G.R.K., 10.xi.1962; 6 exs., coll. N.V.S.R., 26.ii.1964; 38 exs., Lions' Rump, coll. N.V.S.R., 2-5.iii.1964.

*Distribution* : India : Orissa (as above); West Bengal : Sunderbans, Diamond Harbour; Andhra Pradesh : Visakhapatnam, Godavary estuary, Masulipatnam, Nizampatnam; Tamil Nadu : Madras. Elsewhere : Reunion; Malay Archipelago; Indonesia : Sumatra; South America.

*Remarks* : Specimens were collected from 'Karanja, Goan, Sundari' woods. The presence of these shipworms inside the wood can easily be made out from the pallets protruding on its surface.

### 308. *Bankia fimbriatula* Moll and Roch

1931. *Bankia fimbriatula* Moll and Roch, *Proc. malac. Soc. London*, 19 : 213, pl. 25, fig. 37 (Type locality : Teakwood, Leith, Scotland).

1966. *Bankia fimbriatula* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 101, pl. 55, 56A.

1968. *Bankia fimbriatula* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 91, pl. 1.

*Material examined* : Cuttack district : 19 exs., Paradip Port, coll. N.V.S.R., 8.iii.1964; 5 exs., False point, coll. N.V.S.R., 15.iii.1964.

*Distribution* : India : Orissa (as above); only. Elsewhere : Atalantic Ocean and East Pacific.

*Remarks* : Specimens were collected from 'Kherua, and Rai' woods.

### 309. *Bankia rochi* Moll

1931. *Bankia rochi* Moll, *Proc. malac. Soc. Lond.*, 19 : 215, pl. 25 (Type locality : Christmas Island, South Java).

1961. *Bankia (Neobankia) roonwali* Rajagopalaiengar, *Sci. & Cult.*, 27 (11) : 550 (Type locality : Sajnakhali, Sunderbans).

1966. *Banki rochi* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 119, pl. 56C, fig. 23.

1968. *Bankia roonwali* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 91.

*Material examined* : Cuttack district : 163 exs., Light house area, Falsepoint, coll. N.V.S.R.; 1 ex., Paradip, coll. N.V.S.R. 20.iii.1964; 2 exs., Khira Gachha Madeli, coll. N.V.S.R., 23.iii.1964.

*Distribution* : India : Orissa : (as above); West Bengal: Sajnakhali in Sunderbans; Andamans.

*Remarks* : Detailed description was given by Rajagopalaiengar (1961) for the species *B. roonwali* which was synonymised by Turner (1966). This species can be recognised by its brown coloured pallets with compactly arranged cones. The tunnels are lined by calcareous tubes. It is a common species in estuaries.

Largest living specimen collected measured 210 mm in length. Specimens were collected from the woods, viz, 'Sundari, Kherua, Rai, and Gamma.

## Genus 181. *Nausitora* Wright, 1864

### Key to species

1. Pallets with a short and oval shaped blade and long stalk ..... *N. fusticula*  
Pallets with an elongate blade and stalk shorter than blade..... 2
2. Blade of the pallet with elements packed closely on central stalk; distal part similar

to base..... *N. dunlopei*

Blade of the pallet with elements not closely packed; distal part narrow, stalk pointed  
..... *N. hedleyi*

310. *Nausitora dunlopei* Wright

1864. *Nausitora dunlopei* Wright, *Trans. Linn. Soc. Lond.*, 24 : 453, pl. 46, figs. 1-12 (Type locality : Freshwater below Fureedpore (=Faridpur) Comer river, a branch of Muriganga, branch of Ganges, Bengal.)  
1964. *Nausitora lanceolata* Rajagopalaiengar, *J. Bombay nat. Hist.*, 61 : 109. figs. 1-3 (Type locality : Sajnakhali, 24 Parganas, Sunderbans.)  
1966. *Nausitora dunlopei* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 99, pl. 39A.  
1968. *Nausitora lanceolata* : Subb Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 89.

*Material examined* : Cuttack district : 2 ex., Khira Gachha Madeli, coll. N.V.S.R., 26.ii.1964; 38 exs., Badpadia, coll. N.V.S.R., 7-8.iii.1964; 34 exs., Lighthouse, Falsepoint, coll. N.V.S.R., 12-19.iii.1964.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning, Sunderbans, Kidderpore docks, Calcutta; Tamil Nadu : Madras; Andaman & Nicobar Islands.

*Remarks* : It is the largest known estuarine species measuring 84 cms. in length. The burrows are lined with thick secretion of calcareous matter. *Bankia (Nausitora) madrasensis* Nair, 1954 is a synonym of this species.

311. *Nausitora fusticula* (Jeffreys)

1860. *Teredo fusticulus* Jeffreys, *Ann. Mag. Nat. Hist.*, (3) 6 : 125 (Type locality : Leith, Scotland).  
1966. *Nausitora fusticula* : Turner, *A Survey and Illustrated catalogue of the Teredinidae* : 102, pl. 37B (as *Teredo fusticulus*).  
1968. *Nausitora fusticula* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 88, fig. 1.

*Material examined* : Cuttack district : 1 ex., Light house, False point, coll. N.V.S.R., 16.iii.1964.

*Distribution* : India : Orissa (as above); only. Elsewhere : Scotland, Brazil.

*Remarks* : Specimens were collected form 'Kherua' wood.

312. *Nausitora hedleyi* Schepman

1919. *Nausitora hedleyi* Schepman, *Nova Guinea Res. Exped. Scient.*, 13, *Zoologie*, : 195 pl. 7, fig. 3 (Type locality : Merauke, New Guinea).  
1966. *Nausitora hedleyi* : Turner, *A Survey and Illustrated Catalogue of the Teredinidae* : 104, pl. 42C.  
1968. *Nausitora hedleyi* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 89, fig. 2.

*Material examined* : Cuttack district : 10 exs., Hukitola, coll. N.V.S.R., 17.iii.1964.

*Distribution* : India : Orissa (as above); Tamil Nadu : Madras harbour; Kerala : Ernakulam; Andamans. Elsewhere : Indonesia : Borneo, Sumatra, Java; New Guinea; Philippines; New Calendonca. Indo Pacific.

*Remarks* : Specimens were collected form 'Kherua' trees.

Genus 182. *Nototerredo* Bartsch, 1923

313. *Nototerredo knoxi* (Bartsch)

1917. *Teredo (Nototerredo) knoxi* Bartsch, *Bull. U.S. Nat. Mus.*, 122 : 51, pl. 29, fig. 2, pl. 34, fig. 2 (Type locality : Naval Station, Guantanamo Bay, Cuba).  
1966. *Nototerredo knoxi* : Turner, *A Suvey an Illustrated Catalogue of Teredinidae* : 106, pl. 30A.

1968. *Nototeredo knoxi* : Subba Rao, *Proceedings of the Symposium on Mollusca*, pt. 1 : 88.

*Material examined* : Cuttack district : 2 exs., Lion Rump, coll. N.V.S.R., 4.iii.1964.

*Distribution* : India : Orissa (as above); Andhra Pradesh : Visakhapatnam. Elsewhere : Gulf of Mexico; East coast of north and south America, West coast of Africa.

*Remarks* : Specimens were collected from 'Sundari' wood along with *Bankia campanellata*.

Family LXXXVIII PANDORIDAE

Genus 183. *Pandora* Bruguiere, 1797

314. *Pandora brevifrons* Sowerby  
(pl. XXVIII, figs. 7, 8)

1835. *Pandora brevifrons* Sowerby, *Proc. zool. Soc. Lond.*, 1835 : 93 (Type locality : "Panaman"). (=Panama)

1874. *Pandora brevifrons* : Reeve, *Conch. Icon.*, 19, *Pandora*, sp. 12 pl. 2, fig. 12.

1910. *Pandora perangusta* Preston, *Rec. Indian Mus.*, 5 : 120, fig. 5 (Type locality : Off Devi River, 31-36 M).

*Material examined* : Puri district : 1 ex., Puri, coll. No data; 25 exs., Off Devi river, coll. Bengal Fisheries (Golden Crown) (including type of *P. perangusta* Preston).

*Measurements* : L. 8.55-13.05; Ht. 3.00-4.95; T. 1.20-1.70; Type, *P. perangusta*. L. 12.55; Ht. 5.00; T. 1.50.

*Distribution* : India : Orissa (as above) only. Elsewhere : Panama.

*Remarks* : It was earlier reported as *P. perangusta* Preston.

Family LXXXIX LATERNULIDAE

Genus 184. *Laternula* Roeding, 1798

Two species are included under this genus.

315. *Laternula navicula* (Reeve)  
(Pl. XXIX, figs. 1-4; Pl. XXX, figs. 1, 2)

1863. *Anatina navicula* Reeve, *Conch. Icon.*, 14, *Antina*, sp. 21 pl. 4, fig. 21 (Type locality : Not given).

1914. *Anatina granulosa* Preston, *Rec. Indian Mus.*, 10 : 310, fig. 17, 17a (Type locality : Chilka Lake).

1914. *Lyonsia samalinsulae* Preston, *Rec. Indian Mus.*, 10 : 310, fig. 16, 16a (Type locality : Off Samal Island, Ganjam district, 2-3 M).

1915. *Anatina barkulensis* Preston, *Rec. Indian Mus.*, 11 : 309, fig. 24, 24a (Type locality : Stn 47, Barkul point, Lake Chilka).

1915. *Anatina barkudaensis* Preston, *Rec. Indian Mus.*, 11 : 309, fig. 25, 25a (Type locality : Barkuda Island, Chilka Lake).

1916. *Anatina barkulensis* : Anandale and Kemp, *Mem. Indian Mus.*, 5 : 358.

1916. *Anatina barkudaensis* : Anandale and Kemp, *Mem. Indian Mus.*, 5 : 358.

*Material examined* : Puri district : 1 ex., Chilka Lake (Type of *Anatina granulosa* Preston, 1910); 1 ex., Barkul point, Chilka lake (Type of *Anatina barkulensis* Preston, 1915); 2 exs. Barkuda island, Chilka lake (Type of *Anatina barkudaensis* Preston, 1915); 30 exs., Chilka lake (Rambha Mahosa, Cherriya Island, Barhampur Island, Satpara and Barkuda Island) Coll. NA.

*Measurements* : L. 4.70-21.85; Ht. 3.55-11.20; T. 1.20-13.50.

Type of *Anatina barkulensis* L. 19.40; Ht. 11.10;

Type of *Anatina granulosa* L. 18.40; Ht. 11.35; T. 5.70.



*Distribution* : Known only from Chilka lake.

*Remarks* : The species occurs in all parts of the lake except the sandy area of the outer channel. Living specimens were collected in the salt water season by digging on shore during low tide (Annandale and Kemp, 1916).

Preston's species *Anatina granulosa*, *A. barkulensis* and *A. bakudaensis* collected from Chilka lake agree with *Anatina navicula* Reeve which is now placed under the genus *Laternula* (Solene Whybrow in litt.).

316. *Laternula truncata* (Lamarck)

1818. *Anatina truncata* Lamarck (Ex. part) *Hist. Anim. Sans Vert.*, 5 : 463 (Type locality : Bay of Manila, Philippines).

1863. *Anatina truncata* : Reeve, *Conch. Icon.*, 14, *Antina*, sp. 11, pl. 2, fig. 11.

1977. *Laternula subrostrata* : Subba Rao, *Newsl. zool. Surv. India*, 3 (5) : 301.

1982. *Laternula truncata* : Abbott and Dance, *Compendium of the Sea shells* : 372, fig.

*Material examined* : Baleshwar district : 1 ex., Talesari nr. Suvarnarekha river mouth, coll. A. D. & S.B. 5.ix.1983.

*Measurements* : L. 50.16; Ht. 25.06; T. 17.25.

*Distribution* : India : Orissa (as above); West Bengal : Port Canning, Digha. Elsewhere : Indian Ocean; Philippines : Bay of Manila; South western Pacific, Japan.

*Remarks* : Prashad (1932, p. 319) discussed about Reeve's *A. truncata*; while keeping it under *A. rostrata* Sowerby, he stated, that "Lamarck (1818) confused under the name *A. truncata* two species, but Pacific species was neither described nor given a name till Sowerby published a good figure of it under the name *A. rostrata* in 1842. Reeve however, in *Conch. Icon.* apparently in ignorance of Sowerby's work still described the species as *A. truncata* Lamarck."

However, Abbott and Dance (1982) gave the figure of *Laternula truncata* Lamarck and cited *rostrata* Lamarck as its synonym.

Family XC CUSPIDARIIDAE

Only genus *Cuspidaria* is represented in Orissa.

Genus 185. *Cuspidaria* Nardo, 1840

Two species are recorded under the genus.

317. *Cuspidaria annandalei* Preston

(Pl. XXX. 5, 6)

1915. *Cuspidaria annandalei* Preston, *Rec. Indian Mus.*, 11 : 308 (Type locality : Patsahnipur, Chilka Lake, 1-1.5 M).

1916. *Cuspidaria annandalei* : Preston, *Rec. Indian Mus.*, 12 : 39.

1916. *Cuspidaria annandalei* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 357.

*Material examined* : Puri district : 34 exs., Chilka lake Patsahanipur, Kalidai, Kaluparaghat, Seruanadi, Barkul etc., coll. Chilka Survey; 8 exs., Busandipur, Chilka lake, coll. G.R.K., 1.iii.1975.

*Measurements* : L. 3.30-10.80; Ht. 2.30-6.30; T. 1.50-4.70. Type L. 6.50 Ht. 4.10.

*Distribution* : India : Orissa (as above); Tamil Nadu : Ennur; Kerala : Cochin Backwaters.

*Remarks* : A thinner shell with a strongly produced rostrum differentiates this species from *C.*

*chilkaensis*.

318. *Cuspidaria chilkaensis* (Preston)  
(Pl. XXX, figs. 3, 4)

1911. *Corbula chilkaensis* Preston, *Rec. Indian Mus.*, 6 : 39, fig. 2 (Type locality : Rambha, S. end of Lake Chilka).  
1916. *Corbula chilkaensis* : Annandale and Kemp, *Mem. Indian Mus.*, 5 : 356.

*Material examined* : Ganjam district : 1 ex., Rambha, Chilka lake, coll. Chilka survey (Type).

*Measurements* : L. 8.25; Ht. 5.30; T. 4.00.

*Distribution* : Known from Chilka Lake only.

*Remarks* : Annandale and Kemp (1916) pointed out its resemblance to some species of *Cuspidaria*. On examination of the type we are convinced that it should be placed under the genus *Cuspidaria*. The following characters bring out its affinity with the genus.

The shell is very thin, valves with fine concentric striae, posterior end produced into a rostrum.

Class CEPHALOPODA

The class includes cuttle fish, octopus and nautilus which are exclusively marine in their habitat. Commonly occurs in off shore waters except *Octopus* which is found to visit the shore occasionally. There are six species included in five genera under three families from Orissa coast.

Order SEPIOIDA

Family XCI SEPIIDAE

The family includes two genera *Sepia* and *Sepiella* from Orissa. They possess an internal shell.

Genus 186. *Sepia* Linnaeus, 1758

The genus includes two species from Orissa. Internal shell, which is situated under the integument has a rostrum on its lower part.

319 *Sepia aculeata* Ferussac et d'Orbigny

- 1835-48. *Sepia aculeata* Ferussac et d'Orbigny, *Hist. nat. Gen. et. Part Ceph. Acetabi* : 287 pl. 5, fig. 25 (Type locality : Java).  
1916. *Sepia aculeata* : Massy, *Rec. Indian Mus.*, 12 : 233.  
1968. *Sepia aculeata* : Silas, *Proceedings of Symposium on Mollusca*, pt. 1 : 294 (for synonyms and distribution).

*Material examined* : Baleshwar district : 1 ex., Baleshwar Bay, coll. Bengal Fisheries (Golden Crown); 1 ex., Orissa coast, coll. Marine Survey.

*Distribution* : India : Orissa (as above); West Bengal : Digha ; Tamil Nadu : Madras, Ennur, Gulf of Mannar; Kerala : Cochin; Karnataka : Karwar; Maharashtra : Bombay; common in Indian seas. Elsewhere : Indo Pacific.

320. *Sepia pharaonis* Ehrenberg

1831. *Sepia pharaonis* Ehrenberg, *Symbolae Physicae Evertibrata Mollusca* Berlin, 4 unpage : (Type locality : Tor, Sinai, Massaouah).

1912. *Sepia singalensis* : Massy, *Rec. Indian Mus.*, 12 : 227.

1968. *Sepia pharaonis* : Silas, *Proceedings on Symposium on Mollusca*, Pt. 1 : 300 (for synonyms and distribution).

*Material examined* : Ganjam district : 1 ex. Off Gopalpur, coll. Bengal Fisheries (Golden Crown); 1 ex. Gopalpur, coll. No data, 22.ix.1941.

*Measurements* : L. 173.00; W. 70.00.

*Distribution* : India : Orissa (as above); Common in Bay of Bengal, Arabian Sea, Andaman Sea. Elsewhere : Indo Pacific, range from Red Sea to Queensland, Australia.

*Remarks* : The animal can be distinguished by the presence of conspicuous dark bands on the dorsal surface of the mantle. *Sepia singalensis* Goodrich 1896, originally reported from Gulf of Mannar was later recorded from Orissa coast by Massy (1916).

#### Genus 187. *Sepiella* Gray, 1849

Internal shell is without any rostrum on its lower part. Single species is recorded from Orissa.

#### 321. *Sepiella inermis* (Ferussac et d'Orbigny)

1835-48. *Sepiella inermis* Ferussac et. d'Orbigny, *Hist. Nat. Gen. et. Part Ceph, acetab* : 226, pl. 6; 1848 : 286, pl. 20, figs. 1-9.

1916. *Sepiella inermis* : Massy, *Rec. Indian Mus.*, 12 : 231, pl. 23, fig. 6, pl. 24, figs. 1-9.

1968. *Sepiella inermis* : Silas, *Proceedings on Symposium on Mollusca*, pt. 1 : 303.

*Material examined* : Baleshwar district : 4 exs., Baleshwar Bay, coll. Bengal Fisheries (Golden Crown). Cuttack district : 12 exs., Off Paradip, coll. V.K.P., 31.i.1972. Puri district : Puri 6 exs., coll. Bengal Fisheries (Golden Crown); 3 exs., coll. N.A., 20-22.iii.1906, 1 & 2.ii.1909; 4 exs., coll. N.A. & R.E.L. 1908; 1 ex., coll. Paiva; 4 exs. coll. Gravely; 1 ex., coll. B.P., 6.vi.1938; 4 exs. Off Devi River, coll. Marine Survey, 24.xii.1888; 1 ex., Chilka Lake, coll. Marine Survey, 9.i.1890; 3 exs. Swargdwar beach, Puri, coll. V.K.P., 5.ii.1972. Ganjam district : 2 exs., Gopalpur, coll. M.H., 28.xi.1973.

*Measurements* : L. 43.00-62.00; W. 29.00-42.00.

*Distribution* : India : Orissa (as above); West Bengal : Sand heads; Tamil Nadu : Madras, Palk Bay, Pamban, Rameswaram, Kundugal point; Kerala : Cannanore, Cochin, Tellicherry; Maharashtra : Bombay; Andamans; Lakshadweep. Elsewhere : Indo-Malay region, Japan. Widely distributed in Indo Pacific area.

*Remarks* : Body oblong, width two thirds of length, arms short; internal shell devoid of rostrum, small, narrowly ovate. Adam and Rees (1966) gave a good description of this species.

Order TEUTHOIDA

Family XCII LOLIGINIDAE

These are popularly known as squids. Two genera viz. *Loliolus* and *Loligo* are included from Orissa.

#### Genus 188. *Lolious* Steenstrup, 1856

Single species is recorded from Orissa.

322. *Loliolus investigatoris* Goodrich

1856. *Loliolus investigatoris* Goodrich, *Trans. Linn. Soc. London*, 7 : 8, pl. 2, figs. 29-37. (Type locality : Bay of Bengal).  
 1916. *Loliolus investigatoris* : Massy, *Rec. Indian Mus.*, 12 : 222.  
 1968. *Loliolus investigatoris* : Silas, *Proceedings of the Symposium on Mollusca*, pt. 1 : 307.

*Material examined* : Puri district : Puri - 2 exs., coll. S.W.K.: 1 ex., N.A., 1-2.ii.1900; 1 ex., coll. N.A. & R.E.L.; 2 exs., coll. B.P., 6.vi.1938; 1 ex., coll. V.K.P., 5.ii.1972; 1 ex., Off Devi River, coll. No data. Cuttack district : 5 ex., Off Paradip, coll. V.K.P., 31.i.1972. Ganjam district : 4 exs. Gopalpur, coll. G.R.K., 29.xi.1962; 1 ex., coll. M.H., 28.xi.1973.

*Distribution* : India : Orissa (as above); West Bengal : Hooghly mouth; Frazergange in Sunderbans. Elsewhere : Bangladesh; Burma; Malaysia: Penang; Indonesia; Western Pacific Ocean.

*Remarks* : There is a distinct sexual dimorphism. Males have longer lateral arms than females where as mantle length is short (Massy, 1916).

Genus 189. *Loligo* Lamarck, 1798.323. *Loligo duvauceli* Ferussac et d'Orbigny

- 1835-48. *Loligo duvauceli* Ferussac et d'Orbigny, *Hist. Nat. gen et Part des Cephal. Acetabi* 318, pls. 14, 20 figs. 6-16 (Type locality : Not known).  
 1884. *Loligo indica* Pfeiffer *Abh. Naturw. Ver, Hambury*, 8 : 4, figs. 3, 3a.  
 1916. *Loligo indica* : Massy, *Rec. Indian Mus.*, 12 : 218, pl. 23, fig. 9, pl. 24, fig. 11.  
 1939. *Loligo duvauceli* : Adams, *Rec. Indian Mus.*, 41 : 67.  
 1968. *Loligo duvauceli* : Silas, *Proceedings on the Symposium on Mollusca*, pt. 1 : 308.

*Material examined* : Cuttack district : 11 exs., Off Paradip, coll. V.K.P., 31.i.1972. Puri district : 3 exs., Off Puri, coll. Bengal Fisheries (Golden Crown) Puri beach : 1 ex., coll. S.W.K.; 18 exs., coll. No data; 9 exs., coll. N.A. and R.E.L.; 5 exs., coll. F.H.G.; 2 exs., coll. caunter, 31.i.1909; 2 exs., coll. V.K.P., 5.ii.1972. Ganjam district : 4 exs., Off Gopalpur, coll. Bengal Fisheries (Golden Crown) Sept, -Dec., 1909.

*Distribution* : India : Orissa (as above); West Bengal : Hooghly; Andhra Pradesh : Gangavaram; Kerala : Varkulay nr. Trivandrum; Andamans. Elsewhere : Indonesia; Philippines to Formosa.

*Remarks* : Massy (1916) recorded *Loligo indica* from Orissa coast but it has been synonymised to the present species by Adams (1939). However Silas (1968) was of the opinion that Massy's *indica* differs from the present species. It is the most common species in the Indo Malayan area.

## Order OCTOPODA

## Family CXIII OCTOPODIDAE

Animals possess ten arms of equal size, which are provided with suckers and with membrane at their bases. One of the arm is hectocotylized in males.

Genus 190. *Octopus* Lamarck, 1798Subgenus *Octopus* s.str.324. *Octopus (Octopus) globosus* Apelloef

1886. *Octopus globosus* Apelloef, *K. Svensk. Vetensk. Akad. Handl.*, 21 : 7, pl. 1, figs. 4-5 (Type locality : Japan).  
 1916. *Octopus globosus* : Massy, *Rec. Indian Mus.*, 12 : 202.

1968. *Octopus (Octopus) globosus* : Silas, *Proceedings of the Symposium on Mollusca*, pt. 1 : 340.

*Material examined* : Ganjam district : 1 ex., Off Gopalpur, coll. Bengal Fisheries (Golden Crown), Sept. 1909.

*Distribution* : India : Orissa (as above); West Bengal : Sand heads; Maharashtra : Bombay; Andaman and Nicobar Islands. Elsewhere : Sri Lanka; Malaysia : Malacca Straits; Burma : Mergui Archipelago; Japan.

*Remarks* : No fresh material is studied by us. Massy (1916) gave a detailed description where as Adams (1939) studied the radula and figured spermatophore of this species.

### SUMMARY

On the basis of material available in the Zoological Survey of India and also literature records 338 species and subspecies under 97 families and 197 genera are recorded from the Orissa coast. Of these only 14 species are included on the basis of literature records. It is interesting to note that as many as 84 species have their type localities in Orissa. The earlier works were concentrated on Chilka Lake and Puri coast while the present account is based on collection from all along Orissa Coast. There are several new records viz., 141 species under 94 genera and 59 families for Orissa coast and a few species viz. *Euchelus alabastrum* Reeve, *Colubraria muricata* (Lightfoot); *Nassarius (Aciculina) vittatus* (A. Adams); *Nuculana (N.) robsoni* Prashad; *Galeomma argentea* Deshayes; *Macra (M.) grandis* Gmelin; *Macra (M.) symmetrica* Deshayes; *Siliqua (S.) fasciata* (Spengler) and *Glauconome angulata* Reeve are recorded for the first time from India.

### ACKNOWLEDGEMENTS

The authors are grateful to Dr. B.K. Tikader, former Director and Dr. B.S. Lamba, Acting Director, Zoological Survey of India for necessary facilities to work and to Dr. O.B. Chhotani, Scientist 'S.E.' for going through the manuscript and offering suggestions for its improvement.

### REFERENCES

- Abbott, R. T. 1968. The Helmet Shells of the World (Cassidae) pt. 1. *Indo-Pacif. Mollusca*, 2 (9) : 15-201, pls. 1-187.
- Abbott, R. T. & Dance, S. P. 1982. *Compendium of Sea Shells, A color guide to more than 4,200 of the world's Marine shells*. E.P. Dutton, Inc., New York : ix + 411 pp.
- Adam, W. 1939. The Cephalopoda in the Indian Museum, Calcutta. *Rec. Indian Mus.*, 41 : 61-110.
- Adam, W. & Rees, W. T. 1966. A review of the Cephalopod family Sepiidae. *John Murray Expedition Sci. Rept.* 11(1) : 1-165.
- Ahmed, M. 1971. Oyster species of West Pakistan. *Pakistan Jour. zoology*, 3 : 229-236.
- Ahmed, M. 1975. 'Speciation in living oysters' *Advances in Marine Biology*, 13 : 357-397.
- Annandale, N. 1912. Some sponges associated with gregarious molluscs of the family Vermetidae. *Rec. Indian Mus.*, 6 : (1911) 47-55, pls. 8-9.
- Annandale, N. 1922. Bivalve molluscs injuring brick works in the Calcutta docks. *J. Asiat. Soc. Beng.*, 18 : 555-557.

- Annandale, N. 1924. Fauna of Chilka Lake. Mollusca, Gastropoda (Revision). *Mem. Indian Mus.*, **5** : 853-873.
- Annandale, N. & Kemp, S. W. 1916. Fauna of Chilka Lake. Mollusca Gastropoda and Lamellibranchiata, (with an account of the common *Solen* by E.N. Ghosh). *Mem. Indian Mus.*, **5** : 328-374, pls. 14-16.
- Awati, P. R. & Karandikar, K. R. 1948. *Oncidium verruculatum* Cuv. (Anatomy, Embryology and Bionomics). *The Univ. Bombay zool. Mem. No. 1, Oncidium*, 52 pp., 62 figs.
- Bentham Jutting, W. S. S. Van. 1956. Systematic studies on the nonmarine mollusca of the Indo-Australian Archipelago, V. Critical Revision of the Javanese Freshwater Gastropods. *Treubia*, **23** (2) : 259-577, 135 text-figs.
- Blanford, W. T. 1867. Contributions to Indian Malacology, No. VIII. List of Estuary shells collected in the delta of Irawaddy, in Pegu, with descriptions of the new species. *J. Asiat. Soc. Beng.*, **36** (1) : 51-72, pls. 1-XIV.
- Cernohorsky, W. O. 1967. *Marine Shells of the Pacific*. Pacific Publ., Sydney, 248 pp., 444 figs.
- Cernohorsky, W. O. 1971. The family Naticidae (Mollusca : Gastropoda) From the Fiji Islands. *Rec. Auckland Inst. Mus.*, **8** : 169-208, 70 figs.
- Cernohorsky, W. O. 1972. *Marine Shells of the Pacific*, 2. Pacific Publ., Sydney, 411 pp., 68 pls., 28 tex-figs.
- Cernohorsky, W. O. 1972a. Indo Pacific Nassariidae (Mollusca : Gastropoda). *Rec. Auckland Inst. Mus.*, **9** : 125-194, figs.1-162.
- Cernohorsky, W. O. 1976. The Taxonomy of some Indo-Pacific Mollusca, pt. 4 with descriptions of new taxa and remarks on *Nassarius coppingeri* (Smith). *Rec. Auckland Inst. Mus.*, **13** : 111-129, 43 figs.
- Cernohorsky, W. O. 1977. Correction to the nomenclature of *Bullia* (Nassariidae). *Auck. Mus. Consc. Sec. Bull.*, **2** (N.S.) : 25-26.
- Chavan, Andre. 1969. In Moore's *Treatise on Invertebrate Plaeontology*, pt. N. Vol. 2 (of 3) Mollusca 6, Bivalvia : N491-N 952.
- Cheriyani, P. V. 1968. On a collection of molluscs from the Cochin harbour area. *Proceedings of Symposium on Mollusca*, pt. 1 : 121- 136.
- Chichton, M. D. 1940. Marine shells of Madras. *J. Conch. Lond.*, **21** : 193-212.
- Crichton, M. D. 1941. Marine shells of Madras. *J. Bombay nat. Hist. Soc.* **42** (1) : 323-341, 4 pls.
- Daniel, A. & Subba Rao, N. V. 1982. Distribution pattern of *Martesia striata* (Linnaeus) in estuarine systems of the east and south west coast of India. *Rec. zool. Surv. India*, **79** : 303-310, pl. 11, figs. 1-3.
- Dey, A. 1981. *Studies on Indian Tellinids* (Mollusca : Bivalvia : Tellinidae), Ph. D. Thesis, Ranchi Univ., 310 pp., Table, 46 pls.
- Durve, V. S. 1968. On the nomenclature of two Indian backwater oysters. *J. mar. biol. Ass. India*, **9**(1) (1967) : 173-178.
- Eliot, C. 1916. Fauna of the Chilka Lake. Mollusca - Nudibranchiata. *Mem. Indian Mus.*, **5** : 377-379, text-fig.

- Fischer-Piette, E. 1976. Les Veneridae Indéterminées des collections de Calcutta. *Rec. zool. Surv. India*, **70** : 235-257.
- Fischer-Piette, E. & D. Vukadinovic, 1972. Revision des Veneridae appartenant aux *Comus*, *Saxidomus*, Cyclininae, Gemminae et Clementiinae - *J. Conch. Paris*, **109** (4) : 130-167, 22 figs.
- Ghosh, E.N. 1916. Appendix, Fauna of the Chilka Lake, Mollusca Gastropoda and Lamellibranchia. Anatomy of the common *Solen* of Chilka Lake, A dwarfed form of *S. fonesi* Dunker. *Mem. Indian Mus.*, **5** : 367-374, 3 figs.
- Ghosh, E.N. 1920. Taxonomic studies on the soft parts of the Solenidae. *Rec. Indian Mus.*, **19** : 47-78.
- Gravelly, F. H. 1942. Shells and other animal remains found on the Madras beach, II, Snails etc. (Mollusca : Gastropoda). *Bull. Madras Govt. Mus. new Ser.* **5**(2) : 1-110, 17 figs.
- Grüneberg, H. 1979. A search for cause of polymorphism in *Clithon oualaniensis* (Lesson) (Gastropoda : Prosobranchia). *Proc. R. Soc. Lond. B*, **203** : 379-386.
- Hornell, J. 1917. A Revision of the Indian species of *Meretrix*. *Rec. Indian Mus.*, **13** : 154-179, pls. 4-6.
- Jenkins, J. T. 1912. Observations on the shallow-water fauna of the Bay of Bengal made on the Bengal Fisheries steam-trawler "Golden Crown," 1908-1909. *Rec. Indian Mus.* **7** : 51-64.
- Kilburn, R. N. 1976. A revision of the Naticidae of South Africa and Mocambique (Mollusca). *Ann. Natal Mus.*, **22** (3) : 829-884.
- Knight, J. B., Cox, L. R., Keen, A. M. Batten, R. L., Yochelson, E. L. & Robertson, R. 1960. Systematic descriptions - in Moore (ed.) *Treatise on Invertebrate Palaeontology*, pt. I, Mollusca 1 : Mollusca - General Features : I 169 - I 331, figs. 89-216.
- Kohn, A. J. 1978. The Conidae (Mollusca : Gastropoda) of India, *J. nat. Hist.*, **12** : 295-335.
- Krishnamoorti, K. P. & Rajagopalan, S. 1968. Survey of mollusc nuisance in some water supplies at Calcutta. *Proceedings of Symposium on Mollusca*, pt. 3 : 740-754.
- Kuroda, T., Habe, T. & Oyama, K. 1971, *The Sea Shells of Sagami Bay*, Maruzen Co., Ltd. Tokyo (English), 488 pp., 121 pls., Index. (Also in Japanese).
- Lamarck, J. B. 1818. *Histoire naturelle des animaux sans Vertèbres*, **5** : 612 pp.
- Mallik, T. K. 1979. Sand collars from a recent beach. *Marine Geology*, **29** : M 17 - 23, figs. 1-10.
- Mane, U. H. 1974. The adaptation of estuarine clam, *Katelysia opima* to the salinity fluctuations. *Revista Biol.*, **67** : 73 - 107, 8 figs., 6 tabs.
- Massy, A. L. 1916. The cephalopoda of the Indian Museum. *Rec. Indian Mus.*, **12** : 185-247, pls. 23-24.
- Melville, J. C. 1912. Descriptions of thirty three new species of Gastropoda from the Persian Gulf, Gulf of Oman, and North Arabian Sea. *Proc. malac soc. Lond.*, **10**(3) : 240-254. Pls. XI-XII.
- Melville, J. C. 1928. The marine Mollusca of the Persian Gulf, Gulf of Oman, and North Arabian sea, as evidenced mainly through the collections of Captain F.W. Townsend, 1893-1914.

- Addenda, corrigenda, and emendanda. *Proc. malac. Soc. Lond.*, 18 : 93-117.
- Melvill, J. C. & Standen, R. 1898. The marine molluscs of Madras and immediate neighbourhood, *J. Conch. Lond.*, 9 : 30-48 & 75-85.
- Menon, P. K. B., Datta Gupta, A. K. & Dasgupta B. 1961. On the marine fauna of the Gulf of Kutch, Pt.2, Gastropoda. *J. Bombay nat. Hist. Soc.*, 58(2) : 475-494.
- Menzel, R. W. 1974. Portuguese and Japanese oysters are the same species. *J. Fish. Res. Board Canada*, 31 : 453-456.
- Mienis, H. K. 1973. Notes on recent and fossil Neritidae 4. *Nerita lineata* Gmelin, 1791, a junior homonym of *N. lineata* Mueller, 1774. *Argamon*, 4 (1) : 21-22.
- Mookherjee, H. P. 1985. Contribution to the Molluscan fauna of India, pt. 3, Marine molluscs of the Coromandel coast, Palk Bay and Gulf of Mannar - Gastropoda : Mesogastropoda (Part 2.). *Occ. Pap. Rec. zool. Surv. India* No. 75 : 93 pp., 15 pls.
- Nagabhushanam, A. K. & Chandrasekhara Rao, G. 1969. Preliminary observations on a shore fauna of the Orissa coast. *Proc. zool. Soc. Calcutta*, 22 (1) : 67-82.
- Nair, N. B. 1956. Destruction of timber structures by shipworms in Madras waters. *J. Sci. industr. Res.*, 15C (3): 81-82.
- Nevill, G. 1884. *Handlist of Mollusca in the Indian Museum, Calcutta, pt. 2, Gastropoda, Prosobranchia - Neurobranchia.* (contd.) Indian Museum, Calcutta, : 306 pp.
- Nevill, G. & H. 1871. Descriptions of new Mollusca from the eastern region. *J. Asiat. Soc. Beng.*, 40 (2) : 1-11. pl. 1.
- Nevill, G. & H. 1875. Descriptions of new marine Mollusca from the Indian Ocean. *J. Asiat. Soc. Beng.*, 44 (2) : 83-104, pls. 7-8.
- Newton, R. B. & Smith, E. A. 1912. On the survival of a Miocene oyster in recent seas. *Rec. Geol. Surv. India*, 42 : 1-15.
- Panikkar, N. K. & Aiyar, R. G. 1939. Observations on breeding in brackishwater animals of Madras. *Proc. Indian Acad. Sci.*, 9B(6) : 343-364 (Mollusca : 356-358).
- Patnaik, S. 1972. Seasonal abundance and distribution of bottom fauna of the Chilka Lake. *J. mar. bio. Ass. India*, 13(1) : 106-125 (1971).
- Powell, A. W. B. 1964. The family Turridae in the Indo-Pacific, pt. 1. The subfamily : Turrinae. *Indo-Pacific Mollusca*, 1 (5) : 227-346, pls. 172-261.
- Powell, A. W. B. 1969. The family Turridae in the Indo-Pacific, pt. 2, The subfamily : Turriculinae. *Indo-Pacific Mollusca*, 2 (10) : 215-415, pls. 188-324.
- Powell, A. W. B. 1973. The Patellid limpets of the world (Patellidae). *Indo-Pacific Mollusca*, 3 (15) : 75-206, pls. 60-181.
- Prashad, B. 1932. Lamellibranchiata of the Siboga Expedition, Pt. 2. Pelecypoda (Exclusive of the Pectinidae). *Siboga Exped. Sci. Rept.*, Leiden. 53C : 353 pp., pls. 1-9. Chart.
- Prashad, B. 1933. A revision of the Indian Nuculidae. *Arch. Naturgesch.*, 2 (1) : 124-135. pl. 1, figs. 1-15.
- Preston, H. B. 1910. Descriptions of five new species of marine shells from the Bay of Bengal. *Rec.*



*Indian Mus.*, 5 : 117-121, figs. 1-5.

- Preston, H. B. 1914. Mollusca from the Chilka Lake on the east coast of India. *Rec. Indian Mus.*, 10 : 297-310, 22 figs.
- Preston, H. B. 1915. A further report on Mollusca from Lake Chilka on the east coast of India. *Rec. Indian Mus.*, 11 : 289-310, 25 figs.
- Preston, H.B. 1916. Report on a collection of Mollusca from the Cochin and Ennur backwaters. *Rec. Indian Mus.*, 12 : 27-39, 17 figs.
- Radwin, G.E. and D'Attilio, A. 1976. *Murex shells of the world. An illustrated guide to the Muricidae*, Stanford Univ. Press, : 284 pp., 32 pls., 192 figs.
- Rajagopal, A. S. 1970. Field ecology of some marine borers (Mollusca : Teredinidae) on mangroves in Sunderbans. *Rec. zool. Surv. India*, 62 (1 & 2) : 21-27.
- Rajagopal, A. S. & Mookherjee, H. P. 1978. Contribution to the Molluscan fauna of India, pt. 1. Marine molluscs of the Cormandel coast, Palk Strait and Gulf of Mannar. Gastropoda : Archaeogastropoda. *Rec. zool. Surv. India, Occ. Pap. No. 12* : 48 pp., 1 pl.
- Rajagopal, A. S. & Mookerjee, H. P. 1982. Contribution to the Molluscan fauna of India. pt. 2, Marine molluscs of the Coromandel coast, Palk Bay and Gulf of Mannar-Gastropoda : Mesogastropoda (Partim). *Rec. zool. Surv. India, Occ. Pap. No. 28* : 53 pp.
- Rajagopalaingar, A. S. 1961. A. New species of the marine borer, *Bankia (Neobankia) roonwali* (Mollusca : Teredinidae) from India, *Sci. and Cult.*, 27 (11) : 550.
- Ranson, G. 1967. Les especes d'Huitres vivant actuellement dans le Monde, definies par leurs coquilles larvairéou prodissoconques. Etudes des collections de quelques-uns des grands Musées d'Histoire naturell. *Rev. Trav. Inst. Peeches marit.*, 31 (2) : 127-274, 55 figs.
- Ray, H. C. 1948. On a collection of Mollusca from Coromandel coast of India. *Rec. Indian Mus.*, 46 : 87-122, pl. 3.
- Ray, H. C. 1968. Small marine shells obtained off Puri, India. *Indian Mus. Bull.*, 3 (1 & 2) : 14-32, 34 figs.
- Ray, H. C. 1977. *Contribution to the knowledge of the molluscan fauna of Maungmagan, Lower Burma*, Indian Museum, Calcutta. 150 pp.
- Reeve, L. A. 1857-58. *Conchologia Iconica or Illustrations of the shells of molluscous animals London*, 10; *Modiola*, 87 spp., 11 pls. 87 figs.
- Reeve, L. A. 1859. *Conchologia Iconica or Illustrations of the shells of molluscous animals*, London, 11 : *Anomia*, 37 spp., 8 pls., 40 figs.
- Reeve, L.A. 1864. *Conchologia Iconica or Illustrations of the shells of molluscous animals*. London, 14; *Cytherea*, 49 spp., 49 figs.
- Rippingale, O. H. & McMichael, D. F. 1961. *Queensland and Great Barrier Reef Shells*, Brisbane : 210 pp, 29 pls.
- Rosewater, J. 1970. The family Littorinidae in the Indo-Pacific, pt. 1, The subfamily : Littorininae, *Indo. Pacif. Mollusca*, 2 (11) : 417-506, pls. 325-387.
- Satyamurti, S. T. 1952. The mollusca of Krusadai Island in the Gulf of Mannar, 1. Amphineura, and Gastropoda. *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 6 : 267 pp., 33 pls.

- Satyamurti, S. T. 1956. The mollusca of Krusadsi Island in the Gulf of Mannar, 11. Scaphopoda, Pelecypoda and Cephalopoda. *Bull. Madras Govt. Mus. new Ser.* 1 (2) pt. 7 : 202 pp., 30 pls.
- Silas, E. G. 1968. Cephalopods of the West Coast of India collected during the cruises of the Research vessel 'Varuna', with a catalogue of the species known from the Indian Ocean. *Proceedings of the Symposium on Mollusca*, pt. 1, *Mar. Biol. Ass. India*, : 278 - 359, 13 figs.
- Smith, E. A. 1895. Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander C.F. Oldham, R.N. - Series 2, No. 19. Report upon some Mollusca dredged in the Bay of Bengal and the Arabian sea. 1894-5. *Ann. Mag. nat. Hist.*, (6) 14 : 1-19, pls. I & II.
- Smith, E. A. 1896. Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander C.F. Oldham, R.N. - Series 2, No. 22. Descriptions of new deep sea Mollusca. *Ann. Mag. nat. Hist.*, (6) 18 : 367-375.
- Smith, E. A. 1906. Natural History Notes from R.I.M.S. 'Investigator' Series 3, No. 10. On Mollusca from the Bay of Bengal and the Arabian sea. *Ann. Mag. nat. Hist.*, (7) 18 : 157-264.
- Smith, M. 1961. *Universal Shells, Marine- Freshwater Land*. Asheville, N.C. : 254 pp incl. 11 pls.
- Stenzel, M. 1971. 'Oysters' : in, Moore (ed.) *Treatise on Invertebrate Paleontology*, pt. N, vol. 3(3), Mollusca - 6, Bivalvia : i-v-N953- N1224, 150 figs.
- Subba Rao, N. V. 1968. Report on a collection of woodboring molluscs from Mahanadi estuary, Orissa, India. *Proceedings of the Symposium on Mollusca*, pt. 1, *Mar. Biol. Ass. India* : 85-93, p; 1.
- Subba Rao, N. V. 1971. On the collection of Strombidae (Mollusca : Gastropods) from Bay of Bengal, Arabian sea and western India Ocean, with some new records, 1 - Genus : *Strombus*. *J. mar. biol. Ass. India*, 12 (1 & 2) : 109-124, pl. 1 (1970).
- Subba Rao, N. V. 1975. *Studies on Indian Neritids (Mollusca : Gastropoda : Neritidae)*. Ph. D. Thesis, Calcutta University : 311 pp., 36 pls.
- Subba Rao, N. V. 1977a. Molluscs of Digha coast, West Bengal,, Pt.1: Gastropods, *Newsl, zool. Surv. India*, 3 (4) : 145-148.
- Subba Rao, N. V. 1977b. Molluscs of Digha coast, West Bengal, pt. 2 : Bivalvia, Scaphopoda and Cephalopoda. *Newsl. zool. Surv. India*, 3 (5) : 298-302.
- Subba Rao, N. V. 1982. On the collection of Strombidae (Mollusca : Gastropoda) from Bay of Bengal, Arabian sea and Western Indian Ocean - 2, Genera, *Lambis*, *Terebellum*, *Tibia* and *Rimella*. *J.mar. biol. Ass. India*. 19 (1 & 2) : 21-24, 3 pls. (1977)
- Subba Rao, N. V. & Dey, A. 1984. Contribution to the knowledge of Indian Marine molluscs 1. Family : Mitridae. *Rec. zool. Surv. India, Occ. Pap.* No. 61 : 48 pp., 3 pls.
- Subba Rao, N. V., Dey, A. & Barua, S. 1983. Studies on the malacofauna of Muriganga estuary, Sunderbans, West Bengal. *Bull. zool. Surv. India*, 5 (1) : 47-54, 4 pls.
- Subba Rao, N. V. & Mookherjee, H.P. 1975. On a collection of Mollusca from the Mahanadi estuary, Orissa. *Recent Researches in Estuarine Biology*, (ed.) R. Natarajan. Hindusthan

Publ. : 165-176.

- Subba Rao, N. V., Surya Rao, K. V. & Mitra, S. C. 1987. Malacological notes on Sagar island. *Bull. zool. Surv. India*. 8 (1-3) : 149-158, 4 pls.
- Subrahmanyam, T. V., Karandikar, K. R. & Murti, N. N. 1949. The marine pelecypods of Bombay. *J. Univ. Bombay*, 17 B (5), no. 25 : 50-75, 5 pls.
- Subrahmanyam, T. V., Karandikar, K. R. & Murti, N. N. 1952. The marine gastropods of Bombay, pt. 2. *J. Univ. Bombay*, 21 (3) : 26-73, 181 text-figs.
- Turner, R. D. 1966. *A Survey and Illustrated Catalogue of the Teredinidae*, Harvard Univ., Cambridge : 265 pp., 64 pls. 25 figs.
- Virabhadra Rao, K. V. 1951. Section on molluscan fisheries in 'Hand book of Indian Fisheries, Crustacean and Molluscan Fisheries' (Ministry of Food and Agriculture, Govt. of India, Ed. B. Chopra), pp. 64-69.
- Winckworth, R. 1931. Mollusca from Pulicat Lake. *Proc. malac. Soc. Lond.*, 19 : 188-189.
- Wood Mason, J. & Alcock, A. 1891. Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator' Commander R.F. Hoskyn, R.N. Commanding No. 21. Notes on the results of the last season's deep sea dredging. *Ann. Mag nat. Hist.*, (6) 7 : (Mollusca : 15-19 pp).



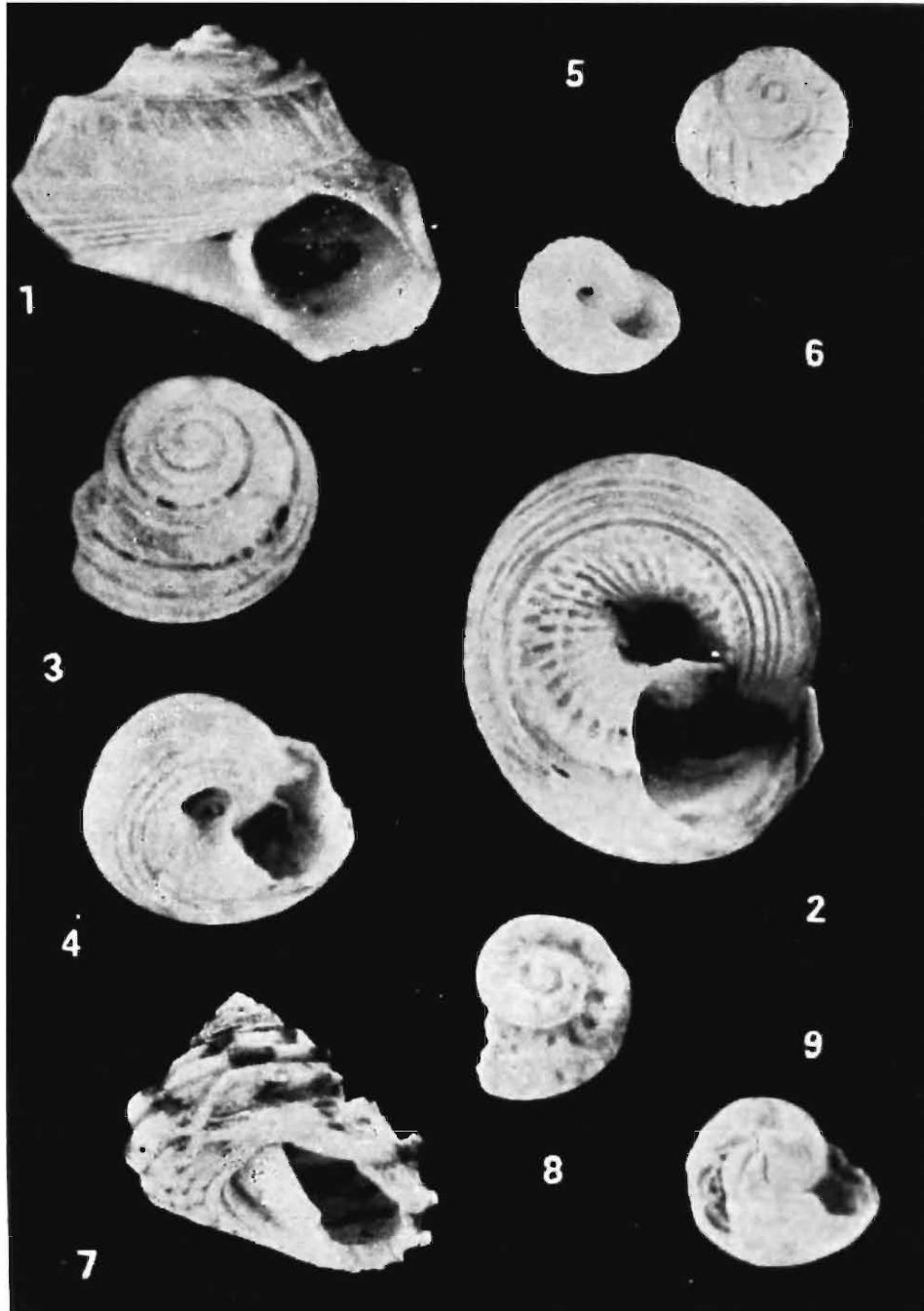


Fig. 1 & 2. *Solariella utkalensis* Ray Holotype. 3 & 4. *Solariella satparaensis* Preston Holotype. 5 & 6. *Cyclostrema eburnea* Nevill Holotype. 7. *Euchelus alabastrium* Reeve. 8 & 9. *Tinostoma variegata* Preston Holotype.

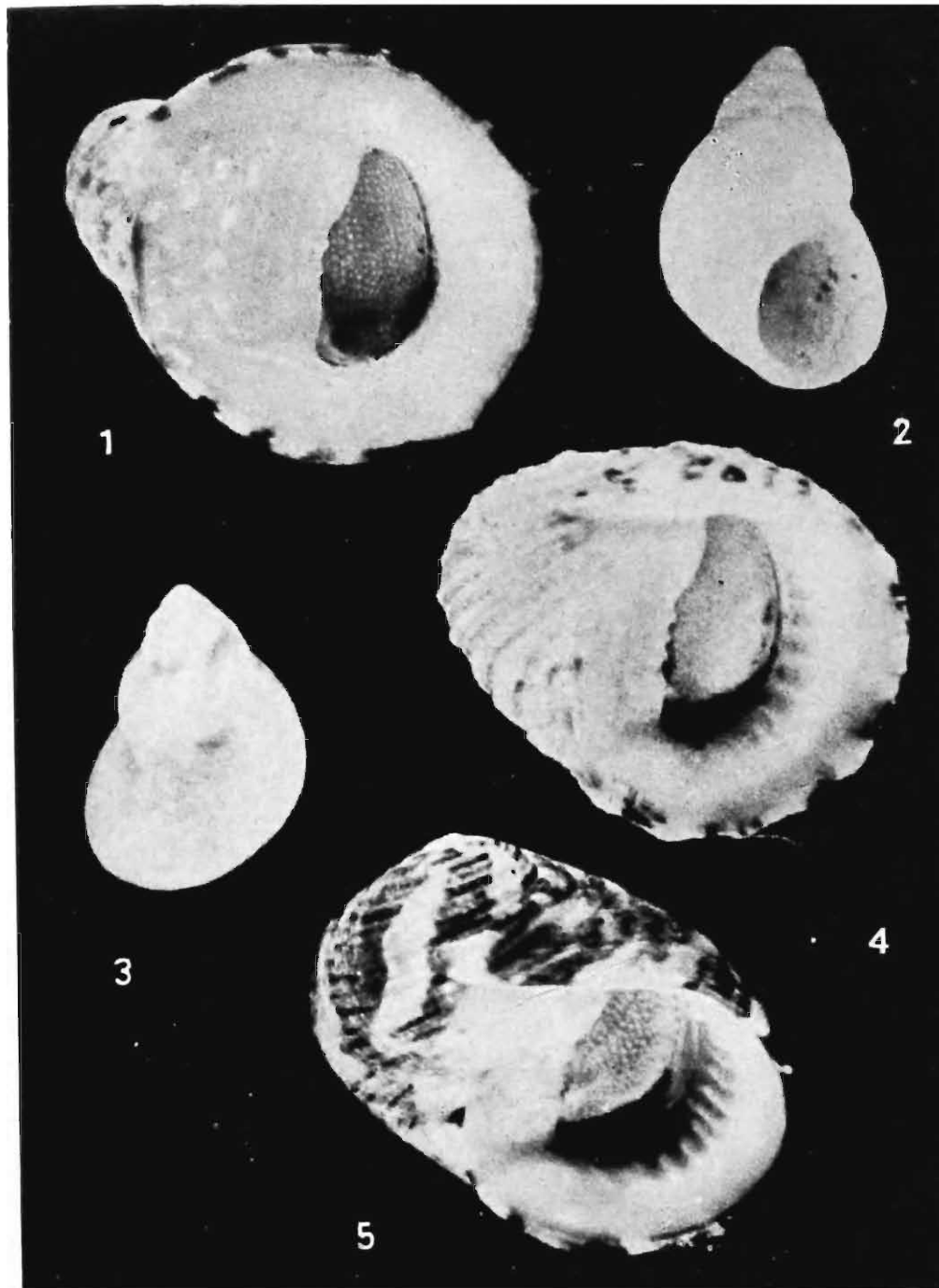


Fig. 1. *Nerita (Theliostyla) albicilla* Linnaeus. 2 & 3. *Tricolia indica* (Winckworth)  
4. *Nerita (Theliostyla) squamulata* Le Guillou. 5. *Nerita (Theliostyla) chamaeleon*  
Linnaeus.

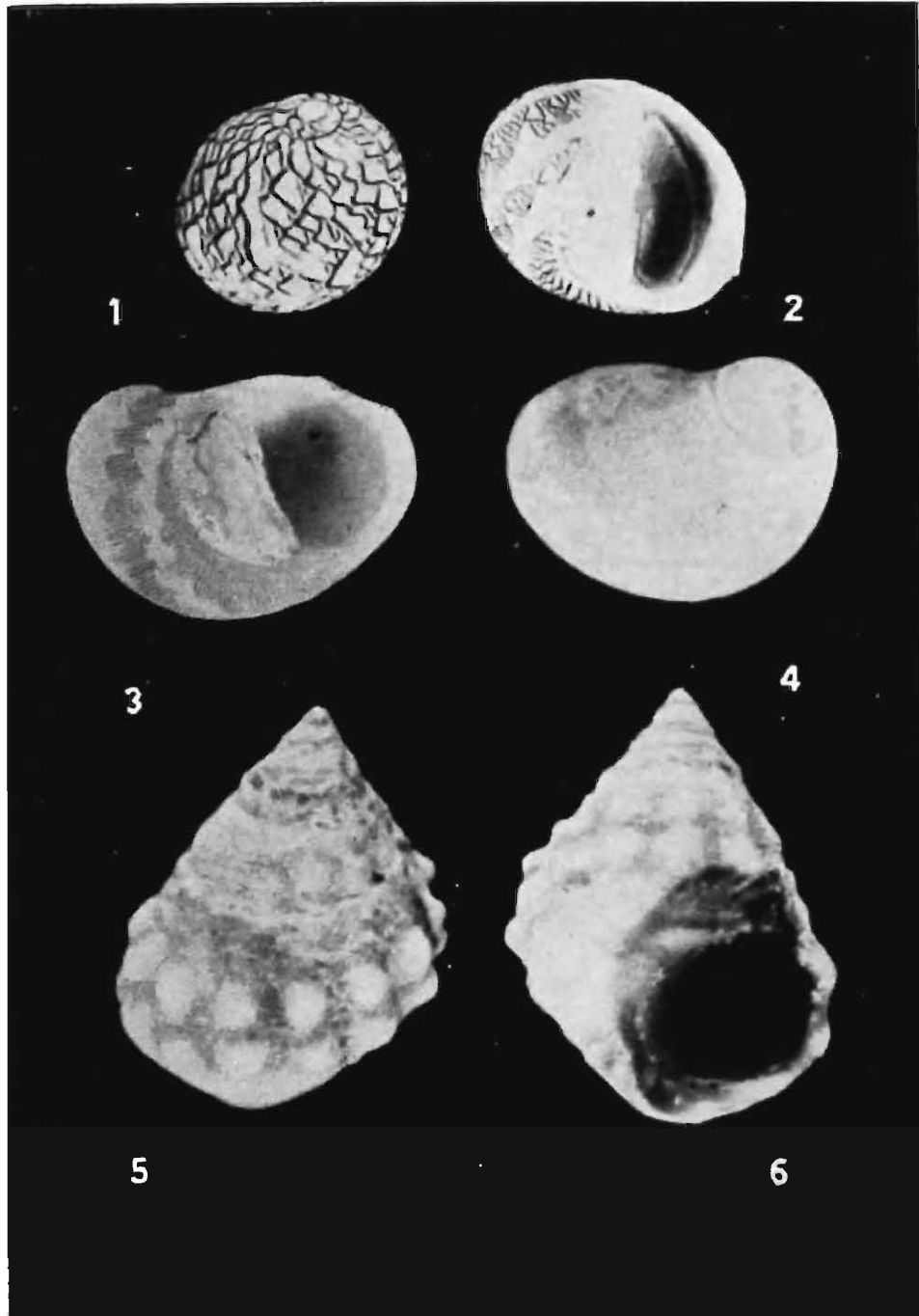


Fig. 1 & 2. *Clithon oualaniensis* (Lesson).  
3 & 4. *Smaragdia mamilla* Annandale Holotype.  
5 & 6. *Nodilittorina* (*Nodilittorina*) *pyramidalis pyramidalis*  
(Quoy & Gaimard).

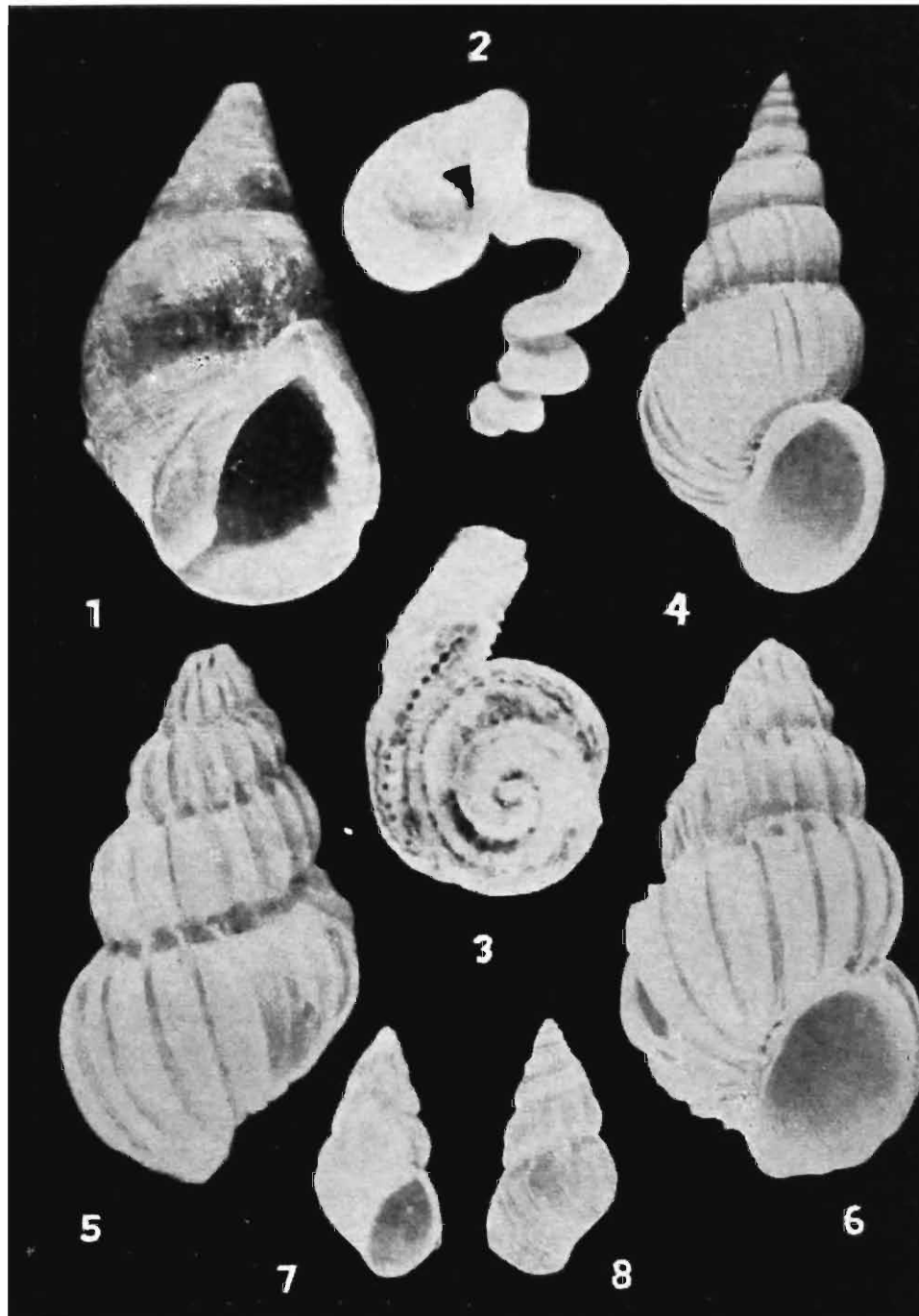


Fig. 1. *Planaxis nigar* Quoy & Gaimard, 2. *Siliguaria cumingii* (Moerch). 3. *Siliguaria trochlearis* (Moerch). 4. *Epitonium immaculatum* (Sowerby): 5 & 6. *Epitonium hamatulae* Preston Holotype. 7 & 8. *Litiopa (Alaba) copiosa* Preston Holotype



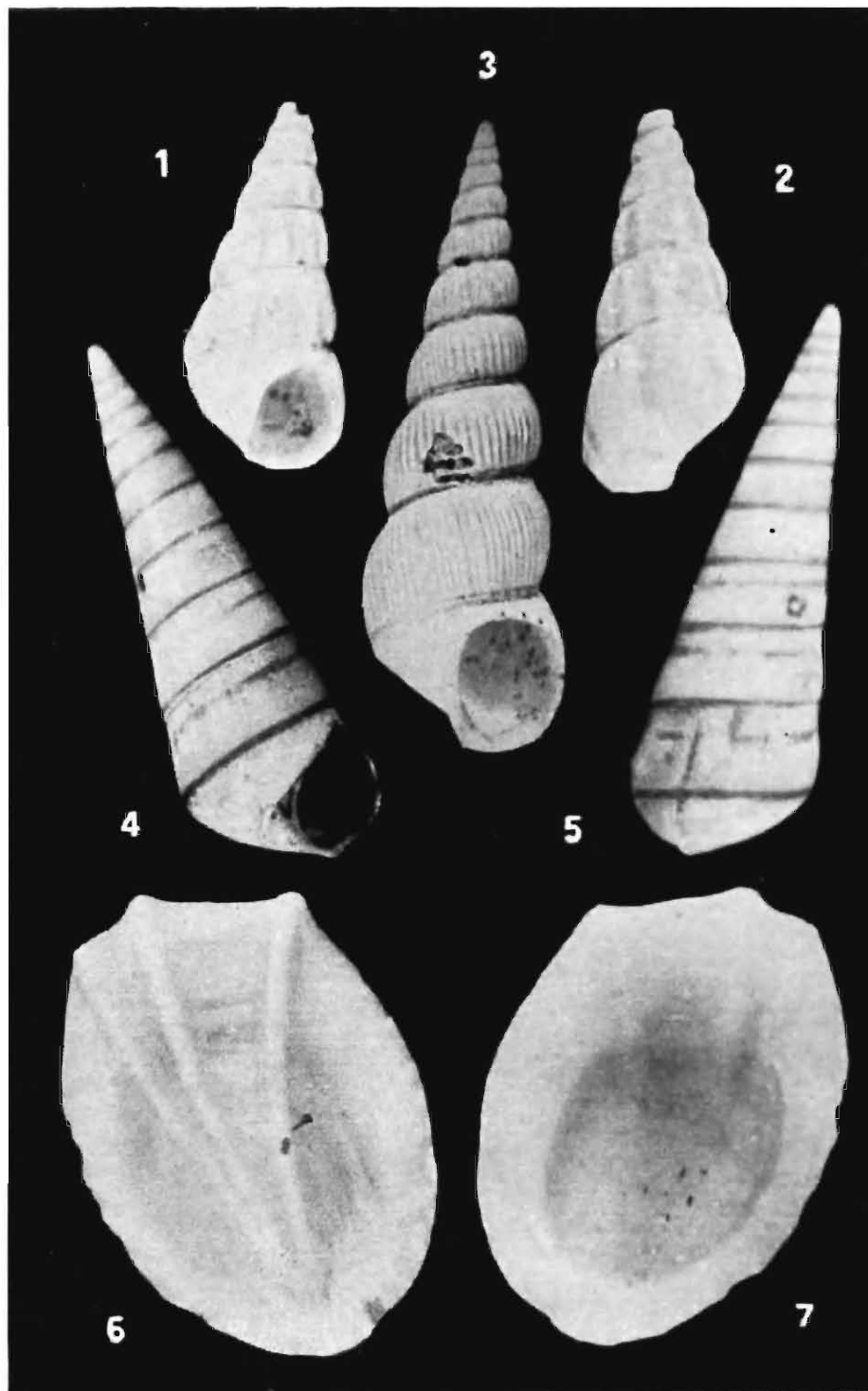


Fig. 1 & 2. *Litiopa (Alaba) kemp* Preston Holotype.  
3, *Acrilla acuminata* Sowerby  
4 & 5. *Niso pyramidelloides* G. & H. Nevill Lectotype  
6 & 7. *Amathina tricarinata* (Linnaeus).

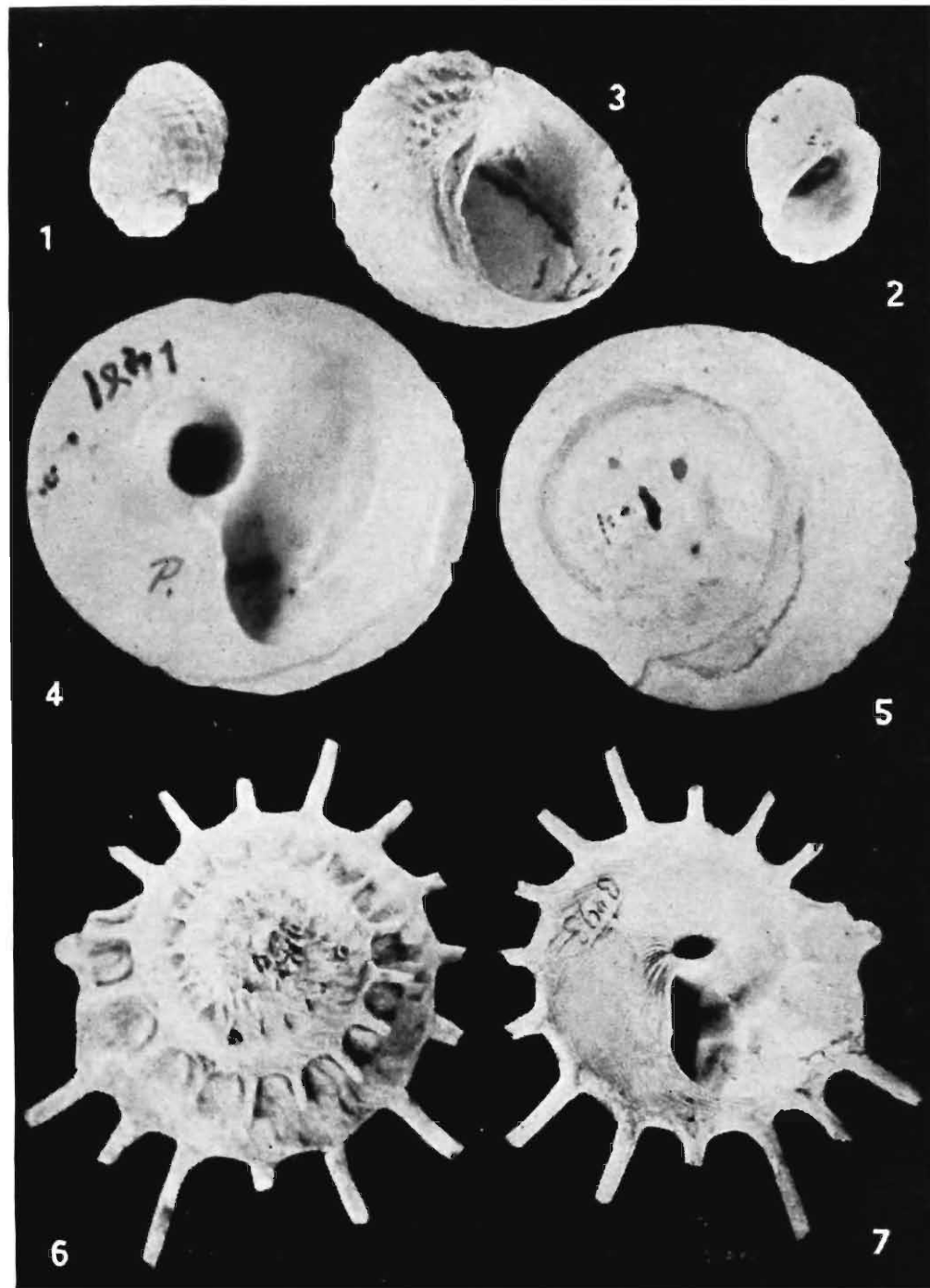


Fig. 1 & 2. *Chilkaia imitatrix* Preston Holotype.

3. *Vanikoro cancellata* (Lamarck),

4 & 5. *Xenophora indica* (Gmelin).

6 & 7. *Xenophora solaris* (Linnaeus).

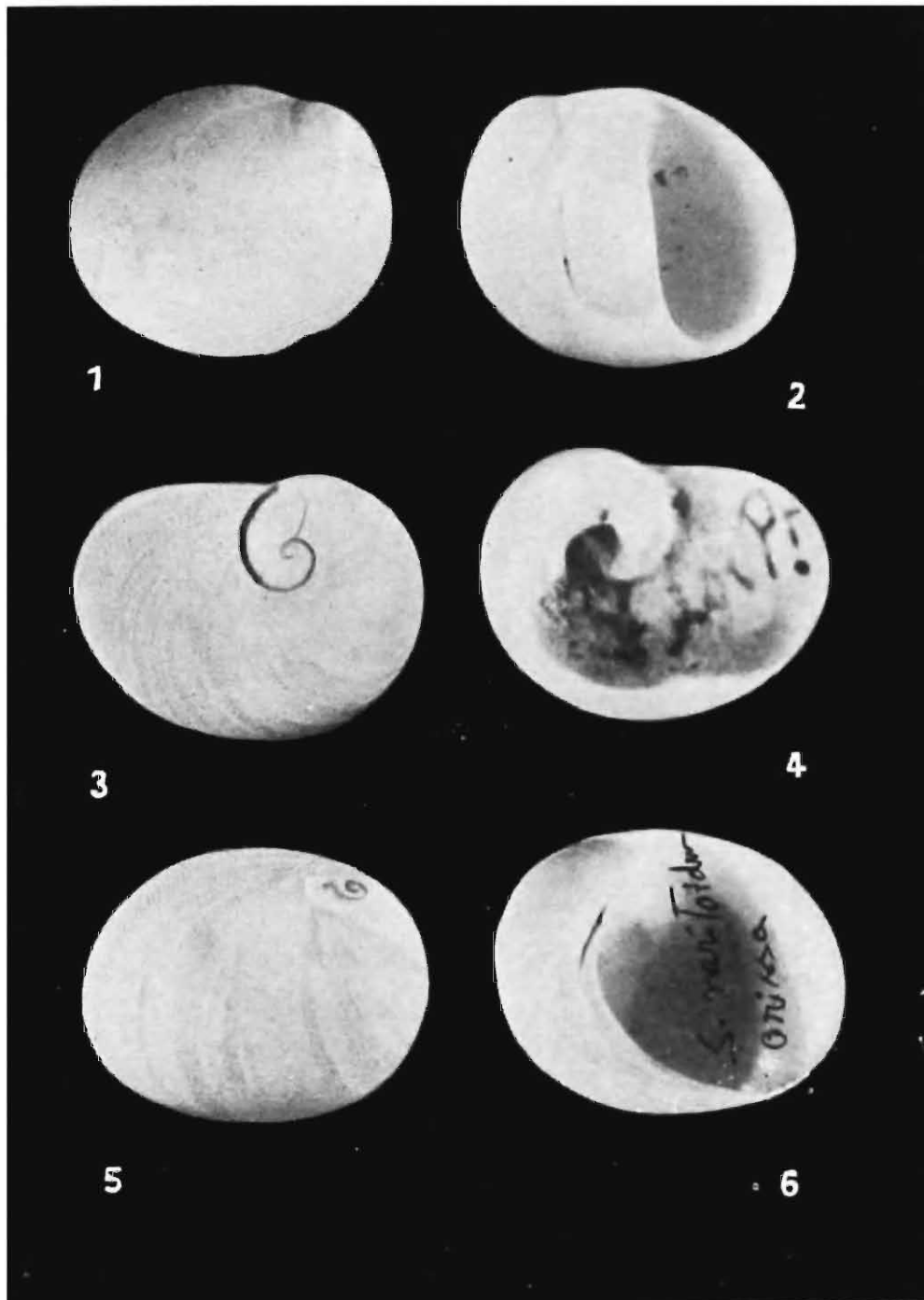


Fig. 1 & 2. *Polinices (Polinices) tumidus* (Swainson).  
3 & 4. *Sinum delesserti* (Recluz).  
5 & 6. *Sinum neritoideum* (Linnaeus).

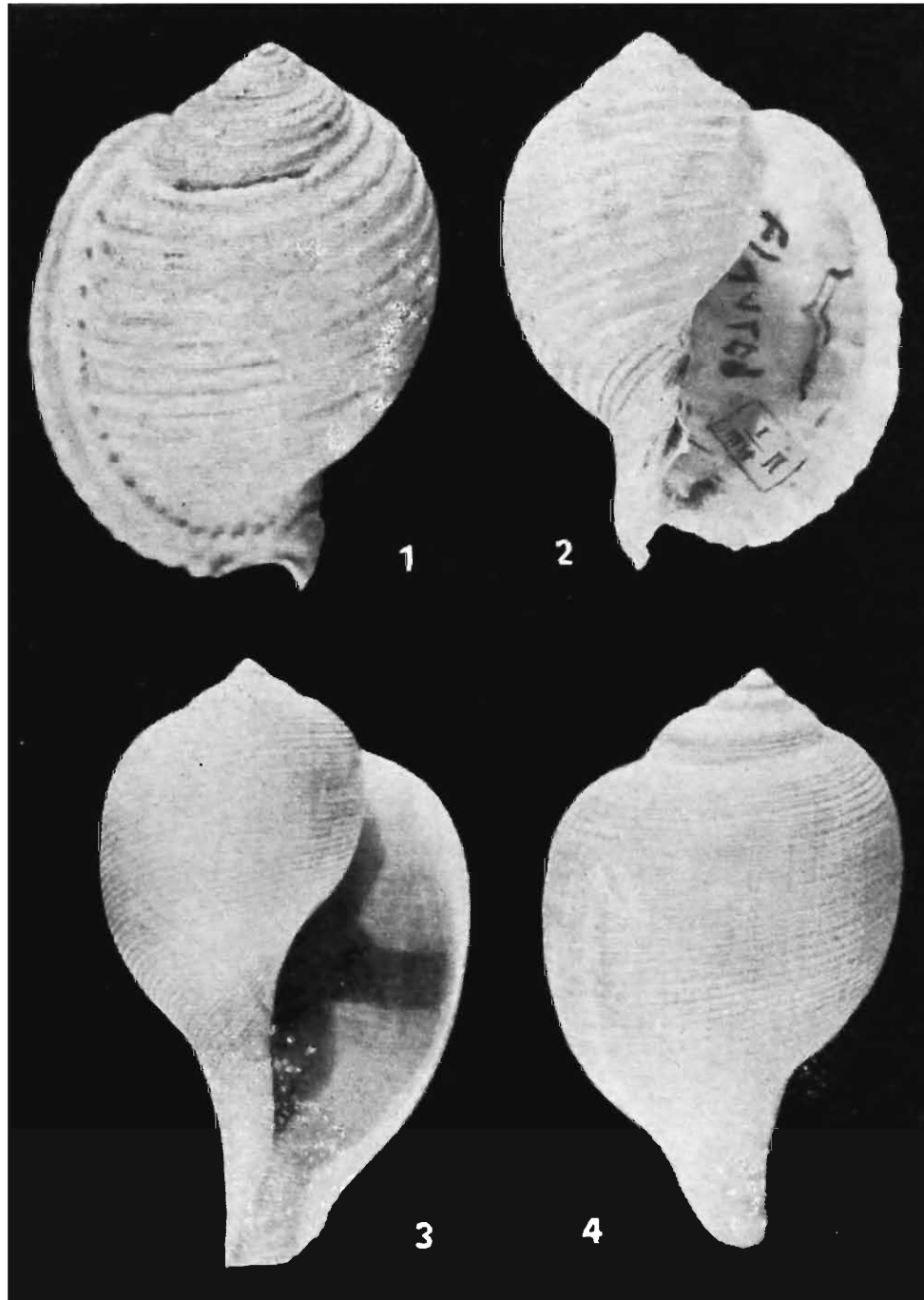


Fig. 1 & 2. *Dolium varicosum* Preston Holotype.  
3 & 4. *Pirula investigatoris* Smith Holotype,

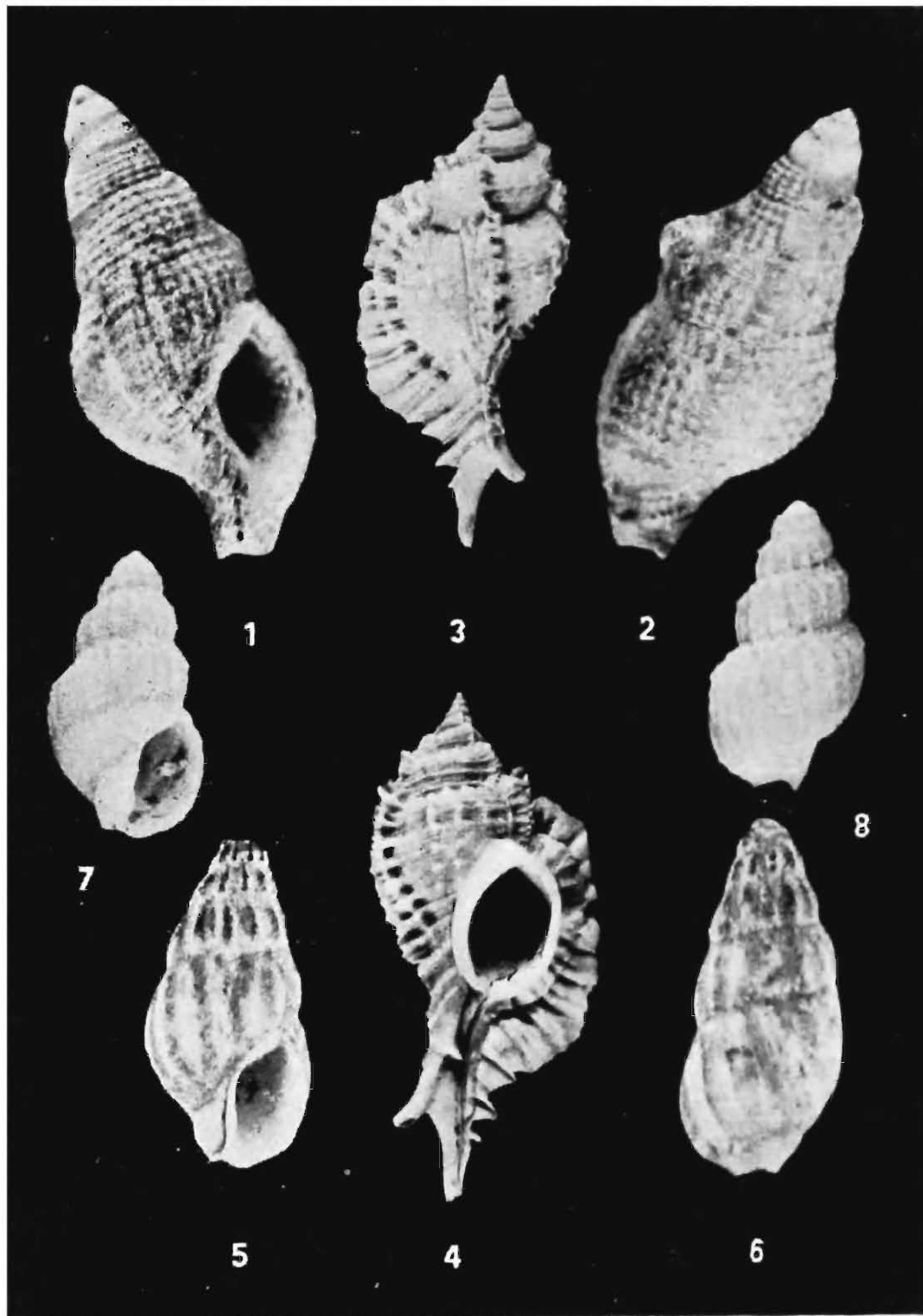


Fig. 1 & 2. *Colubraria muricata* (Lightfoot).  
3 & 4. *Pterinotus annandalei* Preston Holotype  
5 & 6. *Nassarius (Aciculina) vittatus* (A. Adams).  
6 & 7. *Nassa orissaensis* Preston Holotype.

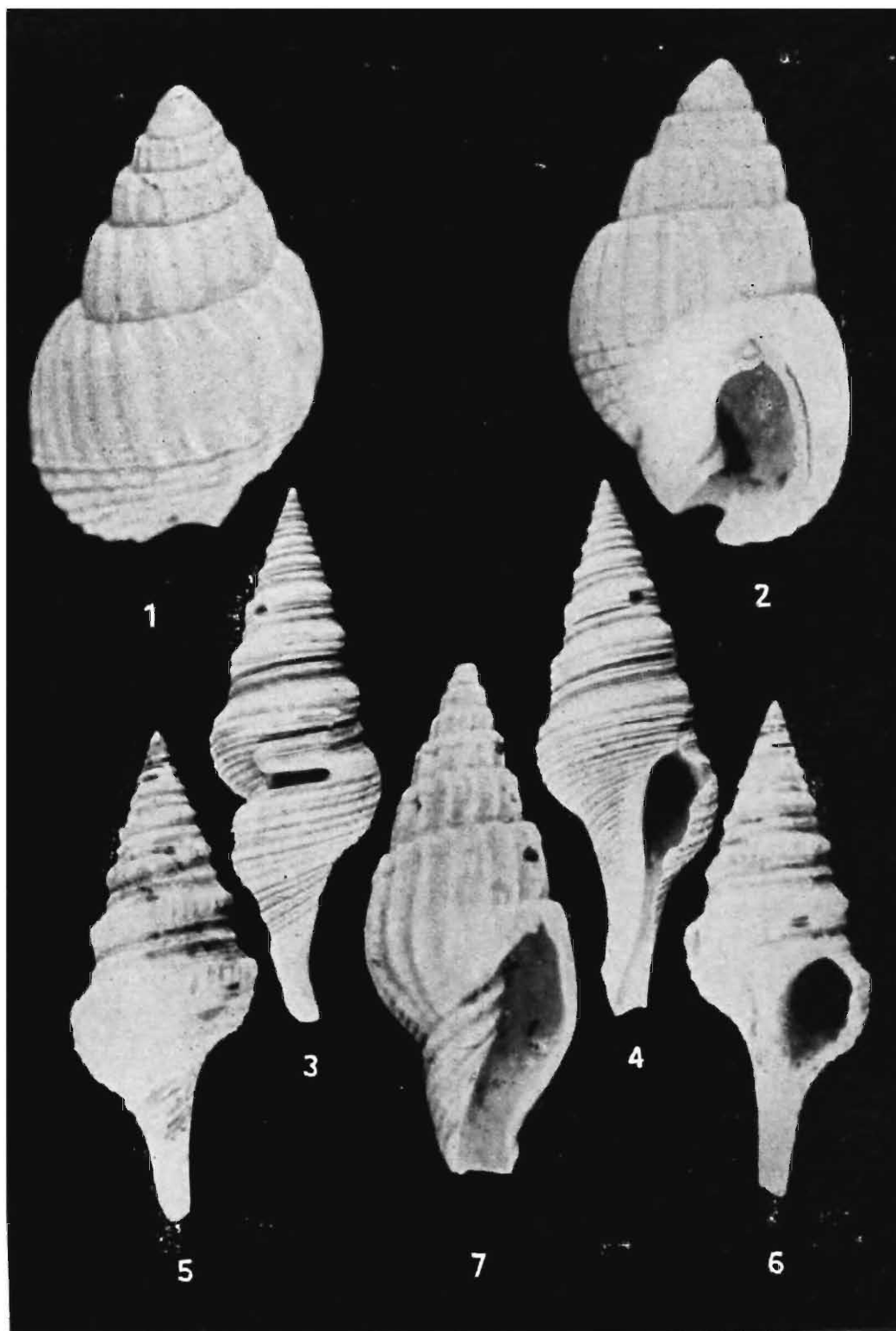


Fig. 1 & 2. *Nassa ariel* Preston Holotype.

3 & 4. *Lophiotoma (Lophioturris) indica* (Roeding).

6. *Gemmula speciosa* (Linnaeus)

7. *Costellaria mandirella* Ray Holotype.

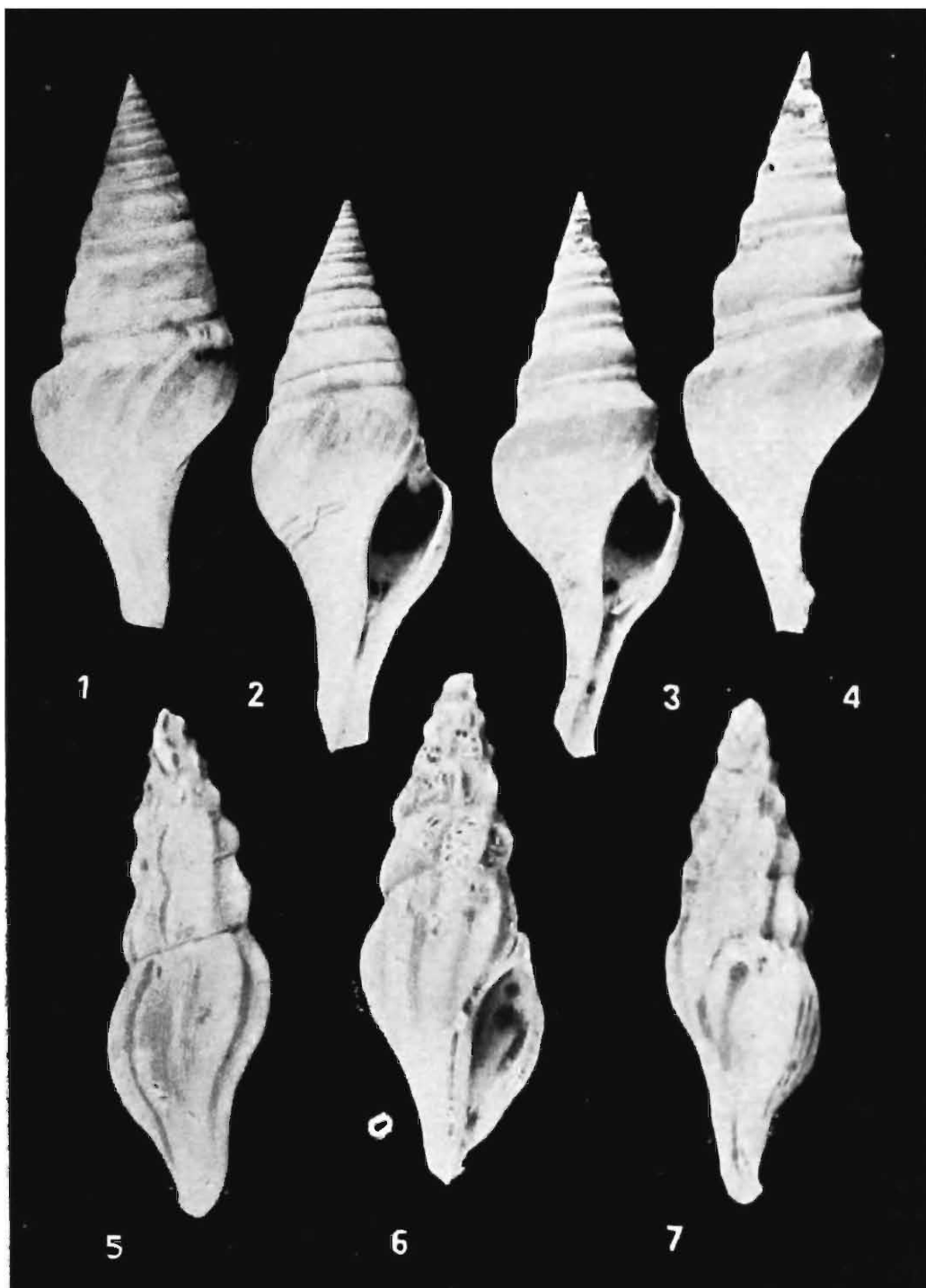


Fig. 1 & 2. *Turricula tornata fulminata* (Kiener).  
3 & 4. *Turricula tornata tornata* (Dillwyn).  
5, 6 & 7. *Drillia ganjamensis* Preston Holotype.

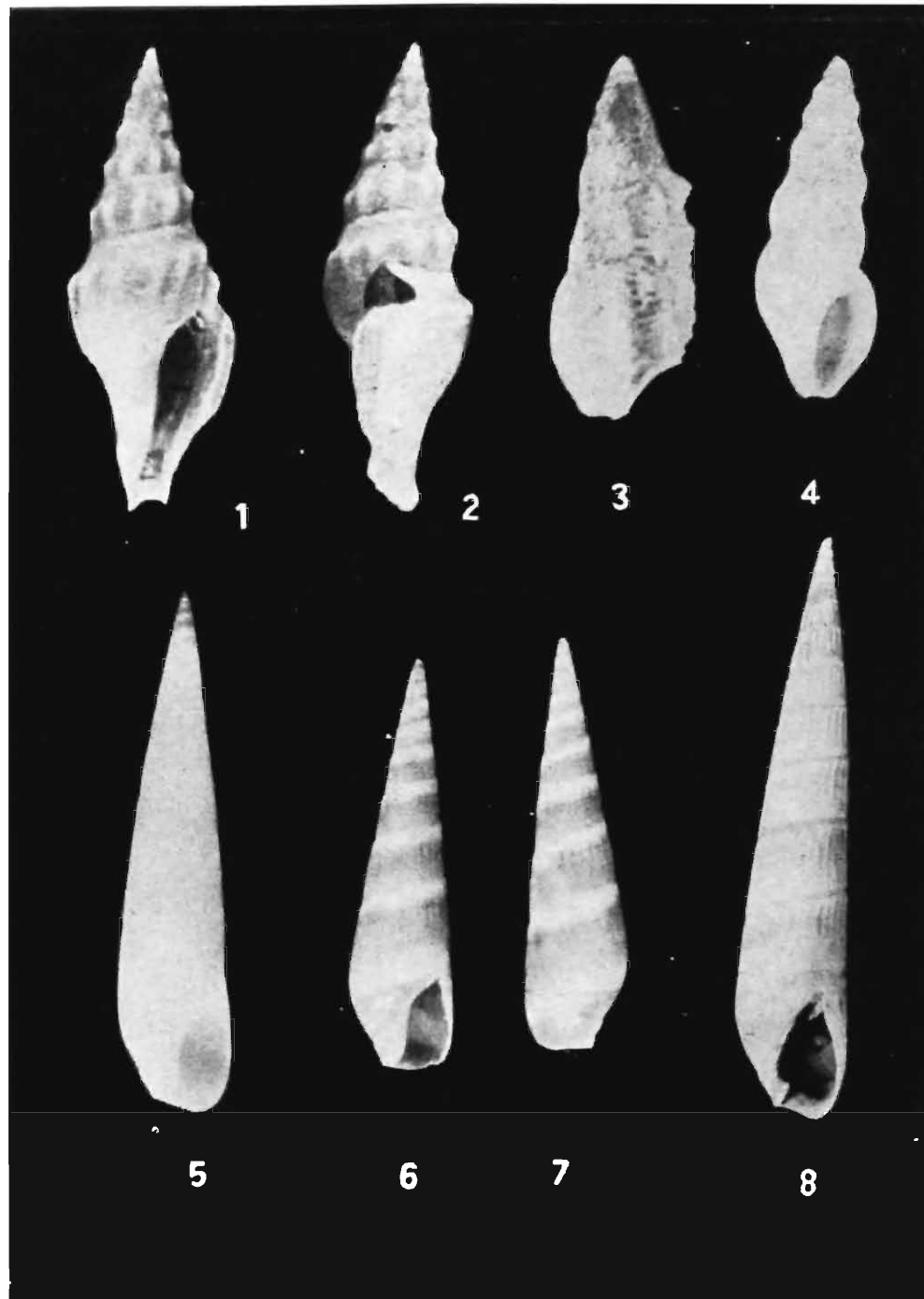


Fig. 1 & 2. *Brachytoma crenularis* (Lamarck). 3 & 4, *Mangelia fulvocincta* Nevill. 5. *Hastula bacillum* (Deshayes). 6 & 7. *Hastula strigilata* (Linnaeus). 8. *Hastula trailli* (Deshayes).



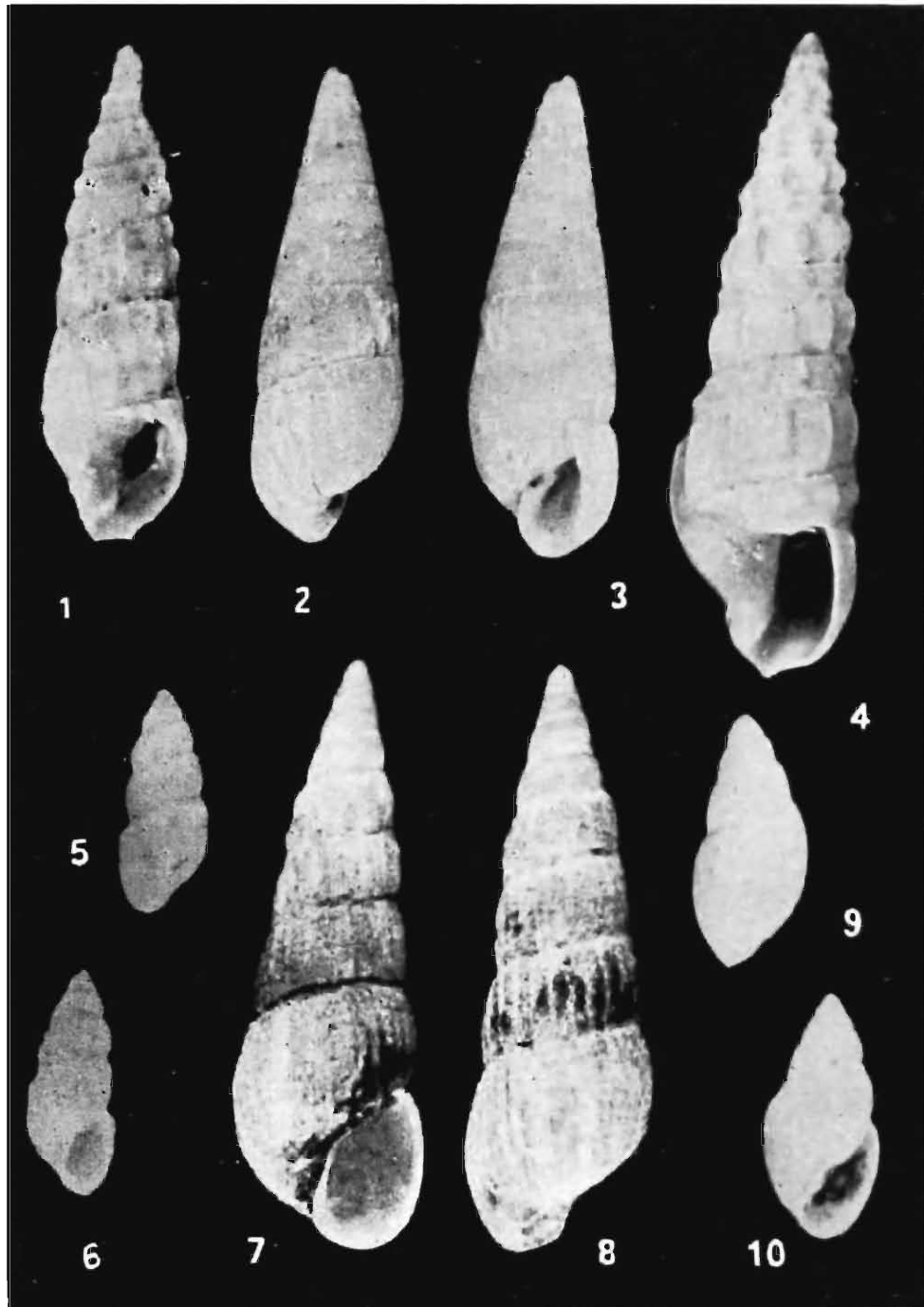


Fig. 1. *Terbera asiatica* Ray Holotype. 2 & 3. *Syrnodea dubiosa* Nevill Holotype. 4. *Terebra durgella* Ray Holotype. 5 & 6. *Chrysallida (Mormula) nadiensis* Preston Holotype. 7 & 8. *Chrysallida (Mormula) ecclesia* Preston Holotype. 9 & 10. *Odostomia chilkaensis* Preston Holotype.

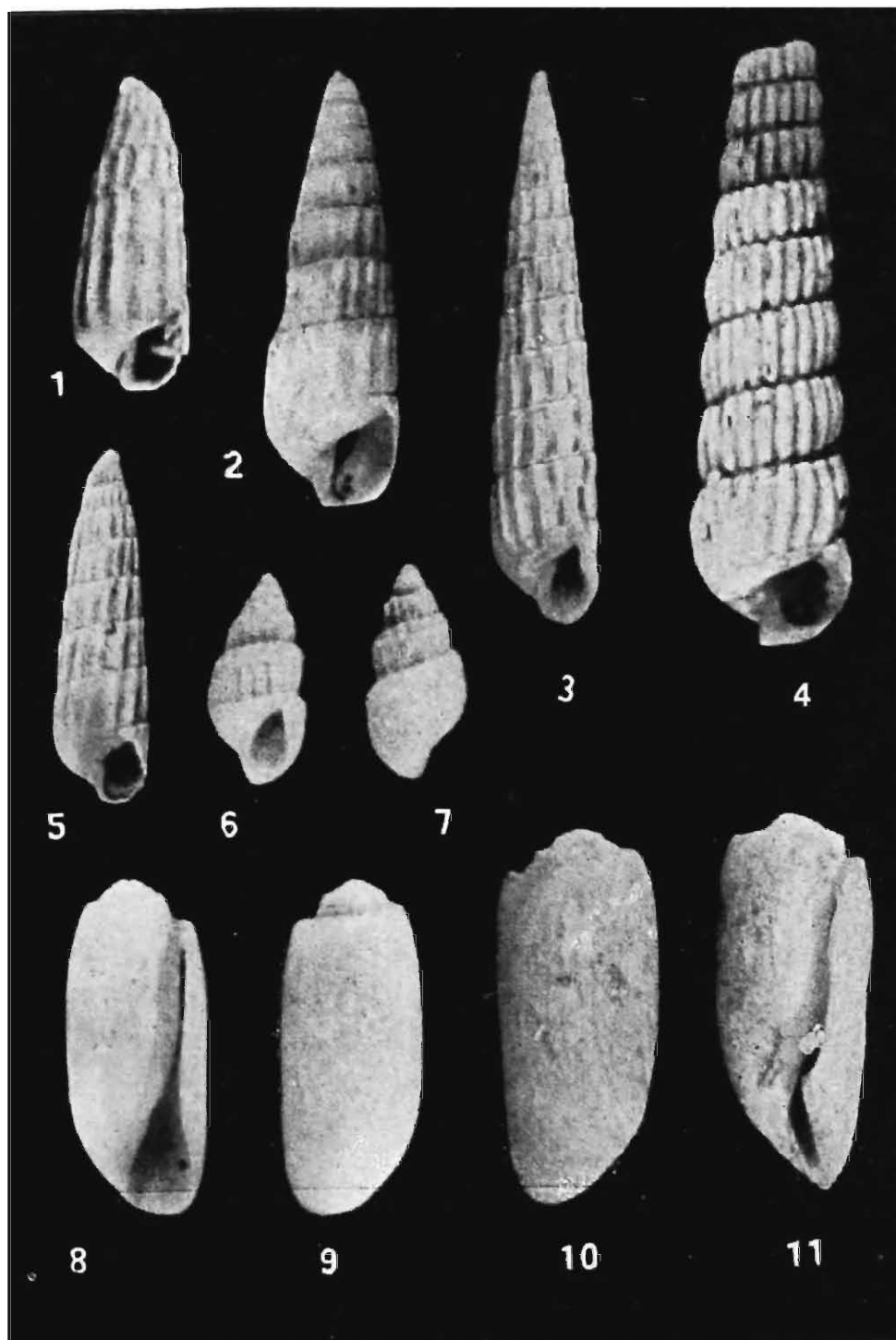


Fig. 1. *Turbonilla puriensis* Ray Holotype. 2. *Turbonilla kemp* Ray Holotype. 3. *Turbonilla prashadi* Ray Holotype. 4. *Turbonilla materna* var. *melvilli* Ray Holotype. 5. *Turbonilla prestoni* Ray Holotype. 6 & 7. *Chrysallida humilis chilkaensis* Preston Holotype. 8 & 9. *Tornatina estriata* Preston Holotype. 10 & 11. *Tornatina soror* Preston Holotype.

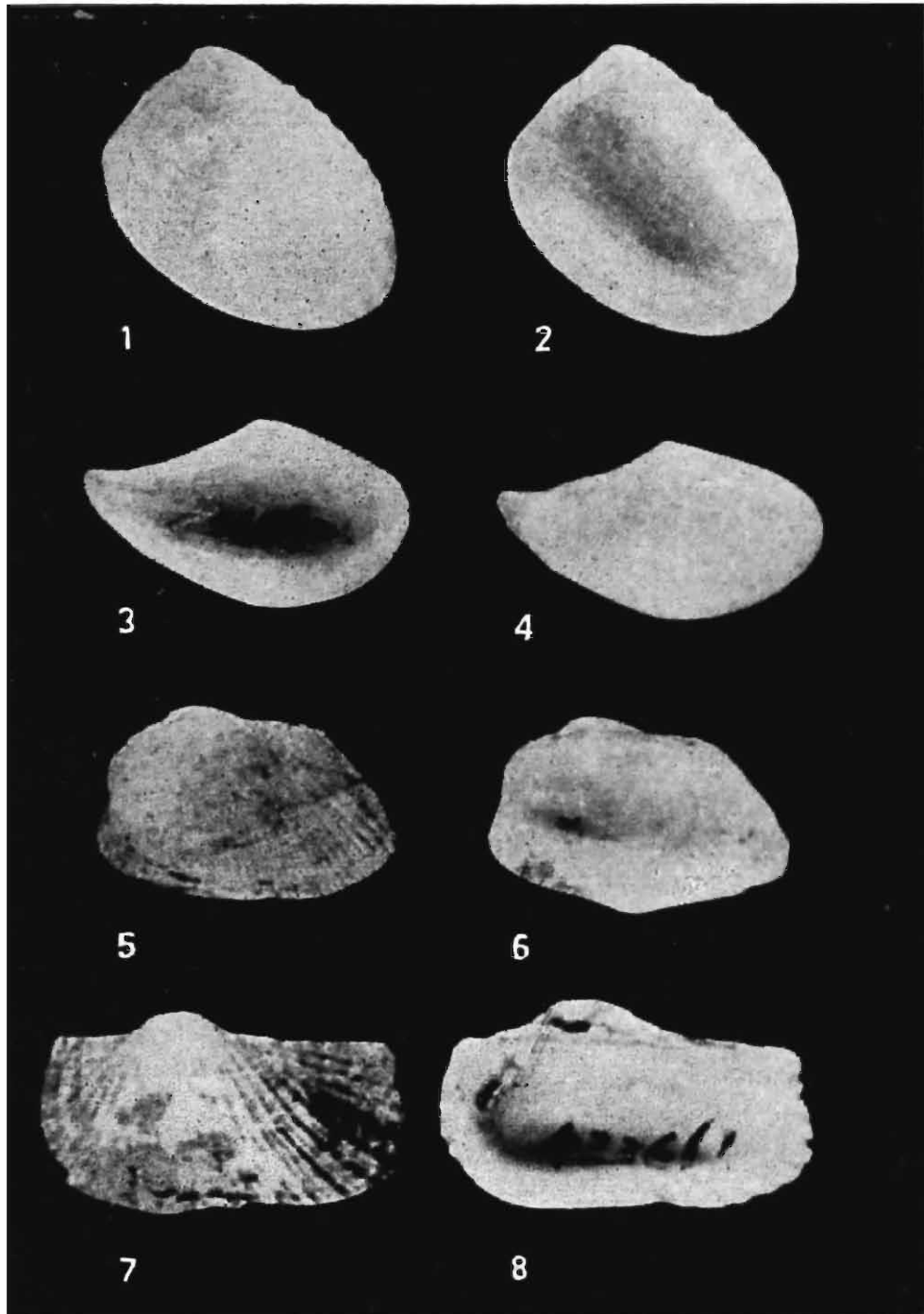


Fig. 1 & 2. *Nucula rabaniana* Nevill Type.  
3 & 4. *Nuculana (Nuculana) robsoni* Prashad.  
5 & 6. *Barbatia helblingii (Cucullaearca) helblingii* (Bruguiere).  
7 & 8. *Barbatia (Calloarca) bistrigata* (Dunker).

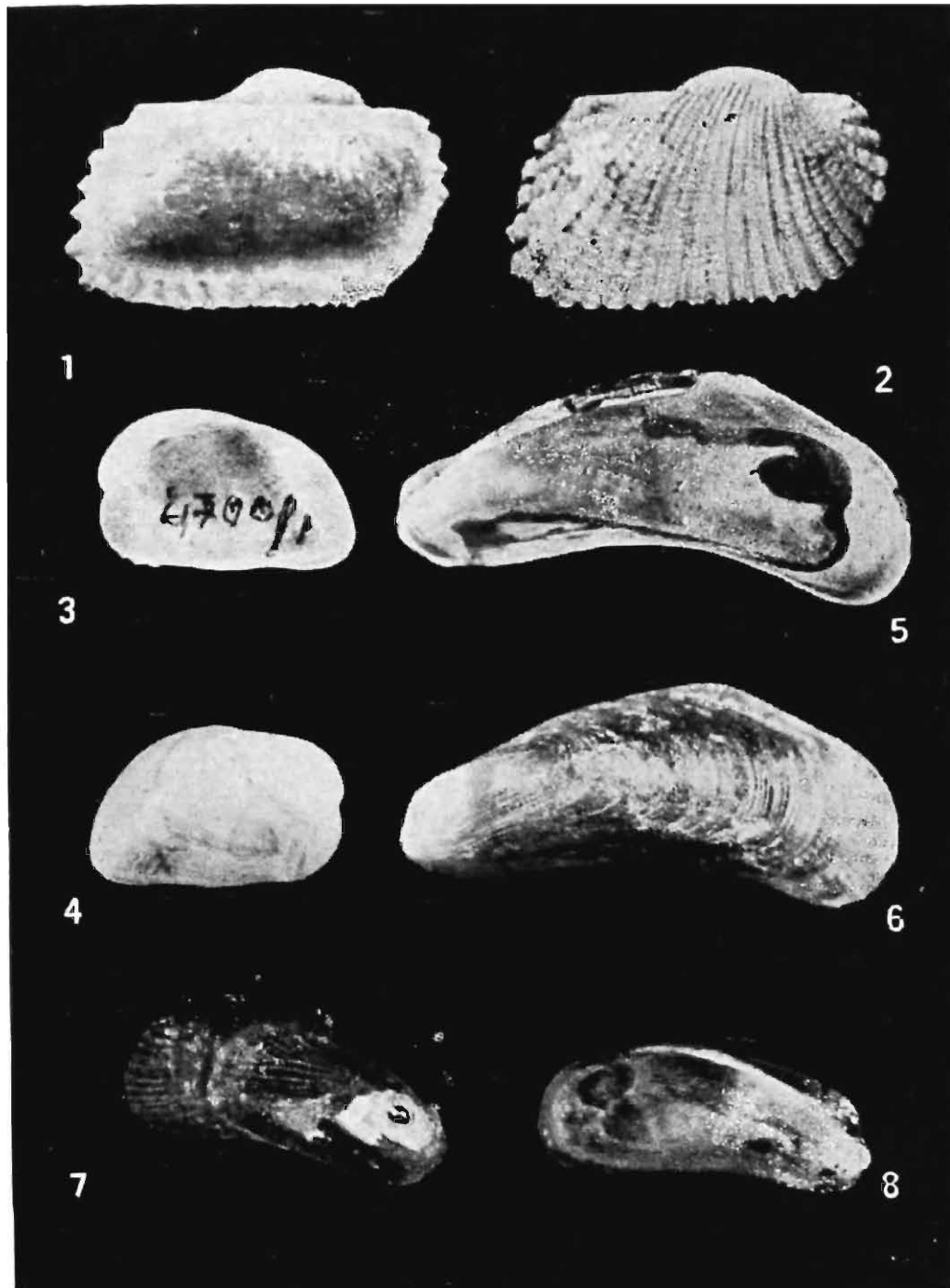


Fig. 1 & 2. *Scapharca clathrata* (Reeve)  
7 & 8. *Modiola celator* Preston Type  
5 & 6. *Modiola annandalei* Preston Type  
3 & 4. *Musculus cumingianus* (Dunker)



Fig. 1 & 2. *Modiola undulatus* var. *crassicostata* Preston  
3 & 4. *Modiola jenkinsi* Preston  
5 & 6. *Modiola chilkaensis* Preston.

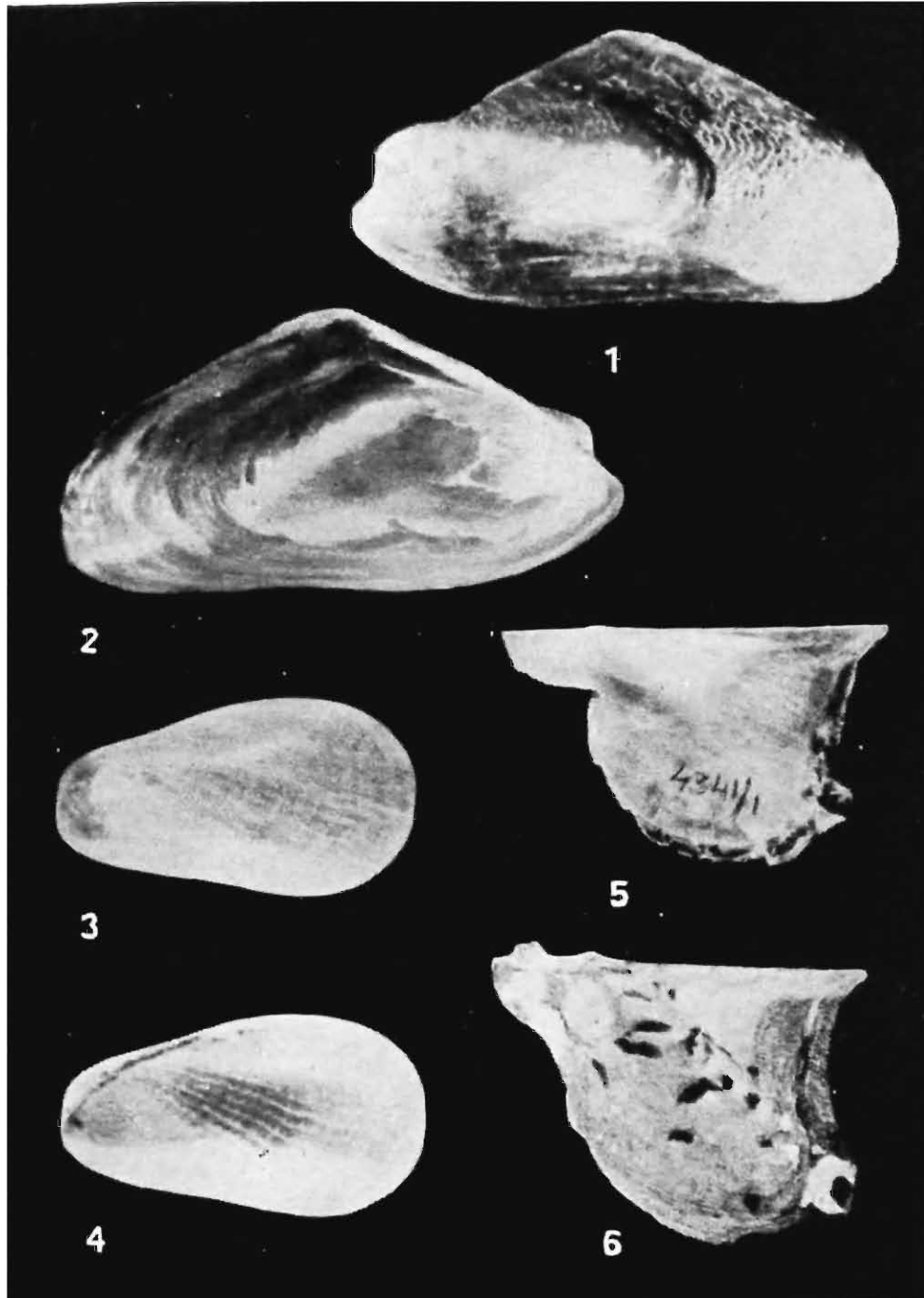


Fig. 1 & 2. *Modiolus philippinarum* Hanley  
3 & 4. *Amygdalam watsoni* (Smith)  
5 & 6. *Avicula smithi* Preston Holotype

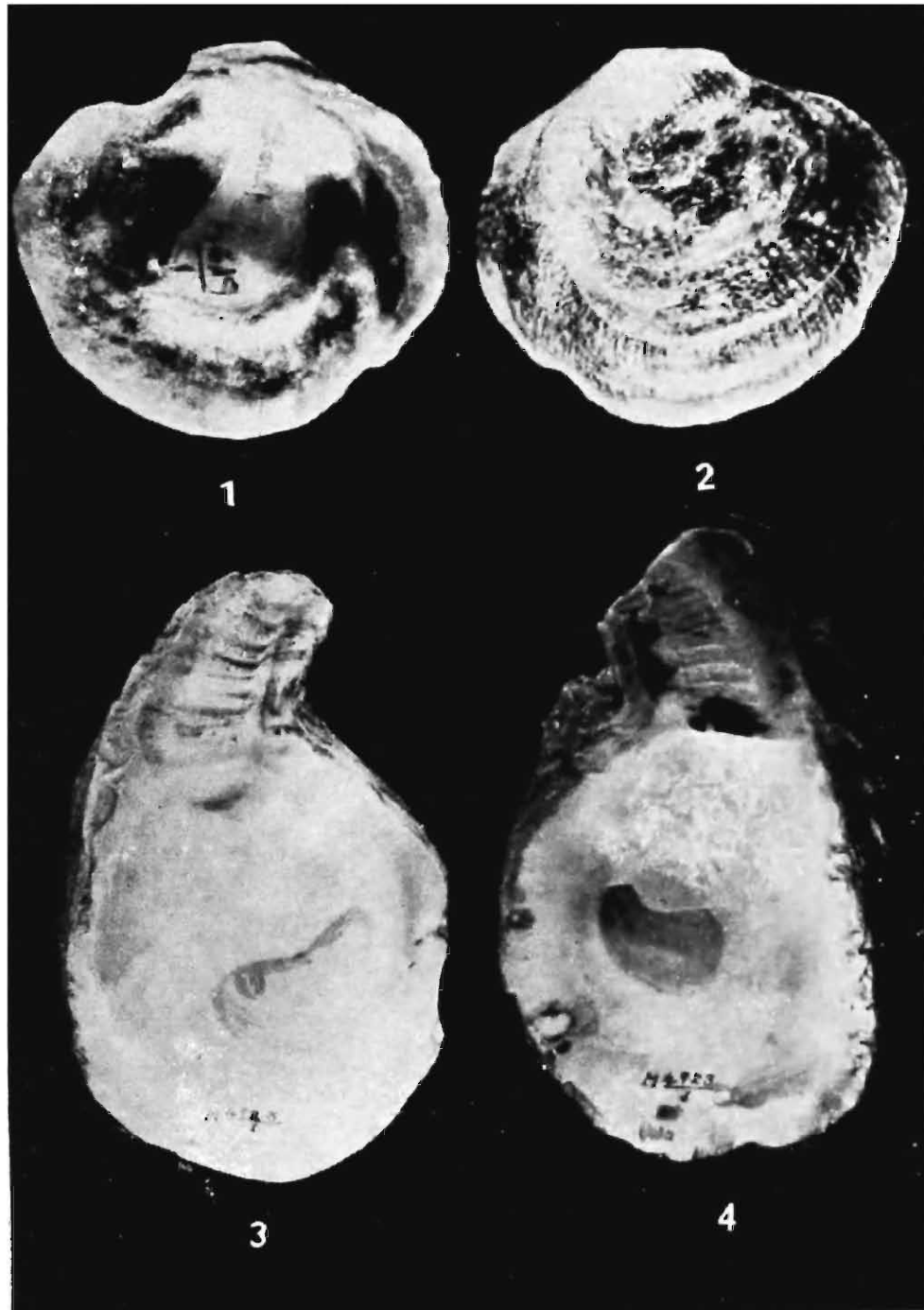


Fig. 1 & 2. *Anomia scabra* Reeve  
3 & 4. *Crassostrea gryphoides* var. *cuttackensis*  
Newton & Smith Holotype

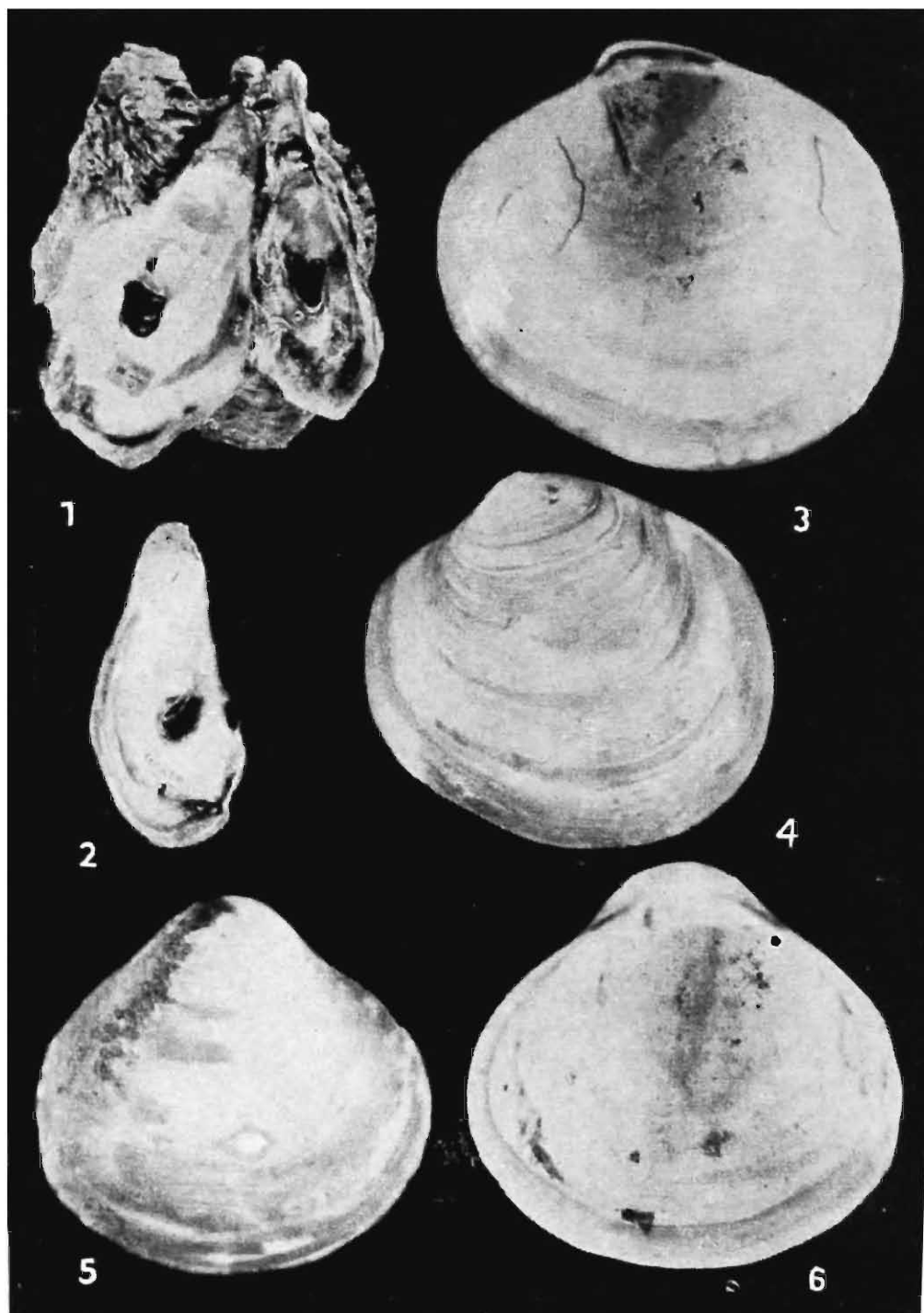


Fig. 1 & 2. *Ostrea madrasensis* Preston Holotype  
3 & 4. *Diplondonta satparaensis* Preston Holotype  
5 & 6. *Diplondonta barhampurensis* Preston Holotype



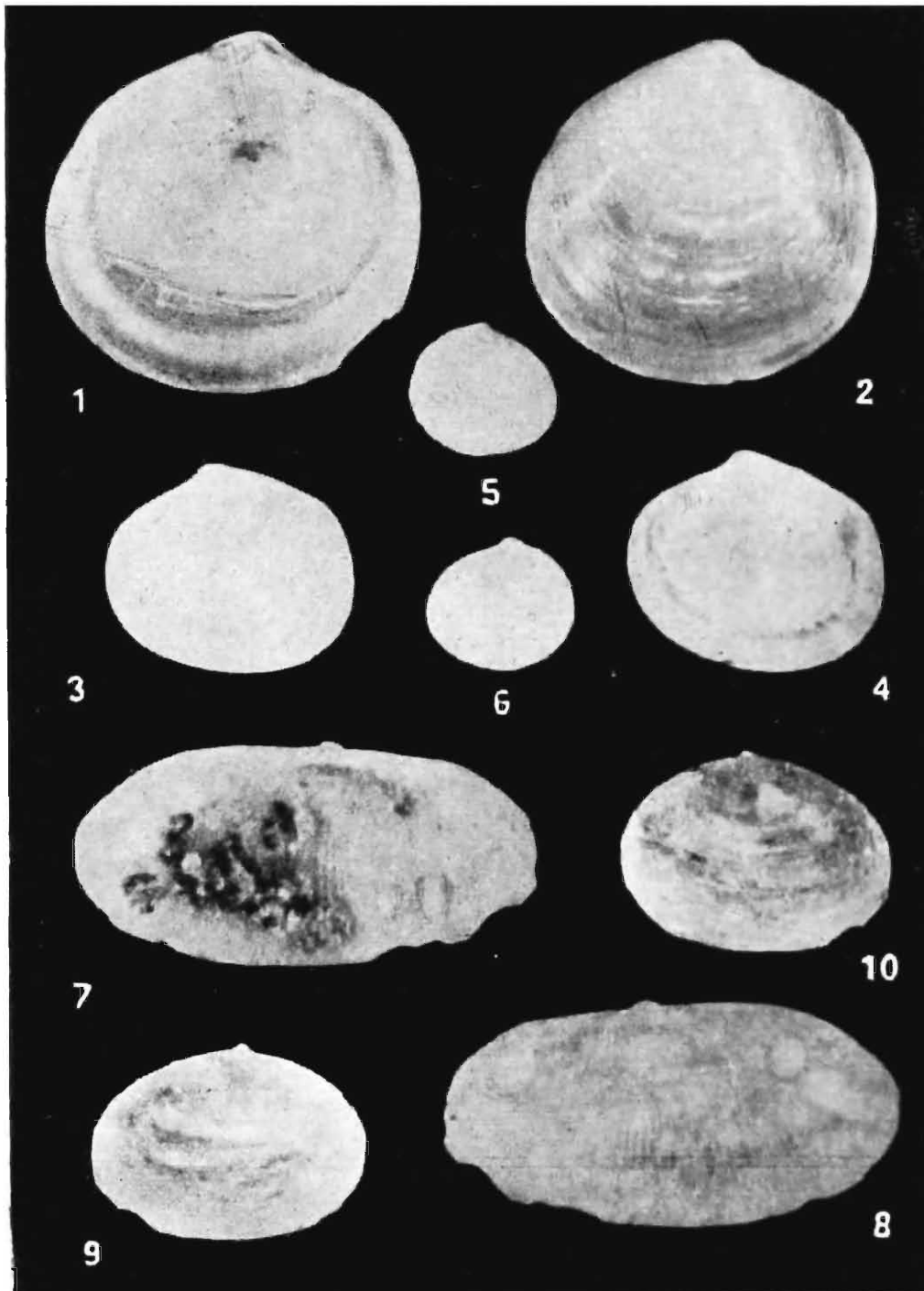


Fig. 1 & 2. *Diplodonta (Felania) chilkaensis* Preston Holotype  
3 & 4. *Diplodonta (Felania) annandalei* Preston Holotype  
5 & 6. *Diplodonta (Felania) ovalis* Preston Holotype  
7 & 8. *Galeomma argentea* Deshayes  
9 & 10. *Kellia chilkaensis* Preston Holotype

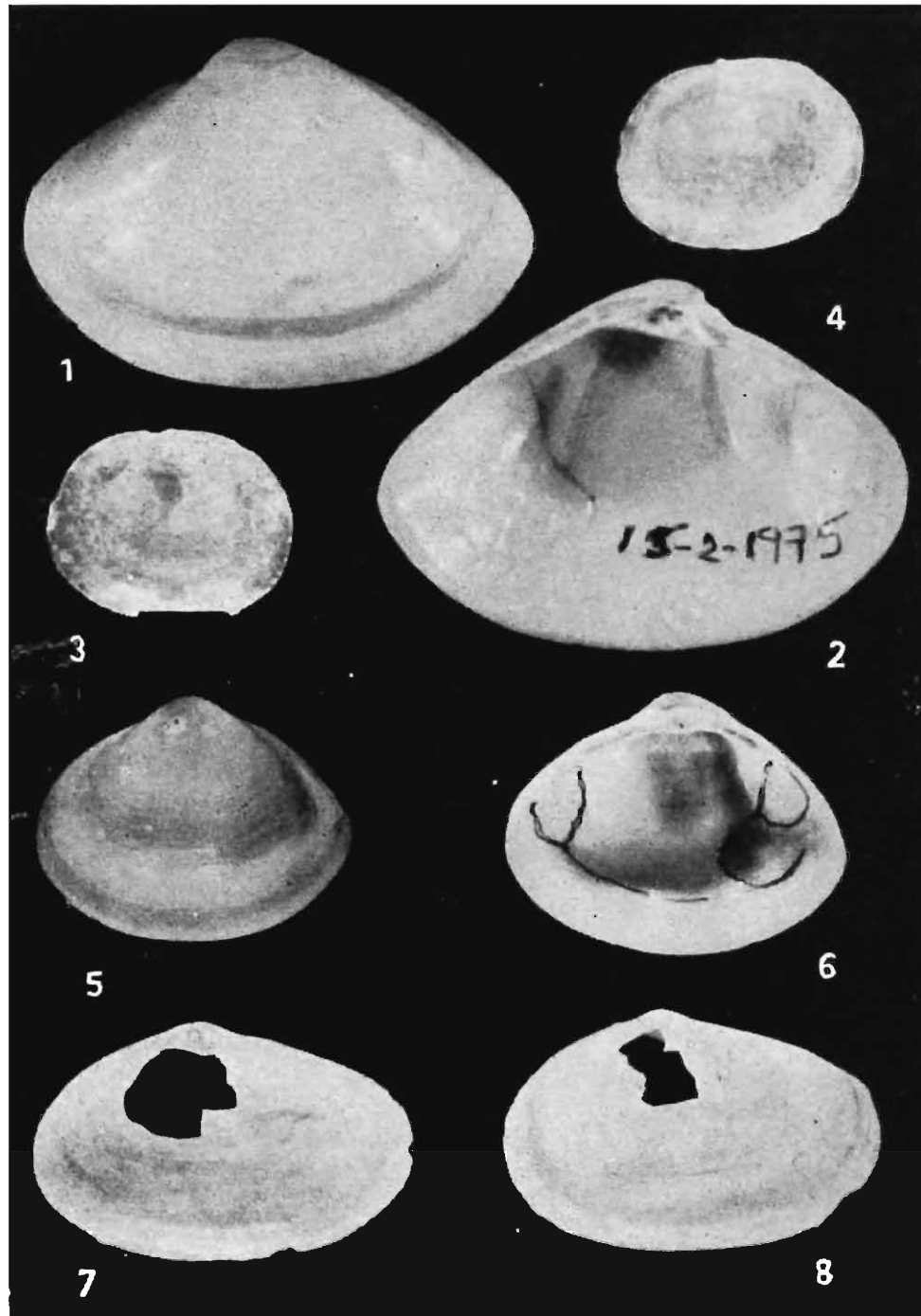


Fig. 1 & 2. *Mactra (Mactra) symmetrica* Deshayes  
3 & 4. *Scintilla chilkaensis* Preston Holotype  
5 & 6. *Mactra (Mactra) grandis* Gmelin  
7 & 8. *Standella annandalei* Preston Holotype



Fig. 1 & 2. *Solen annandalei* Preston  
3 & 4. *Solen gravelyi* Ghosh  
5 & 6. *Solen kempi* Preston  
7 & 8. *Neosolen aqua-dulcioris* Ghosh

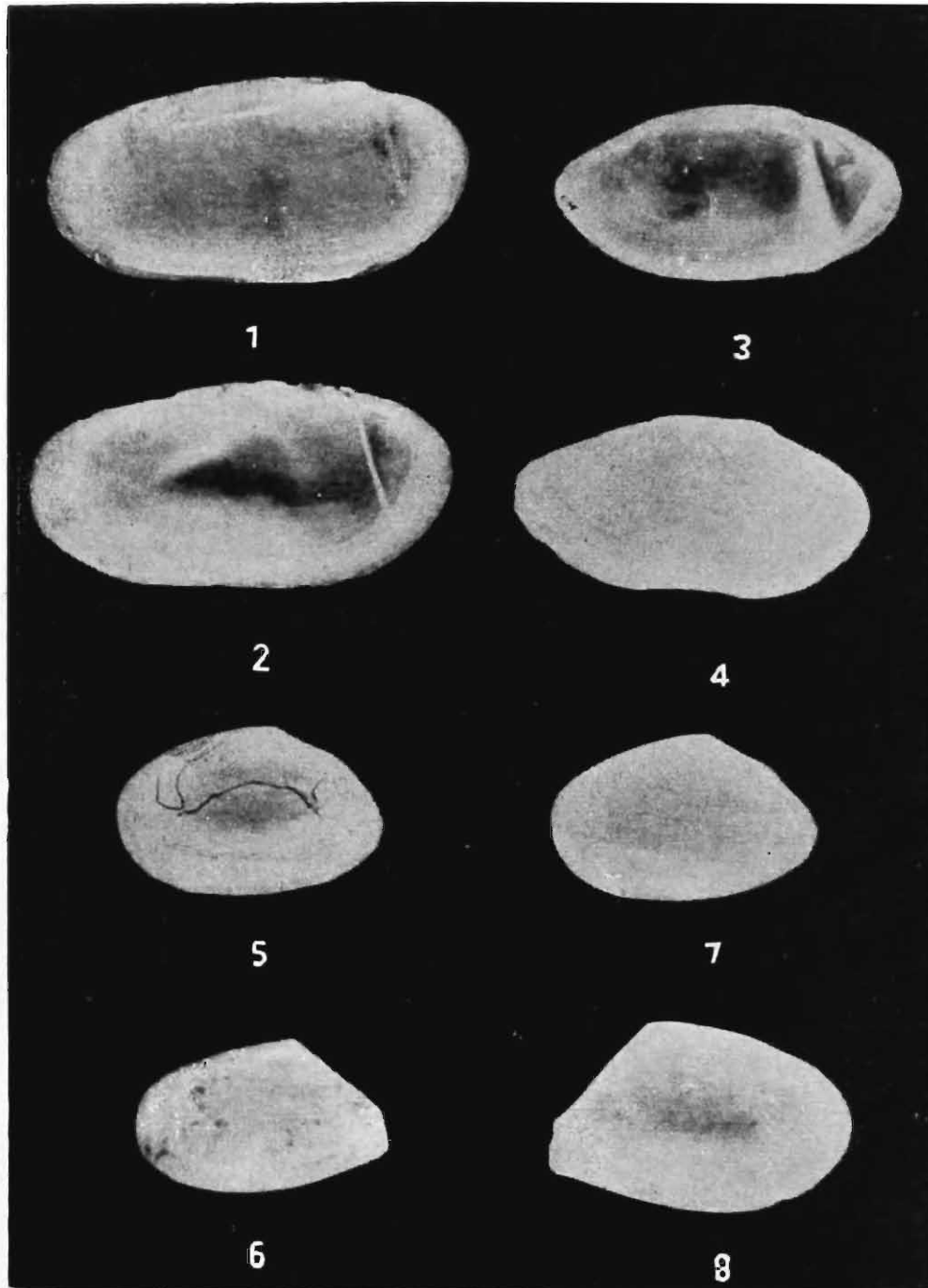


Fig. 1 & 2. *Siliqua albida* (Dunker)  
3 & 4. *Siliqua fasciata* (Spengler)  
5 & 6. *Tellina chilkaensis* Preston Holotype  
7 & 8. *Tellina confusa* Preston Holotype

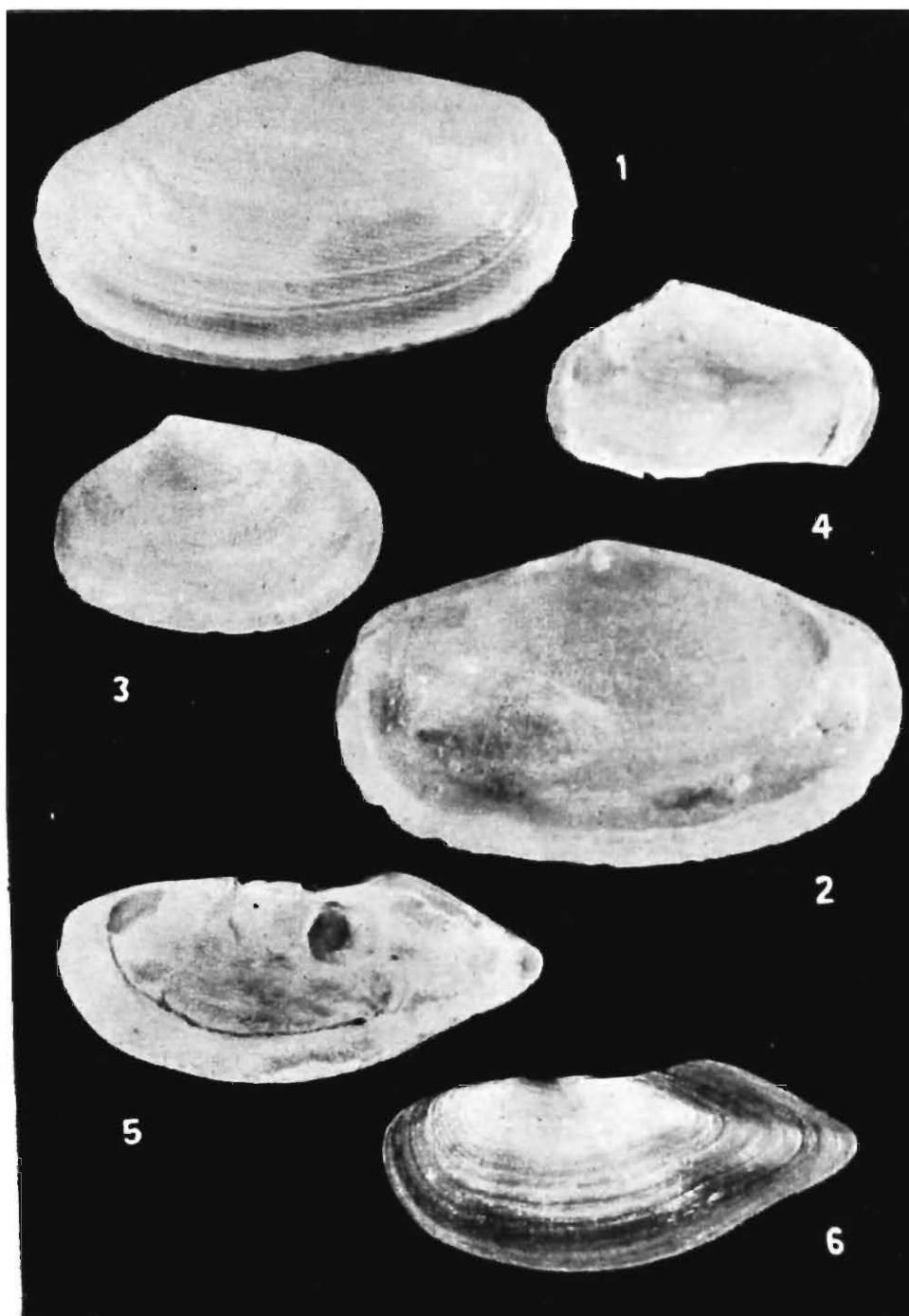


Fig. 1 & 2. *Gari maculosa* ( Lamarck ).

3 & 4. *Psammobia mahosaensis* Preston Holotype

5 & 6. *Sanguinolaria (Soletellina) acuminata* Deshayes

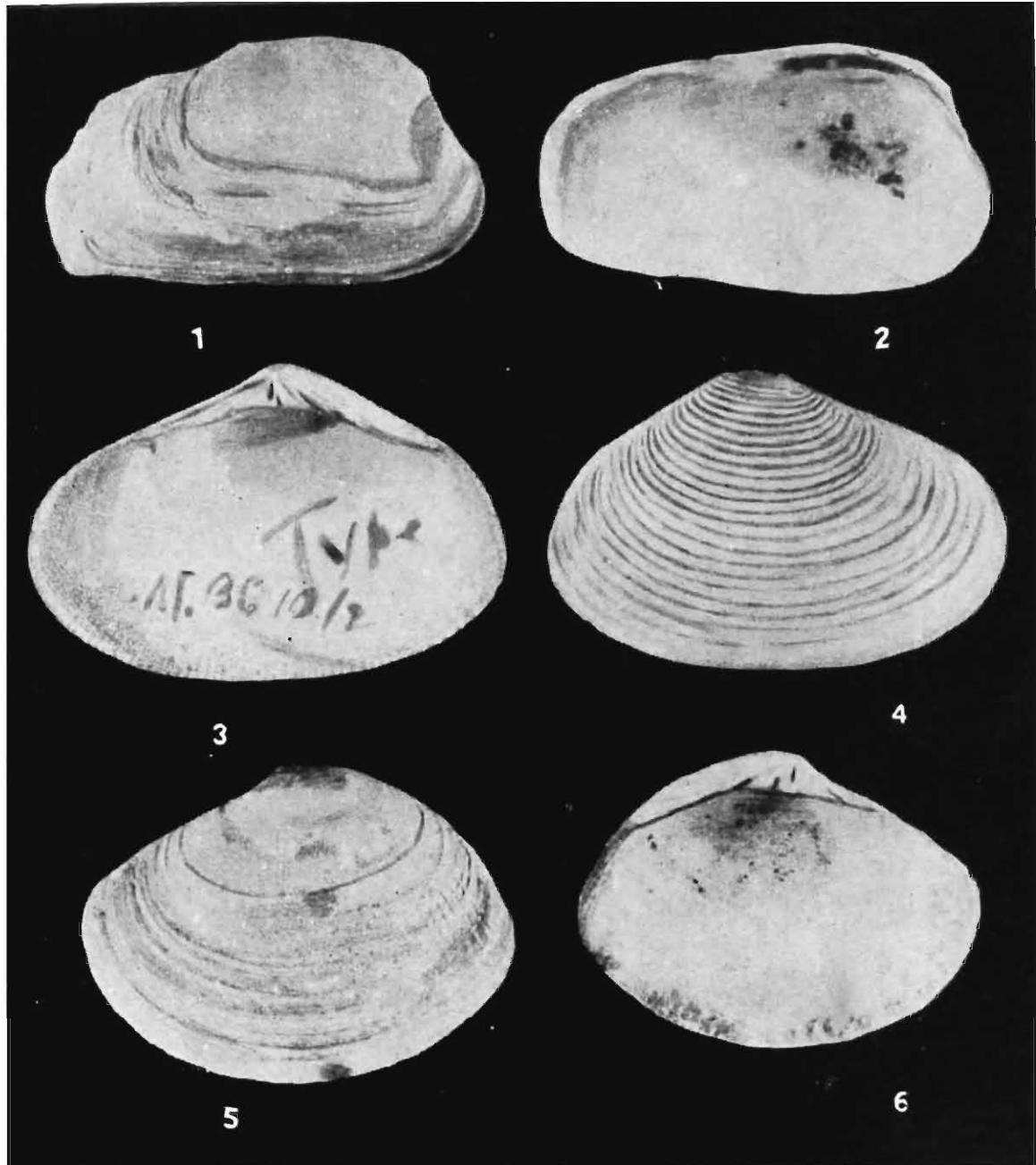


Fig. 1 & 2. *Petricola esculpturata* Preston  
3 & 4. *Meroe chilkaensis* Preston  
5 & 6. *Meroe satparaensis* Preston

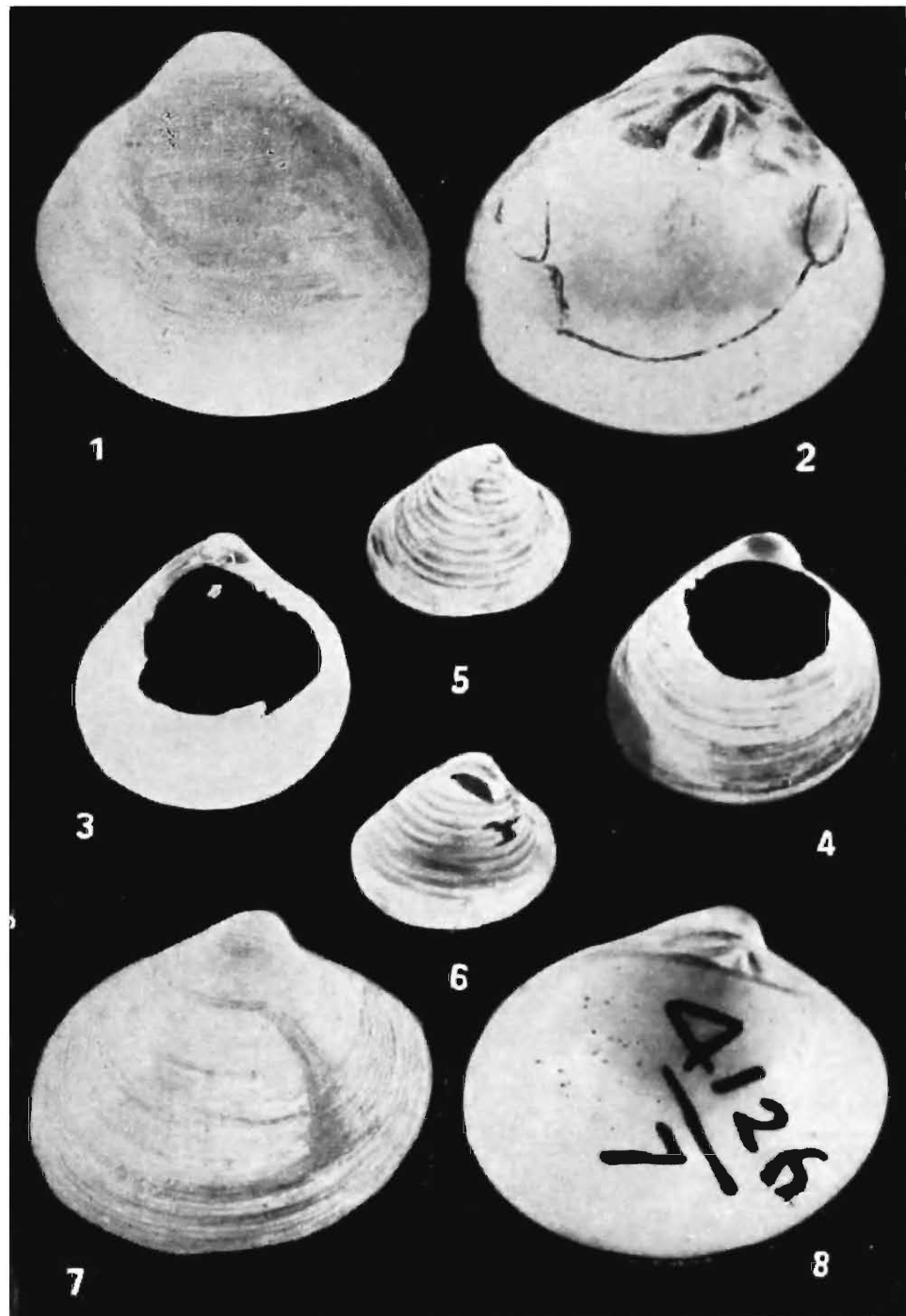


Fig. 1 & 2. *Corbicula (Velorita) satparaensis* Preston Holotype  
3 & 4. *Clementia annandalei* Preston Holotype  
5 & 6. *Clementia annandalei* Preston Topotype  
7 & 8. *Cytheria (Caryatis) pudicissima* Smith

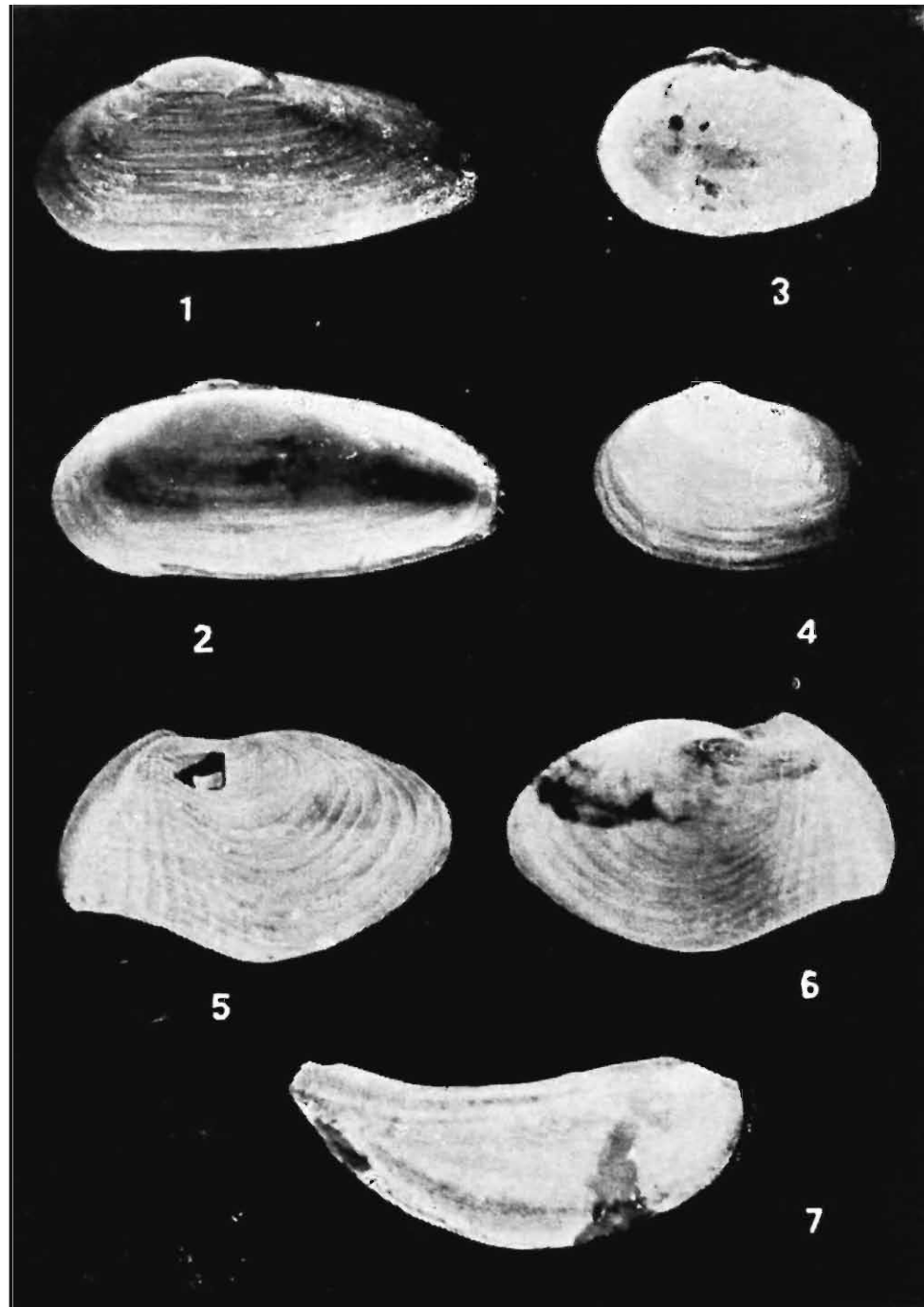


Fig. 1 & 2. *Glaucanome sculpta* Sowerby  
3 & 4. *Glaucanoma angulata* Reeve  
5 & 6. *Martesia delicatula* Preston Holotype  
7. *Pandora perangusta* Preston Holotype



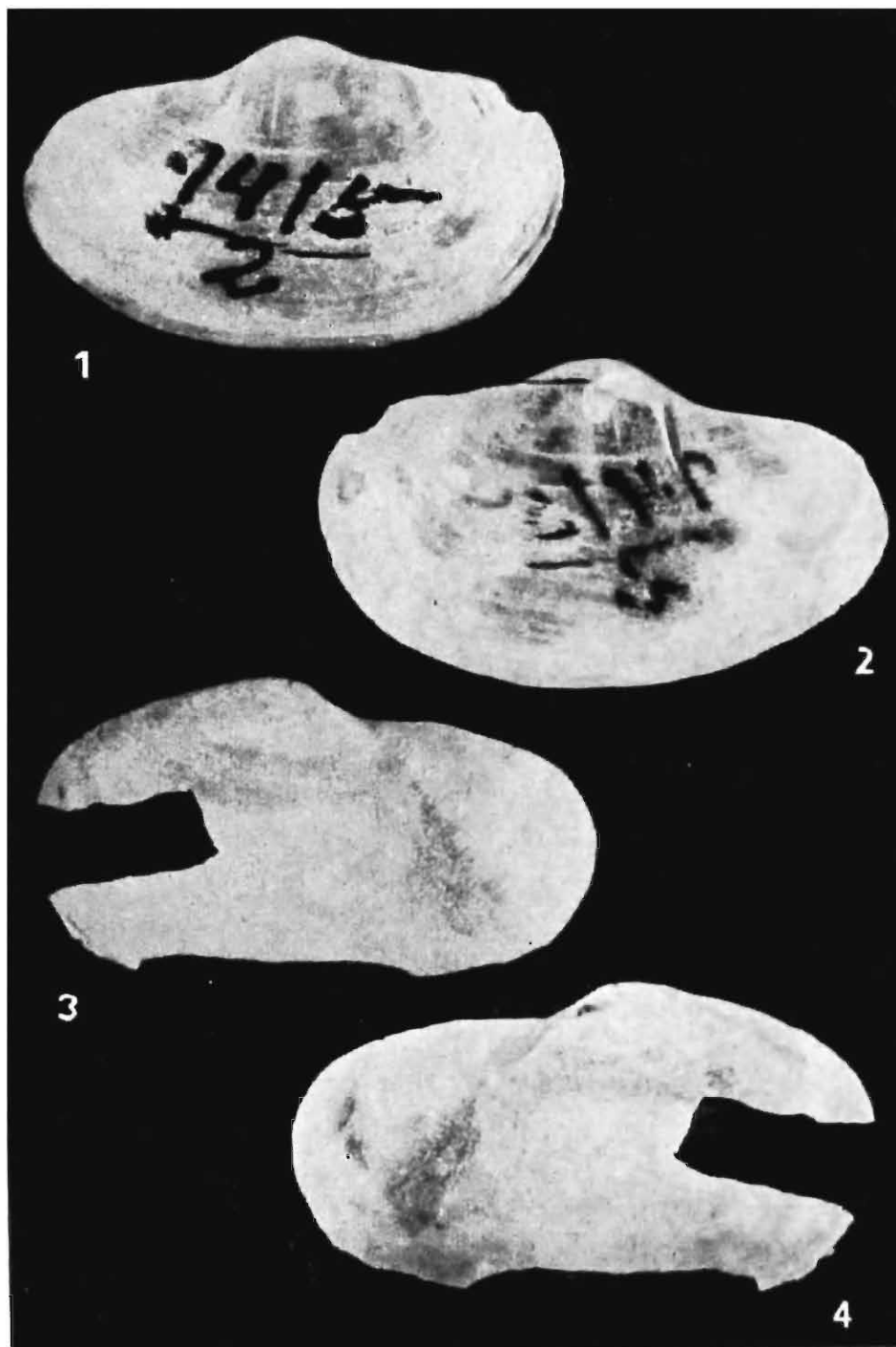


Fig. 1 & 2. *Anatina barkulensis* Preston  
3 & 4. *Anatina barkudaensis* Preston

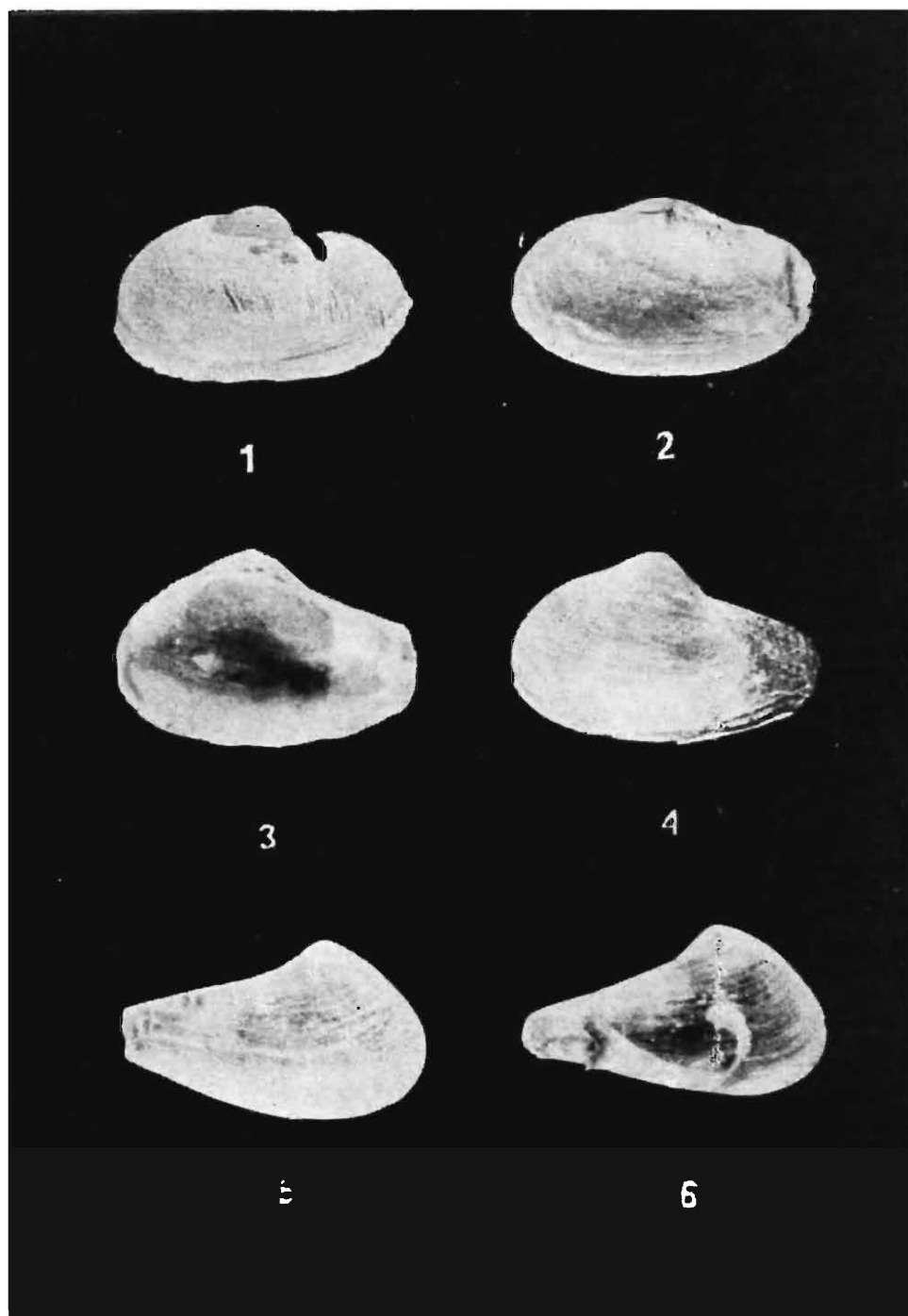


Fig. 1 & 2. *Anatina granulosa* Preston  
2 & 3. *Corbula chilkaensis* Preston  
5 & 6. *Cuspidaria annandalei* Preston

**INSECTA : ORTHOPTERA : ACRIDIDAE**

H. K. BHOWMIK

*Zoological Survey of India  
Gangetic Plains regional Station, Patna*

**INTRODUCTION**

Kirby (1914) in the "Fauna of British India-Orthoptera (Acrididae)" does not mention of any species of grasshoppers from the State of Orissa. It was Uvarov (1921), who was the first to have recorded two species of these insects and described a new one from material from Cuttack. He (Uvarov, 1927), again reported another eight species from the State. Thus, until recently only 11 species of Acrididae were known from the State till the author (Bhowmick, 1983) reported 16 species of which 10 were new records and described 2 more (1985).

In the second part of the volume on the "Fauna of Orissa", Tandon and Shishodia have reported 55 species from the State. The present contribution dealing with collections made by the author from various localities in the State belongs to 39 species of 31 genera. However, a list of all the species of Acrididae known from the State is given at the end.

In the systematic account, the material examined and broad distribution of all these species and synonymy of only those species which are not reported earlier, are given.

The male of *Coptacra punctoria* which was unknown so far is described and the rare species, *Clonacris sila* and *Scintharista notabilis blanchardiana* are reported from the State.

All measurements are in mm.

**SYSTEMATIC ACCOUNT**

Class INSECTA

Order ORTHOPTERA

Family ACRIDIDAE

**1. *Phlaeoba antennata* Brunner, 1893**

*Material* : 2 ♂, 1 ♀; purnakote; 19.9.85.

*Remarks* : The species is now known from Assam, Arunachal Pradesh, Rajesthan, U.P., W.B., and Orissa.

**2. *Phlaeoba infumata* Brunner, 1893**

*Material* : 1♂, 1♀; Purnakote; 199.85. 20, Jenabil, Simlipal National Tiger park; 8.10.85.

*Remarks* : The species is more or less common throughout India barring South and South-Western India.

3. *Phlaeoba panteli* Bolivar, 1902

*Material* : 1♀; Badrama ; 26.3.86.

*Remarks* : It is a little known species. So far was reported from Afganistan; Bihar; Tamil Nadu and West Bengal only.

4. *Ceracris nigricornis nigricornis* (Walker, 1870)

*Material* : 5♂, 5♀; Jenabil, Simlipal National Tiger project; 9.10.85; 4♂ (3 of them damaged); Mathali; 17.10.84.

*Remarks* : The occurrence of this Himalayan subspecies in Orissa is rather very interesting (Bhowmik & Halder, 1983).

5. *Truxalis nasuta* Linn. 1758

*Material* : 1♂ ; Dhenkikote; 3.10.85.

*Remarks* : Though it is a cosmopolitan species, in India it is recorded in a few places (Bilaspur and Surat); Orissa seems to be a new record for it.

6. *Ditopternis venusta* (Walker, 1870)

*Material* : 3♂, 3♀; Harishankar; 20.3.86. 3♂, 2♀; Badrama; 26.3.86.

*Remarks* : The head and pronotum of female, in particular, are strikingly black, otherwise it agrees with known account. Earlier the species was known from Karnatak, T.N. and W.B. only (Bhowmik, 1986).

7. *Oedaleus abruptus* (Thunberg, 1815)

*Material* : 1♂; Angul; 13.9.85. 1♂; Tikarpara; 23.9.85.

8. *Acrotylus humbertianus* Saussure, 1884

*Material* : 2♂; Purnakote; 19.9.85. 1♂, Angul; 14.9.85

*Remarks* : In india the species is rather common throughout the country except northern India (Bhowmik, 1985).

9. *Scintharista notabilis blanchardiana* (Saussure, 1888)

1888. *Quiroquesia brullei* var. *blanchardiana* Saussures, *Mem. Soc. phys. Hist. nat genera*, 30 (1): 35.

1941. *S. notabilis blanchardiana* : Uvarov, *Proc. R. ent. Soc. Lond.* 10 (B) : 95, pl. 1, figs. C and D.

*Material* : 2♂, 2♀; Joshipur, 7.10.85. Also from Bihar 3♂, 2♀, Girdih; 22-10-86.

*Remarks* : This subspecies was previously known from Arabia and Palestine. The present series from Orissa and Bihar extends its eastwards range of distribution.

The female specimens (pl.1, fig.2) tally nicely with Uvarov's (op. cit) description except posterior femora which are not orange-red but more or less dirty-white like *S. n. brunneri*. In males (pl.1, fig.1), tegmina with L1 and L2 somewhat delimited like *S. n. brunneri*. D<sub>2</sub> more patterned with more brownish spots; otherwise it is almost identical to *S.n. brunneri*.

Broadly it can be remarked that the subspecies characterization of features as mentioned by Uvarov (op.cit) in his key are not well defined as in some of the points they overlap.

*Measurements* : Body ♂ 21-24, ♀ 38-45; tegmen ♂ 22-25, ♀ 35-38; post. femur ♂ 12-15, ♀ 21-22; post. tibia ♂ 10-12, ♀ 18-19.

Incidentally it may be mentioned here that the specimen reported earlier from Mandi (H.P.) by Bhowmik & Halder (1983. *Rec. Zool. Surv. India*, 81:175) actually belongs to the subspecies, *S. n. cinctipes* Uvarov, 1941-recorded earlier from Kutch, Gujarat. It differs from Uvarov's description by the fact that the specimen is bigger in size (vide Bhowmik & Halder (op. cit) but its wing fascia (index) is smaller (roughly 0.11 in ♀) and by its bright rose-red disc of wing; and more particularly by its convex pronotum and with a distinct yellowish white postbasal ring of post. tibia (pls. 1 & 2, figs. 3 & 4).

#### 10. *Gastrimargus africanus africanus* (Saussure, 1888)

*Material* : 1♂; Kheorjar; 27.9.85. 1♂; Dherkikote; 1.10.85. 4♀; Harishankar, Bolangir dist; 20.3.86.

#### 11. *Morphacris fasciata sulcata* (Thunberg, 1815)

*Material* : 2♂; Tikarpara; 23.9.85. 1♀; Dhenkikote; 30.9.85.

*Remarks* : Previously recorded from Barkuda (Chilka) within Orissa (Bhowmik, 1983).

#### 12. *Aiolopus thalassinus tamulus* (Fabricius, 1798)

*Material* : 1♂; Purnakote; 16.9.85. 1♂., 1♀; Tikarpara; 23.9.85. 1♂, 4♀; Kheorjher; 28.9.85. 1♂; Jenabil, Simlipal National Tiger Park, 9.10.85.

#### 13. *Pternoscirta bimaculata* (Thunberg, 1815)

*Material* : 4♂, 6♀; Purnakote; 19.9.85. 1♂, 2♀; Tikarpara; 23.9.85 4♂. 3♀; Joshipur; 7.10.85.

*Remarks* : The species has as yet been restricted distribution in India. So far recorded only from Bankura and purulia districts of W.B. and Araku Valley of A.P. In Orissa, it seems to be widely distributed.

#### 14. *Pternoscirta cinctifemur* (Walker, 1859)

*Material* : 1♂; Badrama; 25.2.86. 1♀; Harishankar, Bolangir dist., 21.2.86.

*Remarks* : The species was known so far from Khasi Hill; Kurseong; T.N. in India (Bhowmik 1986).

*Measurement* : (Male only) Body 22-23; Antenna 11-11.5; Pronotum 5.5-5.75; Tegmen 23-24; Post. femur 13-13.5; Post. tibia 11-11.5;

#### 15. *Teratodes monticollis* Gray, 1832

*Material* : 10 nymphs; Harishankar, Bolangir dist, 20.3.86. 12 nymphs; Badrama, Sambalpur; 25-26.3.86.

*Remarks* : Long series of nymphal collections were made from among dry-leaves, under growth vegetation being very sparse during the period. Though hundreds of nymphal specimens were noticed, not a single adult could be seen indicating post-winter generation of the species.

All the nymphs belonged to 1st to 3rd stages (10mm to 30mm in length), tegmina were yet pad-like, genitalia ill-differentiated and antennae of variable length, other characters were adult-like and easily identifiable as being the nymphs of the species. Here a nymph of 31 mm long is described below:-

Body pilose and granulated. Antenna filiform, thick, with indistinct joints, 28-29 segmented, segments pitted and with sparse pubescence. Face vertical, granulated throughout; eyes lateral, projected, elongate ovate. Frontal ridge at least three times expanded in upper half (between antennae) than lower half which is almost parallel-sided from below middle ocellus to clypeo-frontal suture; lateral carinae almost straight while clypeofrontal suture truly straight. Pronotal crest semi-laminated, compressed, very high, more or less rounded, on profile; superior edge denticulated, more clearly on oblique, posterior margin; three sulci moderately indented; some granules of crest tooth-like; covers more than half of abdomen. Abdomen smooth, non-granulated; tympanum rounded and closed with a transparent membrane. Prosternal spine acuminate at apex, hairy. Mesosternal lobes with rounded inner margins, its interspace smaller than width of a lobe; metasternal lobes not yet obviously demarcated. Legs short, hairy, granulated. Posterior femur granulated throughout, its upper basal lobe broadly rounded, lower basal lobe also somewhat round; upper marginal area about double width of lower marginal area; upper carinula a little raised, both it and upper carina distinctly spined; lower lobe of posterior femoral knee truncate at apical margin; posterior tibia as long as post. femur, densely pubescent (silky hairs), tuft of hairs as long as spines which are 10 on inner side and 9 on outer side (inner spines stouter than external ones). Cercus short, conical; genital parts not yet clear.

*Measurement* : Body 31, antenna 10, maximum length of pronotum 22, maxi. Width (from extreme of lateral lobes to superior margin) of pronotum 16.5, post.femur 11, post tibia 11. (♀).

*Colouration* : General appearance like dry-leaves in life though some are brownish varied with darkness, with variable emphasis.

*Distribution* : The species was so far known from Maharashtra (Bombay), A.P. and Sri Lanka.

#### 16. *Clonacris sila* Rehn, 1944

(Pl.2, figs. 5-6)

1944. *Clonacris sila* Rehn, *Proc. Acad. nat. Sci. Philad.* 96: 58-66.

*Material* : 1♂ (at light), 1♀; Joshipur; 7.10.85; 1♂; Harishankar; 20.2.86.

*Remarks* : The species was described from Shevarov Hills, Salem district, T.N., on a single male (Pl.2, fig.5) and a female (Pl.2, fig.6) specimens. The other Indian species, *C. kirbyi* (Finot, 1903), based on a female specimen, was also described from Kodaikanal, T.N. This is the first record of the species since its description, after 42 years, from a place other than its type locality.

The specimens in hand broadly agree with the detailed description given by Rehn (op.cit), differing only in a few points. In the male specimen from Joshipur, the inter ocular space having a fine median carinula, which is lacking in the female specimen from the same locality as well as that of male from Harishankar. The length of antennae in males almost double of that of combined length of head and pronotum; in female it is almost subequal. In both sexes from Joshipur, the tegmina are as long as the tip of the abdomen, but in male specimen from Harishankar, they surpass the abdomen by about 4 mm. approx. Again, the width of tegmina is more in Joshipur male specimen (4.5mm) than Harishankar male (3.5) i.e., it is more elongate.

Rehn (op.cit.) described this species without examining the type of *kirbyi* and both of them were reported almost from the same locality. As such there remains chance of oversight and wrong inferences. Study of more material may yield reliable results bringing out the taxonomic identity of both the species. The detailed measurements that follow and the tentative key provided below may make the future study meaningful and conclusive.

*Measurement :*

	♂. from Joshipur	♂, from Harishankar	♂ from Joshipur
Body	22	24	39
Antenna	11.5	12	12
Head+pronotum	6	7	11
Interocular distance	1	1.25	2
Prozona	1.75	2	3.25
Metazona	2	2.5	3.75
Tegmen	18	23	30
Max. width of tegmen	4.5	3.5	6
Wing	16	21	26
Post. femur	11	13	18
Max. depth of Post. femur	2.75	3	4
Post. tibia	10.5	12.5	15

KEY TO INDIAN SPECIES

Less strangulate pronotum of ♂; ♀ tegmina more slender, more elongate and more evenly lanceolate tegmina; legs less pilose; prozona slightly longer than combined length of head and pronotum. Wing pale yellowish; size (♀) slightly longer (38-39).....  
 .....*sila* Rehn

More strangulate (compressed) pronotum of ♀; tegmina less slender and elongate ect in ♀; legs more pilose; prozona shorter than metazona; antennashorter; wing disc minaceous-red; size ♀ slightly smaller (34mm).....  
 .....*kirbyi* Finot

*Habitat* : The Joshipur material was collected from the teak plantation surrounding the crocodile farm. The plantation trees were 15-20 feet high, the undergrowth vegetation was very very sparse; the soil was dry and of seral nature. Some examples of the species were noticed sitting under the shade of teak-leaves. When disturbed they flew over the top of the trees, thus avoiding enemy; the male was collected at light in the rest house in early night.

The Male specimen from Harishankar was collected from among dry leaves, mostly of 'Mahua' and occasional teak and other bushes at the foothill of Gandharva Hill.

The availability of male adult in March indicates that the species has annual breeding cycle.

17. *Eucoptacra praemorsa* (Stal, 1860)

*Material* : 6♂, 3♀ (and 1 nymph); Dhenkikote; 29.9.85. 3♂; Kheorjhar; 27.9.85. 2♀ ; Jenabil, Simlipal National Tiger park; 9.10.85. 3♂, 3♀; Joshipur; 6.10.85. 3♂, 6♀; Harishankar; 20.3.86.3♂,

4♀; Badrama; 26.3.86. 1♀; Balugaon, Puri; 30.9.83. 2♀; Barkuda Island, Chilka; 27.9.83.

*Remarks* : The species is well represented in Sikkim, T.N., Maharashtra, Orissa and W.B.

#### 18. *Epistaurus sinetyi* Bolivar, 1902

*Material* : 3♂, 1♀; Purnakote; 19.9.85. 1♂, 2♀; Joshipur; 6.10.85. 1♀; Harishankar; 20.3.86. 1♂; 1♀ Mathili; 17.10.84. 1♂; Balugaon, Puri; 30.9.83.

*Remarks* : The species is yet scatteredly distributed in India (T.N., A.P., Orissa and W.B.)

#### 19. *Coptacra punctoria* (Walker)

(Pl. 3, figs. 7-8)

1870. *Acridium punctorium* Walker, *Cat. Derm. Salt. Br. Mus.*, 4 : 630.

1914. *Bibractioide punctoria* : Kirby, *Fauna British India, Orth*, Vol. 1: 236.

*Material* : 2 ♂, 5 ♀; Harishankar; 20.3.86. 5 ♂, 11 ♀ (and 10 nymph); Badrama, Sambalpur dist., 25-26.3.86.

Also from-1 ♂, 5 ♀; Araku Valley, A.P.; 6-7.9.83.

*Remarks* : The species was described on a female specimen, from S. India which Kirby (op.cit.) transferred and accommodated in his new genus. Uvarov (1929) recorded it from Nilgiri (Conoor) and synonymized the species with the genus *Coptacra*. The male remaining unknown so far.

The species is recorded herewith for the first time from a place other than its type-locality. And since a large number of specimens have been collected, opportunity is being taken to revise the characters of the species and description of ♂ for the first time.

*Description* of ♂ (previously undescribed) (Pl. 3, fig.7) : Size small. Antenna longer than head and pronotum taken together, 22-23 segmented, not ensiformed at all but clearly filiform, segments elongated and finely pitted. Face almost vertical, coarsely rugosed. Frontal ridge narrow and sulcate, more or less parallel sided, barring area in between antennae which is slightly expanded; from middle ocellus to clypeus, bounding carinulae somewhat wavy; deeply punctured. Lateral carinae nearly straight. Fastigium of vertex horizontal, gradually blending in front, longer than wide, shallowly concave and filled up with deep punctuation, lateral carinae well marked; shortly tricarinate between eyes, median carinula very faint and hardly detectable, up to pronotal margin. Eyes big, round, lateral; inter ocular distance wider than frontal ridge at level of antennae. Head small, furnished with small granules. Pronotum rugosely punctate, with raised granules; prozona may be a little longer, or as long as, or smaller than metazona; no lateral carinae; median carina slightly tectiform, cut by 3 slightly marked sulci; base of pronotum insignificantly angularly produced; posterior margin of metazona truncate, its apex rounded off; lateral lobes higher than long, similarly punctured and granulated like pronotal disc. Prosternal tubercle conical, with apex broadly acuminate. Mesosternal lobes wider than long, their inner angles rounded; interspaces narrower than their width; metasternal lobes contiguous. Tegmen far longer than abdomen and also surpasses tips of posterior femora by at least 2-3 mm; obliquely truncated at apex; precostal lobe a little expanded; basal half coriaceous, densely reticulated. apical half some how opaque-hyaline; cells of radial sectors irregularly oblique. Wing a little shorter than tegmen, costal area produced and feebly rounded and then oblique; posterior margin deeply and roundedly concave. Posterior femur thickly produced in basal half; at least apical third of it attenuated; its knees rounded; upper carina slightly serrulated, pilose; heavily granulated; posterior tibia pilose, without external apical spine, with 8-9 external and 10-11 internal red, black-tipped spines. Supra-anal plate tongue-shaped, with its apex gradually narrowed; its basal region with well developed biforked furcula; cercus wide at base which gradually narrowed down to spine-like apex.



**Female** : (Pl.3, fig.8) Very similar to males barring bigger in size. Supra-anal plate tongue shaped, with basal, longitudinal groove, which extends up to middle where it meets with a transverse, feeble furrow. Cercus identical to males. Valves of ovipositors curved at apices.

**Measurements** :

	Male	Female
Body	14-16	19-21
Antenna	7-8	9-9.5
Pronotum(p)	3.5-3.75	4.5-5
Maxi depth of Pronotum(mp)	2.5-2.75	3-3.25
Ratio of p/mp	1.4	1.5
Tegmen	13.5-15.5	18.5-19.5
Post femur (f)	9-9.5	12-13
Maxi depth of femur (mpf)	2.5-2.75	3-3.25
Ratio of f/mpf	3.5	4
Post. tibia	8.5-9	11-11.5

The present series of specimens are decidedly smaller than the holotype (Body 25; tegmen 18; post. femur 18).

**Colouration** : General colouration brownish; some specimens of both sexes are blackish brown specially on head, pronotum and attenuated portion of post. femur; this darkness of variable emphasis. Majority of granules are black and corinulae of frontal ridge and post. femur etc. are furnished with black spots. Wing except costal lobe at apical area yellowish. A black oblique streak, in middle of post femur, from outer superior carina to external carinula distinguishable. Inner and under surface and as well as almost entire tibiae and tarsi reddish. Four to five ill-defined blackish spots occur at outer side of tibia on external face.

**Discussion** : The genus is represented in India by two endemic species, viz., *C. ensifera* Bolivar, 1902, recorded from Madura (t.c) and Belgaum (Maharashtra) and the present species, also described from S. India. The present localities, though extend its range of distribution, are in fact remain in the same biogeographical region, the Deccan. The present species differs strikingly from *C. ensifera* by having filiform antenna, granulated body, particularly of head, pronotum, metapleura and post. femora etc and longer tegmina. The latter species is, however, unique by possessing ensiform antennae, scabrous and rugosed body (but never granulated), and tegmina never surpass post. femora in length.

## 20. *Spathosternum prasiniferum prasiniferum* (Walker, 1871)

**Material** : 1♂, 1(F); Tikarpara; 22.9.85. 2♂, 3(F); Purnakote, Dhenkanal dist. 19.9.85. 2♂, 2(F); Angul; 15.9.85. 1(F); Dhenkikote; 3.10.85; 3♀; Harishankar 20.3.86.

**Remarks** : A very common subspecies of open fields in India.

21. *Hieroglyphus banian* (Fabricius, 1798)

*Material* : 1♂; Purnakote, Dhenkanal district; 16.9.85. 1♂, 3♀; Kheorjhar 27.9.85. 3♂, 1♀; Dhenkikote; 30.9.85. 1♂; Kalahandi; 25.10.84. 3♂; DNK Rest House, Koraput; 14.10.84.

*Remarks* : A common pest in paddy fields throughout oriental countries.

22. *Anacridium flavescens* (Fabricius, 1793)

*Material* : 2♂; Kheorjhar; 26.9.85.

*Remarks* : A long series of the same species has been reported by the authour earlier (1983) from Barkuda Islan (Chilka). Unlike the series from Chilka, the present specimens were collected from a small rocky hillock (with very spare small herbs) surrounded by paddy cultivation. *Pachyacris vinosa* and the present species were found in the identical habitat.

23. *Pachyacris vinosa* (Walker, 1870)

*Material* : 4♂, 6♀; Keorjhar; 27.9.85. 1♂; Dhenkikote; 3.10.85. 4♂, 5♀; Joshipur; 7.10.85; Harishankar. Bolangir district; 20.3.86.

*Remarks* : Though more or less widely distributed to Himalayan ranges (Including S. Bihar), (Bhowmik and Halder, 1983), the species is a new record for Orissa.

The specimens in hand are smaller and measure as follows: Body ♂ 35-37, ♀ 51-52; antenna ♂ 18-20, ♀ 18-19; prozona ♂ 5-5.5, ♀ 6-6.5; metazona ♂ 4-4.5 ♀ 6.5-7; tegmen ♂ 36-38, ♀ 50-51; post. femur ♂ 21-22, ♀ 28-29; post. tibia ♂ 18-20, ♀ 25-26.

24. *Pachyacris violascens* (Walker, 1870)

*Material* : 1♂; Tikarpara; 23.9.85. 1♂; Keorjhar; 28.9.85. 1♂; Joshipur; 7.10.85.

*Remarks* : The species has rather restricted distribution in India (Karnatak and H.P.) though lately recorded from A.P and Orissa (Chilka Lake) (Bhowmik & Halder, 1983).

25. *Chondracris rosea* (de Geer, 1773)

*Material* : 1♂, 3♀; Jenabil, Simlipal National Tiger Park; 9.10.85.

*Remarks* : A habitat of deep jungle.

26. *Cyrtacanthacris tatarica* (Linnaeus, 1758)

*Material* : 2♀; Keorjhar (at light); 28.9.85. 1♂; Mathili; 17.10.84.

27. *Choroedocus robustus* (Serville, 1839)

*Material* : 1♂, 2♀; Jenabil, Simlipal National Tiger park; 8.10.85.

*Remarks* : Though chiefly a species of eastern Himalyan ranges (Bhowmik, 1986). The species is recorded here from the extreme south-eastern part of its distribution. In Jenabil, a site of deep woods, it was found in abundance.

28. *Tylotropidius varicornis* (Walker, 1870)

*Material* : 1♂ (nymph); Dhenkikote; 3.10.85. 10 (nymph); Jenabil; 9.10.85. 2 (nymphs); Tikarpara; 22.9.85. 30, 20; Badrama, Sambalpur district; 26.3.86. 10, 10; Harishankar; 20.3.86.

**Remarks** : The availability of nymphs only during Sept.-Oct. indicates post monsoon generation of the species. The adult examples show that the length of antennae longer than combined length of head and pronotum; the apices of post. tibiae and tarsi not dull blue but concolourous with rest of post. tibiae (i.e. light testaceous); number of tibial spines are not more than 11 internal and 12 external spines and finally the attenuated apical half of post. tibia is more than 1/3rd of whole length of it (10 mm out of 25 mm in Female and 9.5 mm out of 21 mm in Male).

One 0 specimen collected from Harishankar in very big; it measures-body 39 ; pronotum 7.75 and post. femur 29.

### 29. *Eyprepocnemis alacris alacris* (Serville, 1839)

**Material** : 1♀; Angul; 12.9.85. 1♂, 1♀; Purnakote; 19.9.85. 1♂, 3♀; Dhenkikote; 1.10.85. 3♂, 1♀; Joshipur; 6.10.85. 3♀; Keorjhar; 28.9.85. 1♂; Mathili; 17.10.84. 1♀; Dhenkikote, 3.10.85.

**Remarks** : This variable and common subspecies is wide spread in Orissa.

### 30. *Eyprepocnemis rosea* Uvarov, 1942

**Material** : 1♀; Jenabil, Simlipal Forest; 9.10.85.

**Remarks** : This is the first report of occurrence of the species in Orissa, its previous known localities being H.P., Haryana, Megalaya and A.P. (Bhowmik and Halder, 1983)

### 31. *Caloptenopsis* sp.

One example of this genus was collected, in September, 1983 from Bakugaon but it was lost during pinning and setting.

I put it on record as because that would be interesting to have a representative of the genus from Orissa.

### 32. *Oxya velox* (Fabricius, 1787)

**Material** : 1♂, 1♀; Joshipur; 7.10.85.

### 33. *Oxya fuscovittata* (Marschall, 1836)

**Material** : 1♂; Kheorjhar, 27.9.85.

### 34. *Gerania bengalensis* Bhowmik & Halder, 1983

1983. *Gerania bengalensis* Bhowmik and halder, *Rec. zool. Surv. India*, 81 : 23-26.

**Material** : 1♂; Jenabil, Simlipal Forest; 9.10.85.

**Remarks** : The species has been described from 'Duars' and 'Terai' of W.B. Its availability in Orissa is, therefore, very interesting. It is an inhabitant of deep woods.

### 35. *Diabolocatantops sukhadae* Bhowmik, 1985.

1985. *Diabolocatantops sukhadae* Bhowmik, *Bull. Zool. Surv. India*, 7 (2-3) : 294-295.

**Material** : 2♂; Kheorjhar; 26.9.85. 1♂, 2♀ Madanpur Rampur; 27.9.84. 2♂; Joshipur; 7.10.85. 1♀ (damaged); Phulbani; 3.11.84. 1♂, Jenabil, Simlipal National Tiger park; 9.10.85.

Also from -1♂, F. chamba, H.P. 16.10.82. 2♀ Kangra, H.P; 15-16.10.82. 2♀; Parvatipuram, A.P.; 21.9.83.

## List of grasshoppers known so far from Orissa (Up to 1987)

Name of species (1)	Localities (2)	Authors with Years of pub. (3)	Remarks/ Status (4)
1. <i>Acrida exaltata</i> (Walk 1859)	Variou localities	Uv. 1927	Common
2. <i>Phalaeoba antennata</i> Br. 1893	Purnakote	Bh (M.S.)	
3. <i>P. infumata</i> Br. 18'3	Cuttack, Jaenabil, Purnakote	Uv. 1921, Bh.(M.S)	
4. <i>P. panteli</i> Bol. 1902	Badrama	Bh (MS)	
5. <i>Ceracris n. nigricornis</i> (Walk,1870)	Jenabil, Mathali	Bh (MS)	N. R.
6. <i>Acridella nasuta</i> Linn. 1758	Puri (Chilka Lake)	Bh. 1983	N. R.
7. <i>Leva indica</i> Bol. 1909	Tikarpara, Purnakote, Dhenkikote	Bh. (M S 2)	N. R.
8. <i>L. cruciata</i> Bol. 1914	Balugaon, Dhenkikote	Bh. (M S 2)	N. R.
9. <i>Aulacobothrus bolivari</i> Uv., 1921	Keonjhar and Sambalpur	Bh. (M S 1)	N. R.
10. <i>A. sinensis</i> Uv., 1924	Bolangir dist. (Harishankar)	Bh. (M S 1)	N. R. +
11. <i>A. inclytus</i> (Walk, 1971)	Keonjhar (Joshipur), Kalahandi	Bh. (M S 1)	N. R. +
12. <i>A. decisus</i> (Walk, 1871)	Chilka (Barkuda Island)	Bh. (M S 1)	N. R.
13. <i>A. luteipes</i> (Walker, 1871)	Cuttack, Keonjhar (Joshipur & Jenabil) Koraput	Uv. 1921. Bh. (M S 1)	
14. <i>A. Jaganathi</i> Bhowmik, 1985	Puri (Balugaon)	Bh. (1985, M S 1)	Sp.nov./t.c.
15. <i>Aiolopus thalassinus tamulus</i> (Fabr. 1798)	Puri (Ramba), Jenabil, Keonjhar Tikarpara, Purnakote	Uv. 1927 Bh. 1983	Common
16. <i>Ditopternis venusta</i> (Walk, 1870)	Puri (Chilka) Badrama, Harishankar	Bh. 1983, MS	
17. <i>Oedaleus abruptus</i> (Th., 1815)	Various localities	Bh. 1983	N. R.
18. <i>Acrotylus humberianus</i> Sauss, 1884	Puri (Chilka Lake), Purnakote	Bh. (1983, MS)	
19. <i>Pternoscirta bimaculata</i> (Th.1815)	Joshipur, Tikarpara, Purnakote	Bh. (MS)	
20. <i>P. cinclifemus</i> (Walk, 1859)	Badrama, Harishankar	Bh. (MS)	
21. <i>Gastrimargus a. africanus</i> (Sauss, 1888)	Dhankikote, Keonjhar, Harishankar	Bh. (MS)	Common
22. <i>Morphacris fasciata sulcata</i> (Th.,1815)	Puri (Chilka),Dhenkikote,Takarpara	Bh. (1983, MS)	N. R.
23. <i>Scintharista notabilis blanchardiana</i> (Sauss., 1888)	Joshipur	Bh. (MS)	N. R.
24. <i>Sphingonotus</i> sp. nov.	Dhenkikote		To be described (1991)
25. <i>Clonacris sila</i> Rehn, 1944	Keonjhar (Joshipur), Bolangir (Horishankar)	Bh. (MS)	N. R. /rare
26. <i>Coptacra punctoria</i> (Walk. 1870)	Harishankar, Badrama	Bh. (MS)	N. R. /rare
27. <i>Eucoptacra praemorsa</i> (Stal, 1860)	Keonjhar, Dhenkikote, Joshipur, Jenabil, Harishankar, Badrama	Bh. (MS)	
28. <i>E. saturate</i> (Walk 1870)	Burkul	Uv. 1927	rare
29. <i>Epistaurus sinetyi</i> Bol. 1902	Joshipur, Purnakote, Mathali, Harishankar.	Bh. (MS)	
30. <i>Teratodes monticollis</i> Gray, 1832	Badrama, Harishankar.	Bh. (MS)	N.R. Innumeros nymphs

Name of species (1)	Localities (2)	Authors with Years of pub. (3)	Remarks/ Status (4)
31. <i>Pachyacris vinosa</i> (Walk., 1870)	Keonjhar (Dhenkikote, Joshipur) Bolangir (Harishankar)	Bh. (MS)	N. R.
32. <i>P. violascens</i> (Walk., 1870)	Puri (Chilka, Barkuda) Keonjhar, Joshipur, Tikarpara	Bh. (1983, MS)	N. R.
33. <i>Anacridium flavescens</i> (Fabr., 1793)	Puri (Chilka, Barkuda), Keonjhar	Bh. (1983, MS)	N. R.
34. <i>Tristia pulvinata</i> (Uv., 1921)	Puri (Chilka)	Bh. 1983	N. R.
35. <i>Chondracris rosea</i> (de Geer, 1773)	Jenabil (Simlipal Nat. Park)	Bh. (MS)	N. R.
36. <i>Cyrtacanthacris tatarica</i> (Linn. 1758)	Puri (Chilka), Keonjhar, Mathali	Uv. 1927, Bh. (1983, MS)	Common
37. <i>Choroedocur robustus</i> (Serville, 1839)	Jenabil (Simlipal Nat. Park)	Bh. (MS)	
38. <i>C. illustris</i> (Walk. 1870)	Puri (Chilka)	Bh. 1983	N. R.
39. <i>Tylotropidius varicornis</i> (Walk, 1870)	Puri (Chilka), Dhenkikote, Jenabil, Tikarpara, Badrama.	Bh. (1983, MS)	N. R.
40. <i>Heteracris pulcher</i> (Bol. 1902)	Balugaon (Chilka), Burkuda Is.	Uv. 1927, Bh.1983	
41. <i>Eyprepocnemis alacris alacris</i> (Ser. 1839)	Angul, Purnakote, Dhenkekote, Joshipur, Keonjhar, Mathili.	Bh. (MS)	Common
42. <i>E. rosea</i> Uv. 1942	Jenabil (Simlipal Nat. Park)	Bh. (MS)	N. R.
43. <i>Eupreponotus inflatus</i> Uv. 1921	Cuttack	Uv. 1927	Sp.nov.(t.c)
44. <i>Spathosternum prasiniferum</i> <i>prasiniferum</i> (Walk. 1871)	Tikarpara, Punakota	Bh. (MS)	Common
45. <i>Hieroglyphus banian</i> (Fabr. 1798)	Puri (Chilka), Dhenkikote, Kalahandi, Keonjhar, Purnakote.	Uv. 1927, Bh. (1983, MS)	Common
46. <i>Hieroglyphus oryzivorus</i> Carl, 1916	Khurda	Ma 1973	rare
47. <i>Oxya velox</i> (Fabr. 1787)	Joshipur	Bh. (MS)	Common
48. <i>O. fuscovittata</i> (Mar. 1836)	Keonjhar	Bh. (MS)	Common
49. <i>O. hyla intricata</i> (Stal, 1861)	Bhuvaneshwar	Uv. 1927	Needs verification
50. <i>Gerania bengalensis</i> Bhowmik & Halder, (1983)	Jenabil (Simlipal Nat. Park)	Bh. (MS)	N. R./rare
51. <i>Diabolocatantops sukhadae</i> Bhowmik, 1985	Joshipur, Jenabil, Kheonjhar, M. Rampur, Phulbani.	Bh. (MS)	N. R.
52. <i>Catantops innotabilis</i> (Walk.1870)	Dhenkikote, Joshipur, Purnakote Chandipur, Puri, Satpara, Balugaon	Uv. 1927; Bh. (MS)	Common
53. <i>Stenocatantops splendens</i> (Thunberg, 1815)	Mathali	Bh. (MS)	
54. <i>Xenocatantops humilis</i> (Ser. 1839)	Jenabil	Bh. (MS)	
55. <i>X. jagabandhui</i> Bhowmik, 1985	Korapur (Mathili)	Bh. (MS)	Sp.nov./t.c.
56. <i>Caloptenopsis</i> sp.	Balugaon (Chilka)	Bh. (MS)	

## Abbreviations used:

Bh : Bhowmik; Ma : Mason; Uv : Uvarov; MS, MS1, MS2 : Manuscripts

T.S. : Tandon &amp; Shishodia; N.R : New record; t.c. : Type-locality; + : New records for India.

*Remarks* : Described from H.P., the species is now known from Orissa.

**36. *Catantops innotabilis* (Walker, 1870)**

*Material* : 4♂; 2♀; Dhenkikote; 1.10.85. 1♀; Joshipur; 7.10.85. 1♀; Purnakote; 16.9.85. 2♂; Tikarpara; 23.9.85.

**37. *Stenocatantops splendens* (Thunberg, 1815)**

*Material* : 2♂; Mathili; Koraput; 17.10.84. 1♀; Jenabil, Simlipal National Tiger park; 9.10.85.

**38. *Xenocatantops humilis* (Serville, 1839)**

*Material* : 1♂, 3♀; Jenabil, S.N.T.P.; 9.10.85.

**39. *Xenocatantops jagabandhui* Bhowmik, 1985**

1985. *Xenocatantops jagabandhi* Bhowmik, *Bull. Zool. Surv. India*, 7 (2-3): 293-294.

*Material* : 2 nymphs; Tikarpara; 22.9.85. 5♂, 2♀; Keorjhar; 27.9.85. 4♂; Dhénkikote; 1.10.85. 3♂, 2♀; Jenabil, Simlipal National Tiger park; 9.10.85. 1♂, 5♀; Badrama; 27.3.86. 1♂, 1♀; Harishankari; 20.3.86.

*Remarks* : The species has been described from materials collected from H.P. and Orissa (Koraput dist.) (Bhowmik, 1985). It now appears available throughout Orissa, its natural habitat being wild bushes. Post monsoon period is its breeding time.

#### SUMMARY

39 species of grasshoppers are studied here from Orissa. This, besides the discovery of some new records and some important and rare species, has increased the number of species to 56 from the state. A complete list of species so far known from Orissa, with intrastate distribution etc. is provided.

#### ACKNOWLEDGEMENTS

Sincere thanks are due to the Director, Z S I, for facilities provided, and to Mr. Goutam Ghosh, for typing the manuscript.

#### REFERENCES

- Bhowmik, H.K. 1983. Report on a collection of Orthoptera (Insecta) from three north-eastern districts of Andhra Pradesh and Chilka Lake. *Indian Mus. Bull.*, 18 : 63-75 (1985)
- Bhowmik, H.K. 1985. Three new species of grasshopper from India; *Bull. Zool. Surv. India*, 7 (2-3) : 291-296.
- Bhowmik, H.K. 1986. Grasshopper fauna of West Bengal, India (Orth. : Acrididae). *Tech. mono. no. 14, Zool. Surv. India*, 1-180, figs.
- Bhowmik, H.K. Contribution to grasshopper fauna of Orissa. (MS).
- Bhowmik, H.K. Preliminary contribution to the Indian species of the genus *Aulacobothrus* Bolivar, 1902 (Orth. : Acrididae). (MSI).

- Bhowmik., H.K. Preliminary contribution to the Indian species of the genus *Leva* Bolivar, 1909 and the subgenus *Chorthippus* (Chorthippus) Jago, 1971 (Orth.: Acrididae : Gomphocerinae) from India. (MS2.)
- Bhowmik, H.K. & Halder, P. 1983. Preliminary distributional records with remark on little known species of Acrididae (Orth : Insecta) from the western Himalayas (Himachal Pradesh). *Rec. zool. Surv. India.* 81 : 167-192.
- Kirby, W.F. 1914. *The Fauna of British India including Ceylon and Burma.* Orthoptera (Acrididae) vol. 1.
- Mason, J.B. 1973 A revision of the genera *Hieroglyphus* Krauss, *Parahieroglyphus* Carl and *Hieroglyphodes* Uvarov (Orth.: Acridoidae). *Bull. Br. Mus nat. Hist. (Ent.)* 28 (7) : 509-560. 142 figs.
- Rehn, J.A.G. 1944. A review of the old world Euthymiae. *Proc. Acad. nat sci philad, Philadelphia,* 96; 1 - 135.
- Tandon, S.K. & Shishodia, M.S. 1989 Fauna of Orissa : Insecte Orthoptera : Acridoides. State Fauna Series 1 (Part 1) : 93-146. (Publ. Zool. Surv. India)
- Uvarov, B. P. 1921. Records and descriptions of Indian Acrididae. *Ann. Mag. nat. Hist.,* 7 (9) : 480-509.
- Uvarov, B.P. 1927. Distributional records of Indian Acrididae. *Rec. Indian Mus.,* 29 (4) : 233-239.
- Uvarov, B.P. 1929. Acrididae (Orthoptera) aus süd - Indian. *Revue suisse Zool.,* 36 : 533-563.
- Uvarov, B.P. 1941. Geographical variation in *Scintharista notabilis* (Walker, 1870) Orth. : Acrididae. *Proc. R. ent. Soc. Lond. (B)* 10 : 91-97.





**INSECTA : HOMOPTERA : CICADELLIDAE**

L. K. GHOSH and M. GHOSH

*Zoological Survey of India, Calcutta*

**INTRODUCTION**

The leafhoppers or members of the family Cicadellidae outnumber all other groups of hemipteran insects. These sucking insects drain off the nutritive material from their host plants which result in loss of vitality and vigour and also affect the fruit-bearing capacity of the concerned plants. Besides, malformation and deformations are also not uncommon. Damage becomes more severe when they transmit viral diseases to many valuable crops of agricultural importance. All these reduce yield. So far, 115 species of cicadellids have been reported to transmit 86 plant pathogens (Ishihara 1969). Besides reporting some of the symptoms caused to the crop plants by these insects, very little attention has been paid to explore the cicadellid fauna although it is very rich in India. The cicadellid fauna, however, is reasonably well explored from the Palaeartic and the Nearctic regions.

Atkinson (1885) was the first to undertake studies on this group in India. He reported 38 species of leafhoppers. Later, contributions were made by Distant (1908, 1916, 1918); Pruthi (1930, 1934, 1936, 1940); Ghauri (1963a, 1963b, 1966, 1967); Datta (1969, 1973); Singh (1969); Bindra and Singh (1970); Datta and Ghosh (1973); Ramakrishna and Menon (1972, 1973, 1974); Sohi (1972); Viraktamath (1973, 1976); Malhotra and Sharma (1974); Sharma (1974); Dworakowska (1977); Sohi (1977); and Datta and Dhar (1984), but so far as Orissa state is concerned, very little attention has been paid to the study of this group of insects.

The only work worth mention is that of Sengupta and Behura (1957) who in their list of the crop pests of Orissa, reported 6 species to occur in the state.

The present paper is based upon the collections made by various survey parties of the Zoological Survey of India. It deals with 9 species belonging to 7 genera under 4 subfamilies. Of these, 3 species marked (\*) are being reported from Orissa for the first time. Keys to subfamilies and of genera and species based on the genitalic armatures and general diagnosis of all the 9 species are provided. Since 7 species are already reported in the Fauna of Orissa series Pt. 2, synonymic references, distribution, material examined under these species are not included in the present paper.

The classification is after *sensu* Distant (1902-1918) and Malhotra & Sharma (1977). All the material including the slides of genitalia examined are in the National collections at the Zoological Survey of India, Calcutta.

**LIST OF CICADELLID SPECIES SO FAR RECORDED FROM ORISSA**

*Amritodus atkinsoni* Lethierry

*Empoasca devastans* Fabricius

*Exitianus indicus* (Distant)

*Idioscopus clypealis* Lethierry

*Cicadella spectra* (Distant)

*Empoasca* sp.

\**E. nanus* (Distant)

*I. maculatus* Distant

*Nephotettix apicalis* Motshulsky*N. nigropicta* (St. al)*Parabolocyratus albomaculatus* (Distant)*Bothrogonia ferruginea* (Fabricius)*N. bipunctatus* Fabricius\**N. virescence* (Fabricius)\**Thomsoniella porecta* (Walker)

\* New record from Orissa

## SYSTEMATIC ACCOUNT

## Key to subfamilies

- 1(2) Ocelli situated on vertex; face tumid.....*Cicadellinae*  
 2(1) Ocelli may or may not be on vertex; face not tumid ..... 3  
 3(4) Ocelli on face; frontal sutures continued upto the ocelli.....*Idocerinae*  
 4(3) Ocelli on anterior margin of the head, or on vertex ..... 5  
 5(6) Vertex more or less flatly produced; body distinctly dorsoventrally flattened; pronotum with lateral margin carinate; vertex, pronotum and scutellum without any longitudinal median impressed back line.....*Hecalinae*  
 6(5) Vertex more or less angularly produced in front of eyes and is as long as or longer than width between eyes; body not dorsoventrally flattened .....*Deltocephalinae*

Family CICADELLIDAE

Genus *Cicadella* Latr.1. *Cicadella spectra* (Distant)

(Text-fig. 1)

1908. *Tettigoniella spectra* Distant, *Fauna Brit. India*, IV : 211.1910. *Cicadella spectra* Distant : *Insect. Trans.* 10 : 2341989. *Cicadella spectra* (Distant): Ghosh *et al.*, Hemiptera, In Fauna of Orissa part 2 : 195

**Diagnosis** : Vertex with 4 black spots, one at base and apex and the other two on lateral margins near basal angles of face; scutellum yellowish; tegmina with fuscus and very pale veins; legs pale ochraceous. **Genitalia** : Male plate (Text-fig. 1A) triangulate, thick, lateral margin convex, mesal margin almost linear, gradually tapered from base to apex, discal setae stout, much longer than those apical and densely spinulate. Pygofer (Text-fig. 1B) densely spined, with macrosetae on posterior part; lateral margin unfloded. Style (Text-fig. 1C) beak-like, gradually tapering to a pointed apex, subapically strongly concave. Aedeagus (Text-fig. 1D) subapically curved, curved inside, strut developed, shaft slender. Anal tube as figured (Text-fig. 1E). Connective T-shaped.

Length : ♀ ♀ 9-11 mm; ♂ ♂ 7.5-8.4 mm.

**Distribution** : India: Orissa (Kathpal, Mayurbhanj Distt.; Dighaphand, Ganjam Distt.) Karnataka, Madhya Pradesh, Maharashtra, West Bengal; Elsewhere: Australia (North); Sri Lanka.

## Subfamily HECALINAE

*Key to genera*

- 1(2) Aedeagal appendages minute, dorsally directed; tegmina transparent hyaline with a narrow marginal limbus and with 6 discoidal aereolas; apical half of male plate transversely rugulose (Text-fig. 3 fig. 1) ..... *Thomsoniella* Signoret
- 2(1) Aedeagal appendages long, reaching almost half the length of shaft; posterior portion of tegmina with brownish black colour and lighter aereolets in it; apical half of male plate not rugulose, with a row of macrosetae at middle half..... *Parabolocratrus* Fieber

Genus *Parabolocratrus* Fieber2. *Parabolocratrus albomaculatus* (Distant)

(Text-fig. 2)

1908. *Thomsoniella albomaculatus* Distant, *Fauna Brit. India*, IV : 2801918. *Parabolocratrus albomaculatus* : Distant, *Fauna Brit. India*, VII : 32.1989. *Parabolocratrus albomaculatus* Distant : Ghosh *et al.*, *Hemiptera*. In *Fauna of Orissa part 2* : 196

**Diagnosis** : Vertex dark brown, appearing laminate, margin somewhat strongly reflexed; body ochraceous, apical areas of tegmina brownish with white spots; pronotum fasciate. Scutellum with and angulate line before the apical area, occasionally a darker spot on each basal angle. Abdomen dorsally black and laterally brown, posterior portion of tegmina with brownish black colour. **Genitalia**: Male plate (Text-fig. 2A) broadened at base, gradually tapered towards apex, outer margin to some extent concave with a row of macrosetae at middle half, disc spinulate. Pygofer (Text-fig. 2B) somewhat conical apically, with somewhat spinulate margin, long setae towards apical half, margin rather smooth. Style (Text-fig. 2C) broadened at base, beak-like towards apex, mesal apical extension sharply pointed, directed laterocaudal. Aedeagus as figured (Text-fig. 2D), aedeagal shaft broadened basad; apical processes elongate, slender, acute rather plough-like. Anal tube as figured (Text-fig. 2E).

**Length** : ♀ 4.5 mm; ♂ 4 mm.**Distribution** : India: Orissa (Bhisari, Puri distt.), Bihar, J&K state, West Bengal; Elsewhere: Sri Lanka.Genus *Thomsoniella* Signoret3. \**Thomsoniella porrecta* (Walker)

(Text-fig. 3)

1858. *Acocephalus porrectus* Walker, *list Hom. suppl.* : 2621903. *Thomsoniella porrecta* : Melichar, *Hom. Faun. Ceylon* : 173.**Material examined** : 1♀ and 1♂, Orissa : Bhisari, Puri distt., 1.i.1974, Coll. R.L. Chowdhury.

**Diagnosis** : Vertex considerably shorter than width between eyes, anterior margin of vertex usually blackish. Body with a small spot at the apex of clavus, 2nd spot on the middle of the first apical area. Pronotum transverse, almost broader than the head across eyes; scutellum trifasciate, sometimes faciae obsolete. Tegmina transparent, hyaline with a narrow marginal limbus. **Genitalia** : Male plate (Text-fig. 3A) long, slender, broadened basad, gradually tapered with apical half transversely rugulose, lateral margin of basal half with spines, such spines absent on apical half. Pygofer (Text-fig. 3B) broad basad, posterior half subtriangulate and spinulate, disc with setae.

Style (Text-fig. 3C) with apical part foot-like. Aedeagus as figured (Text-fig. 3D), aedeagal shaft with a pair of unbranched apical processes. Connective U-shaped.

*Length* : ♀ 5.5 mm; ♂ 4.5 mm.

*Distribution* : India: Orissa (Bhisari, puri), Bihar, the Punjab, West Bengal, Elsewhere : Burma, Maldiva; Minikoi; Philippines.

*Remarks* : The species is recorded from orissa for the first time.

#### Subfamily IDIOCERINAE

##### Key to genera

- 1(2) Aedeagus with apical processes (Text-fig. 4D); Pygofer without any long appendage in inner surface (Text-fig. 5B)..... *Idioscopus* Baker
- 2(1) Aedeagus without apical processes (Text fig. 4D); Pygofer with a long appendage in inner surface (Text fig. 4B)..... *Amritodus* Anufriev.

#### Genus *Amritodus* Anufriev

##### 4. *Amritodus atkinsoni* Lethierry

(Text-fig. 4)

1889. *Idiocerus atkinsoni* Lethierry, *J. Asiat. Soc. Beng.*, 8 : 252

1989. *Amritodus atkinsoni* Lethierry : Ghosh *et al.*, Hemiptera In Fauna of Orissa part 2 : 196

*Diagnosis* : Vertex trinitate, with a black spot on each side of apical margin. Pronotum ochraceous, pronotal disc brown, with a narrow dark brown stripe close to anterior margin. Scutellum ochraceous, with a triangulate spot on each basal angle. Tegmina subhyaline, veins dark brown. Legs pale, ochraceous. *Genitalia* : Male plate (Text-fig. 4A) elongate, slender, posterior half thicker than that of anterior one, with a row of macrosetae, apex rotundate with many fine setae, outer margin rather smooth. Pygofer (Text-fig. 4B) with a long appendage, sickle-shaped, pygofer hook arising from lateral margin. Anal tube as figured (Text-fig. 4E) Style (Text-fig. 4C) concavous near at the middle, apical half serrate, apex curved laterally. Aedeagus as figured (Text-fig. 4D), aedeagal shaft with unequal processes near at the middle, slightly bent apically; connective T-shaped.

*Length* : ♀♀ 4.8-5.1 mm; ♂♂ 4.0-4.5 mm.

*Distribution* : India ; Orissa (Pundamari, Ganjam distt.) Bihar, Gujarat, Maharashtra, Uttar Pradesh; Elsewhere : Sri Lanka.

#### Genus *Idioscopus* Baker

##### 5. *Idioscopus clypealis* (Lethierry)

(Text-fig. 5)

1889. *Idiocerus clypealis* Letherry, *J. Asiat. Soc. Beng.*, 8 : 252.

1989. *Idioscopus clypealis* (Lethierry) : Ghosh *et al.*, Hemiptera. In Fauna of Orissa part 2 : 197

*Diagnosis* : Vertex a little longer in the middle than at the eyes. Head as broad as pronotum, a transversely impressed line below anterior margin across eyes. Pronotum greenish with a band on anterior margin. Scutellar margin bordered by dark brown longitudinal stripes extending along commissure of clavus. Tegmina with a black stripe extending from middle to claval sutures. Abdomen black; posterior tibiae at the bases of the spinules spotted with black. *Genitalia* : Male plate (Text-fig. 5A) claviform, with a row of fine setae along lateral margin. Pygofer as figured (Text-fig. 5B); pygofer hook lying along lateral margin. Style (Text-fig. 5C) long, slender, curvate dorso laterally, somewhat

serrated towards apex. Aedeagus (Text-fig. 5D) with four distinct subapical processes directed basad. strut well developed. Connective 'U'-Shaped.

*Length* : ♀♀ : 3.5-4 mm ; ♂♂ 3-3.5 mm.

*Distribution* : India; Orissa (Ganjam), Bihar, J&K. State, Tamil Nadu, West Bengal; Elsewhere: Sri Lanka.

#### Subfamily DELTOCEPHALINAE

##### *Key to genera*

- 1(2) Aedeagus slender; aedeagal shaft with a few spines at its dorsal aspect at about its middle (Text-fig. 4); style obliquely truncate at apex (Text-fig. 8C).....*Nephotettix* Mastsumura
- 2(1) Aedeagus quite massive; aedeagal shaft without such spines; style with apical extension mesally angulate with sharply pointed apex (Text-fig. 7C).....*Exitianus* Ball.

#### Genus *Exitianus* Ball.

##### *Key to species*

- 1(2) Pygofer with 4 macrosetae of almost equal size and near at the apex (Text-fig. 7B); aedeagus slender, subapically rather sulcate (Text-fig. 7D).....*nanus*
- 2(1) Pygofer with a macrosetae at apex, one shorter and club-shaped whereas the other longer and pointed (Text-fig. 6B); aedeagus thick and massive, laterally compressed (Text-fig. 6D) .....*indius*

#### 6. *Exitianus indicus* (Distant) (Text-fig. 6)

1908. *Athysanus indicus* Distant, *Fauna Brit. India*, IV : 344.

1938. *Exitianus indicus* Oman, *Kans. Univ. Sci. Bull.*, 24 : 383.

1989. *Exitianus indicus* (Distant) : Ghosh *et al.*, Hemiptera. In *Fauna of Orissa part 2* : 195

*Diagnosis* : Vertex subangularly rounded anteriorly with a black fascia across the eyes ; pronotum ochraceous, with an arcuate line near anterior margin ; clypeus with dark brown band; tegmina subhyaline, veins pale brown; scutellum granulate on basal area. *Genitalia* : Male plate (Text-fig. 6A) rather robust, posteriorly converging to angulate apex; disc and mesal margin densely spinulated. Pygofer (Text-fig. 6B) thickened densely spinulate, gradually broadened from base, with bluntish tip apically and with a pair of distinct apical spurs, the terminal spur being nearly twice as long as subapical one, mesal margin with sparse hairs. Style (Text-fig. 6C) with apical extension mesally angulate and with apex sharply pointed. Aedeagus (Text-fig. 6D) quite thick and massive, laterally compressed, subapically sulcate and with rather acute apex. Anal tube as figured (Text-fig. 6E); connective Y-shaped.

*Length* : ♀ 5 mm; ♂ 4 mm.

*Distribution* : India : Orissa (Kathpal, Mayurbhanj), Bihar, J&K. State, Uttar Pradesh, West Bengal; Elsewhere : Nepal.

7. \***Exitianus nanus** (Distant)  
(Text-fig. 7)

1908. *Athysanus nanus* Distant, *Fauna Brit. India*, iv : 345.  
1938. *Exitianus nanus* Oman, *Kans. Univ. Sci. Bull.*, 24 : 383.

*Material examined* : 1 ♀ and 1 ♂, Orissa, Chilka, 19.ii.1969. coll. K.N.Nair.

*Diagnosis* : Vertex ochraceous short, broad, convexly rounded in front, arcuate fascia between eyes; pronotum yellow with greenish tinge, finely punctate; scutellum brownish yellow, with a black spot near each basal angle; tegmina subhyaline; veins brown. Abdomen pale brownish ; legs pale ochraceous, usually with a piceous spot near the intermediate coxae. *Genitalia* : Male plate (Text-fig. 7A) broadened basally, gradually tapering to almost round apex, with a longitudinal row of macrosetae arranged medially and laterally, disc spinulate. Pygofer (Text-fig. 7B) quadrate basally and somewhat digitiform apically with 4 short spur-like setae. Pygofer hook absent. Style (Text-fig. 7C) shorter, about 0.3 times as long as male plate, preapical lobe not differentiated, apical extension curved and sharply pointed rather sickle-shaped. Aedeagus (Text-fig. 7D) slightly curved, subapically sulcate; connective Y-shaped.

*Length* : ♀ 4.8 mm; ♂ 4 mm.

*Distribution* : India : Orissa (Chilka), Bihar, Himachal Pradesh, J&K. State, Uttar Pradesh, West Bengal.

*Remarks* : The species is a new record from Orissa.

Genus **Nephotettix** Matsumura

*Key to species*

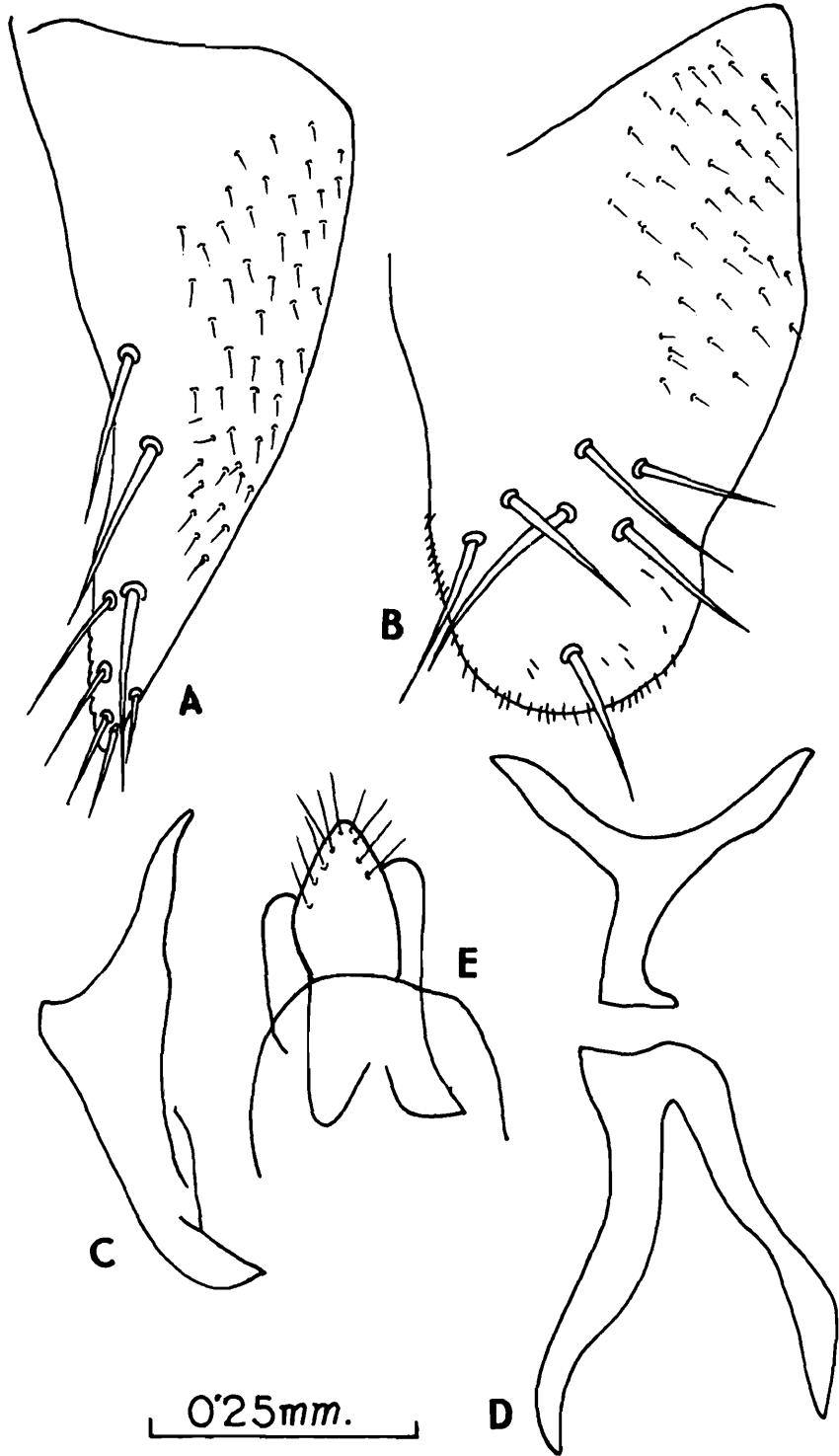
- 1(2) Style less than half the size of male plate (Text-fig. 8C); pygofer rather conical (Text-fig. 8B); aedeagal shaft elongate, curved ..... *nigropicta* (Kirk.)  
2(1) Style elongate, more than half the size of male plate (Text-fig. 2C) pygofer somewhat rectangular; aedeagal shaft not as above..... *virescens* (Distant)

8. **Nephotettix nigropicta** (Stal)  
(Text-fig. 8)

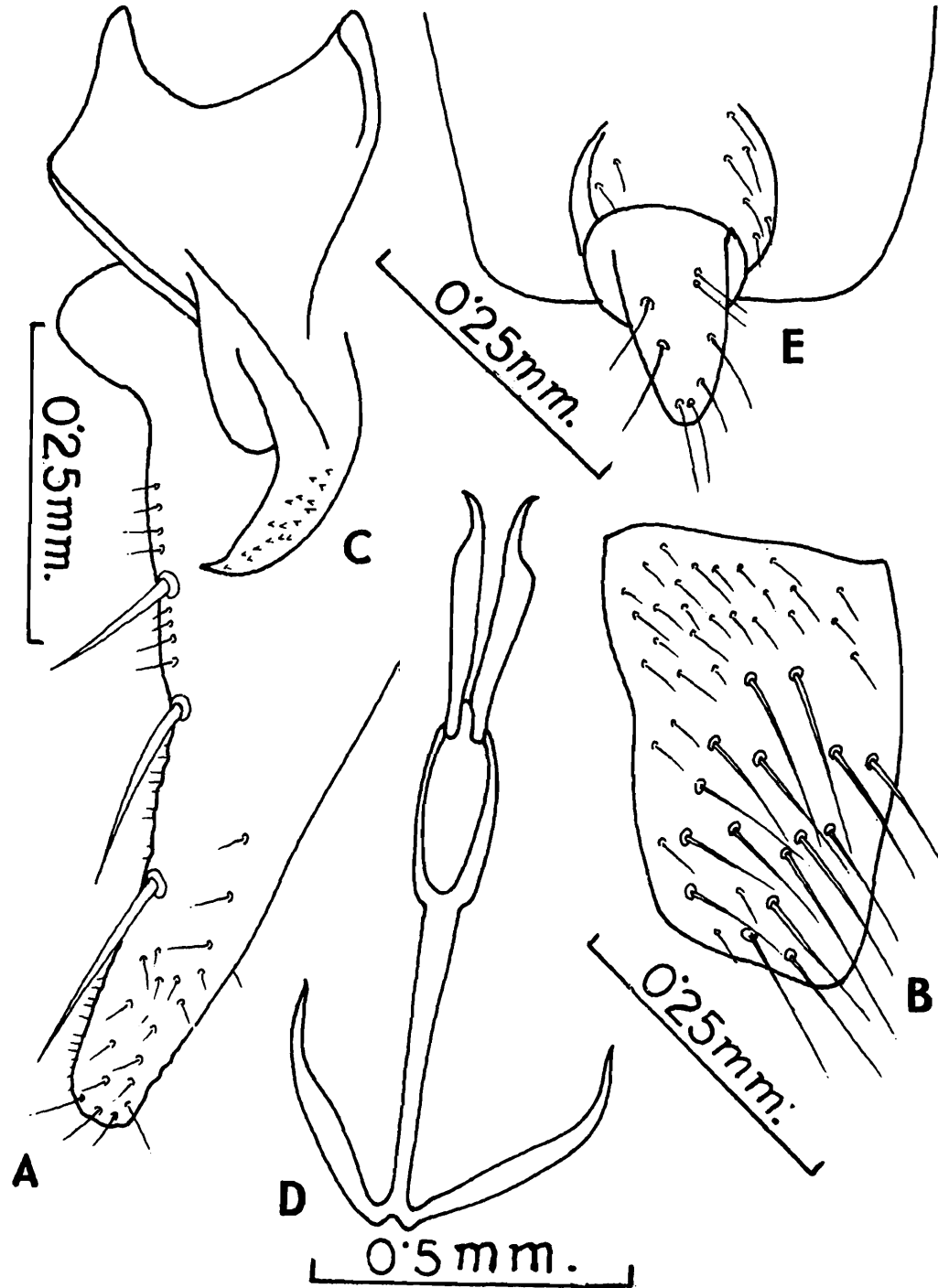
1870. *Thamnotettix nigropicta* Stal, *Ofv. Vet. Ak. Forh.*, : 740.  
1971. *Nephotettix nigropicta* Ghauri, *Bull. ent. Res.*, 60 (3) : 481-512.  
1989. *Nephotettix nigropicta* (Stal) : Ghosh *et al.*, *Hemiptera*. In *Fauna of Orissa part 2* : 195

*Diagnosis* : Vertex ivory white, shining with a transversely impressed line below anterior margin between eyes. Head about as broad as pronotum. Anterior margin of pronotum with a band. Scutellar margin broadened with dark stripes extending along commissure of clavus. Tegmina with apical third blackish, with a stripe extending from middle to claval suture, then acutely produced hindward on each tegmina. *Genitalia* : Male plate (Text-fig. 8A) gradually tapered, lateral margin with rows of macrosetae from posterior half, mesal margin thickly spinulate Pygofer (Text-fig. fig. 8B) rather conical, mesal margin spinulate. Style (plate viii; fig. 8C) less than half the size of male plate, preapical lobe developed, mesal apical extension obliquely truncate at apex, rather curved laterally. Aedeagus (Text-fig. 8D) with distinct strut, aedeagal shaft elongate, curved with three of superior processes, first pairs shortest, 3rd pairs longest. Anal tube as figured (Text-fig. 8E); connective Y-shaped.

*Length* : ♀♀ 4.5 mm 5 mm ; ♂♂ 4 mm-4.2 mm.

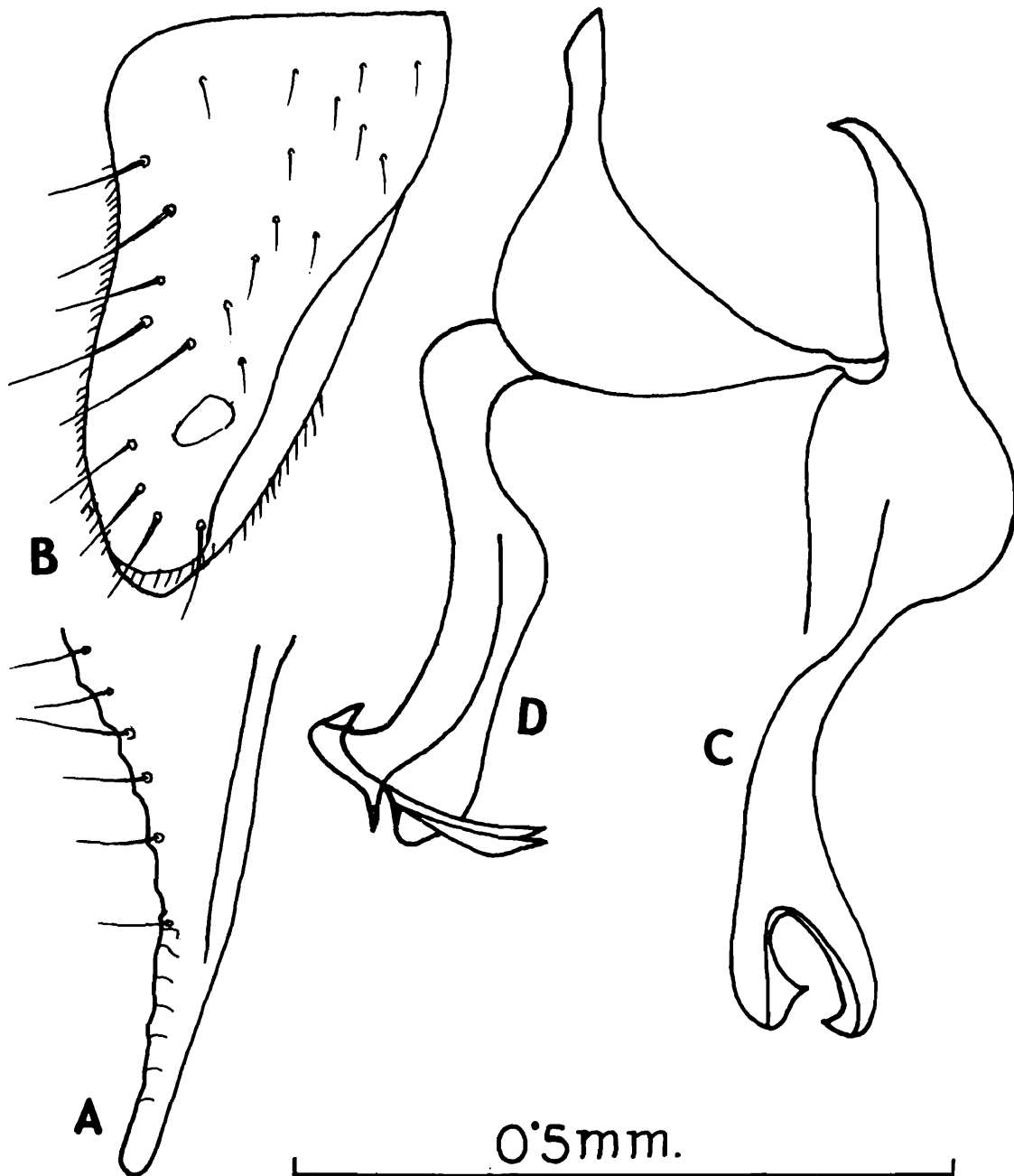


**Text-fig. 1** A-E, *Cicadella spectra* (Distant) ; A, Male plate ; B, Pygofer; C, style; D, Aedeagus; E, Anal tube.

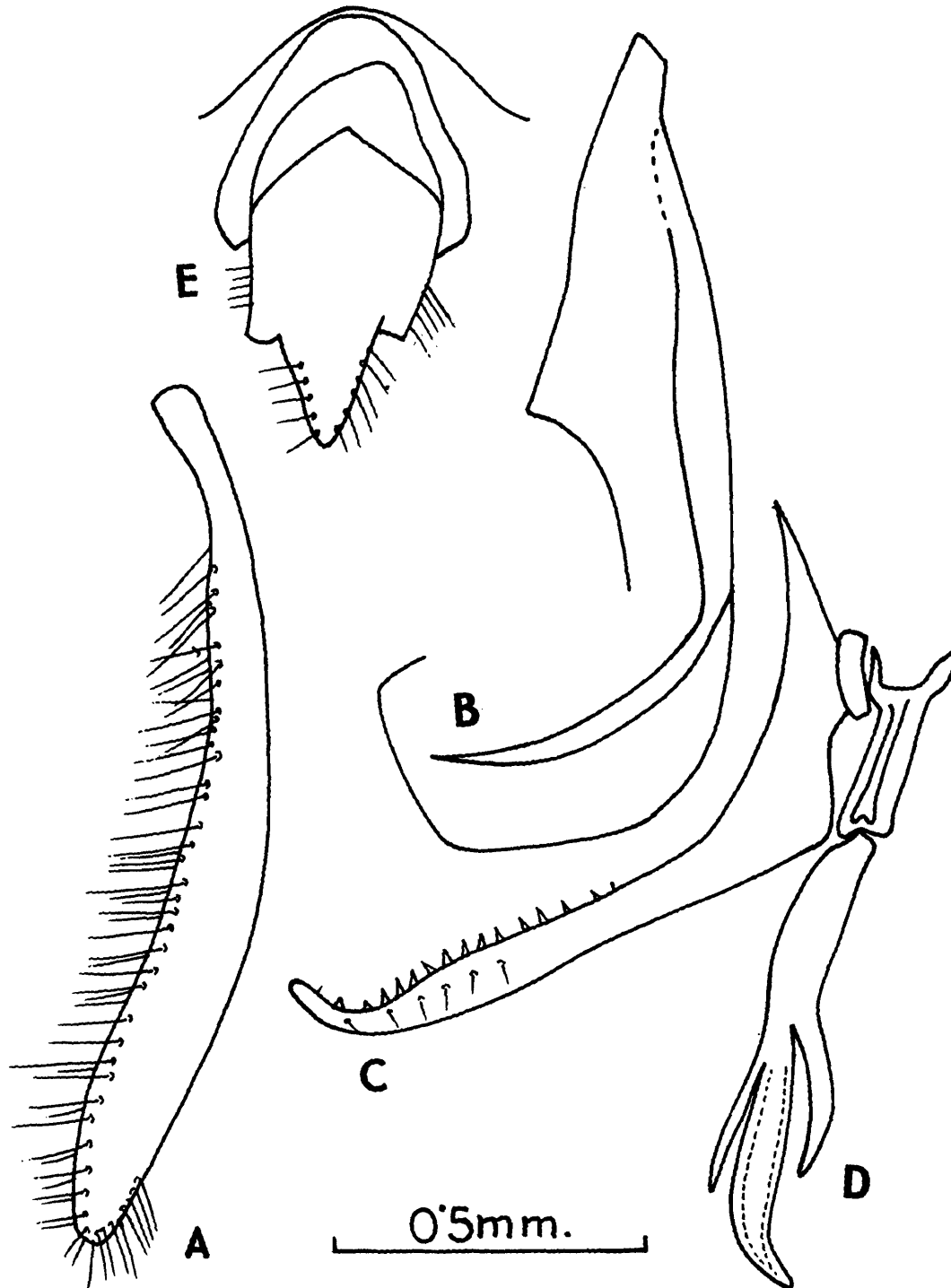


Text-fig. 2 A-E, *Parabolocratius albomaculatus* (Distant); A, Male plate; B, Pygofer; C, Style; D, Aedeagus; E, Anal tube.

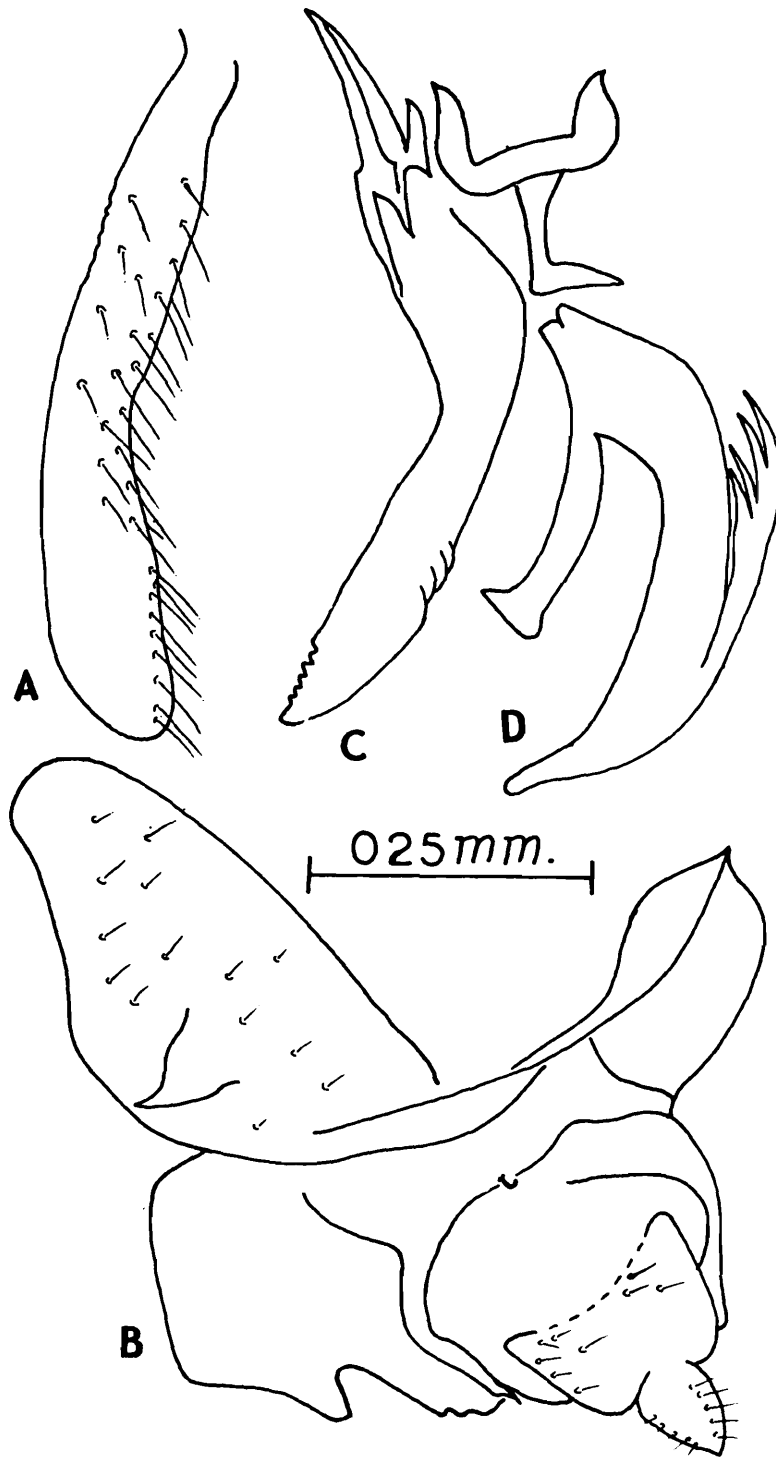




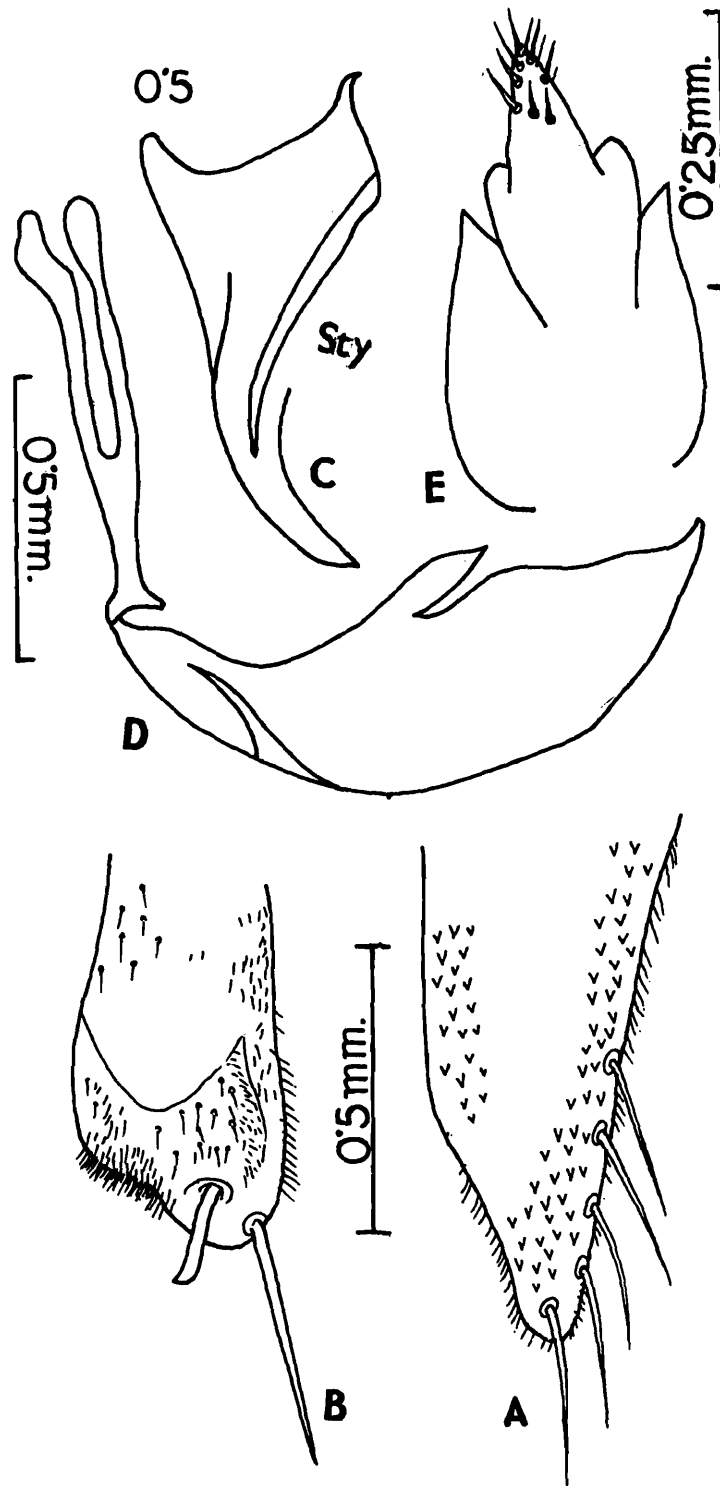
Text-fig. 3 A-D, *Thomsoniella porrecta* (Walker); A, Male plate ; B, Pygofer; C, Style; D, Aedeagus.



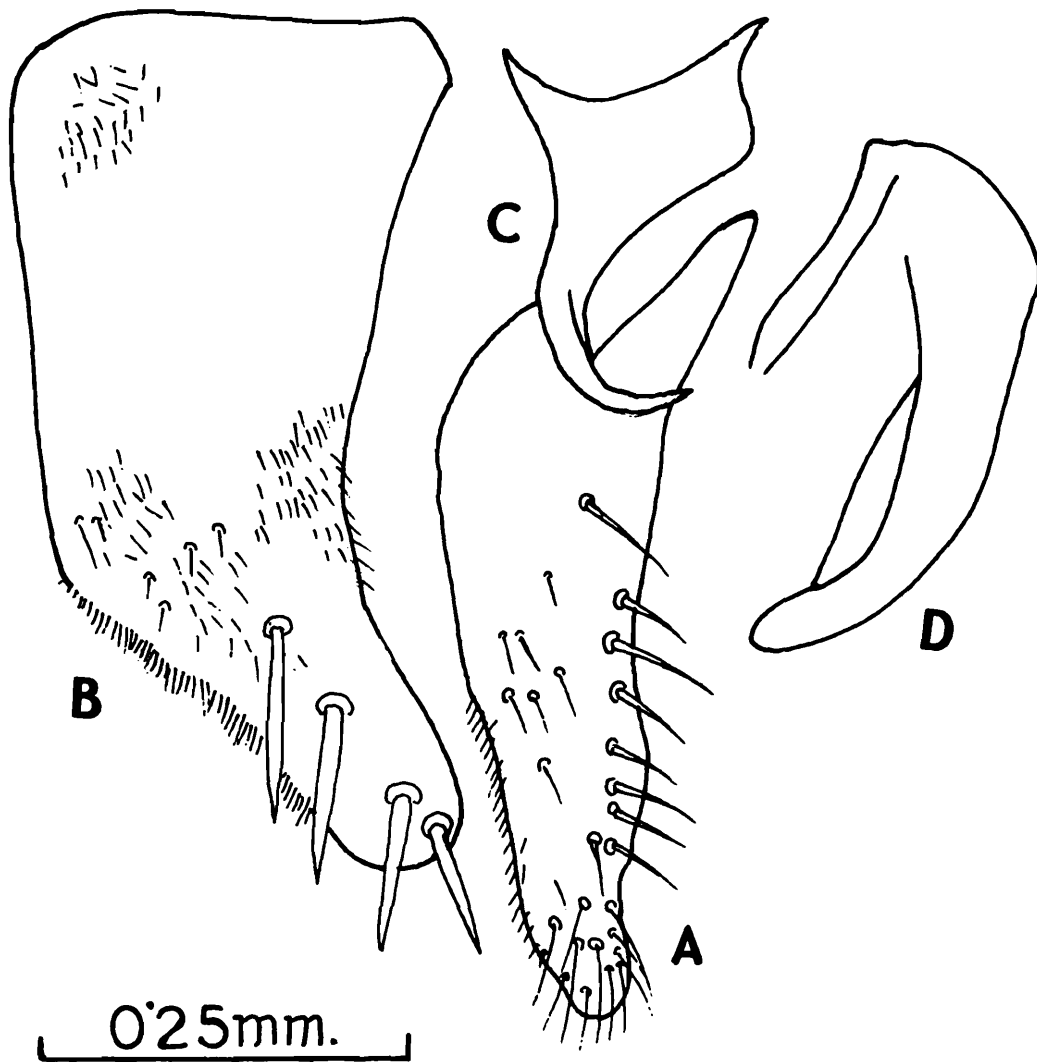
Text-fig. 4 A-E, *Amritodus atkinsoni* Lethierry; A, Male plate; B, Pygofer; C, Style; D, Aedeagus; E, Anal tube.



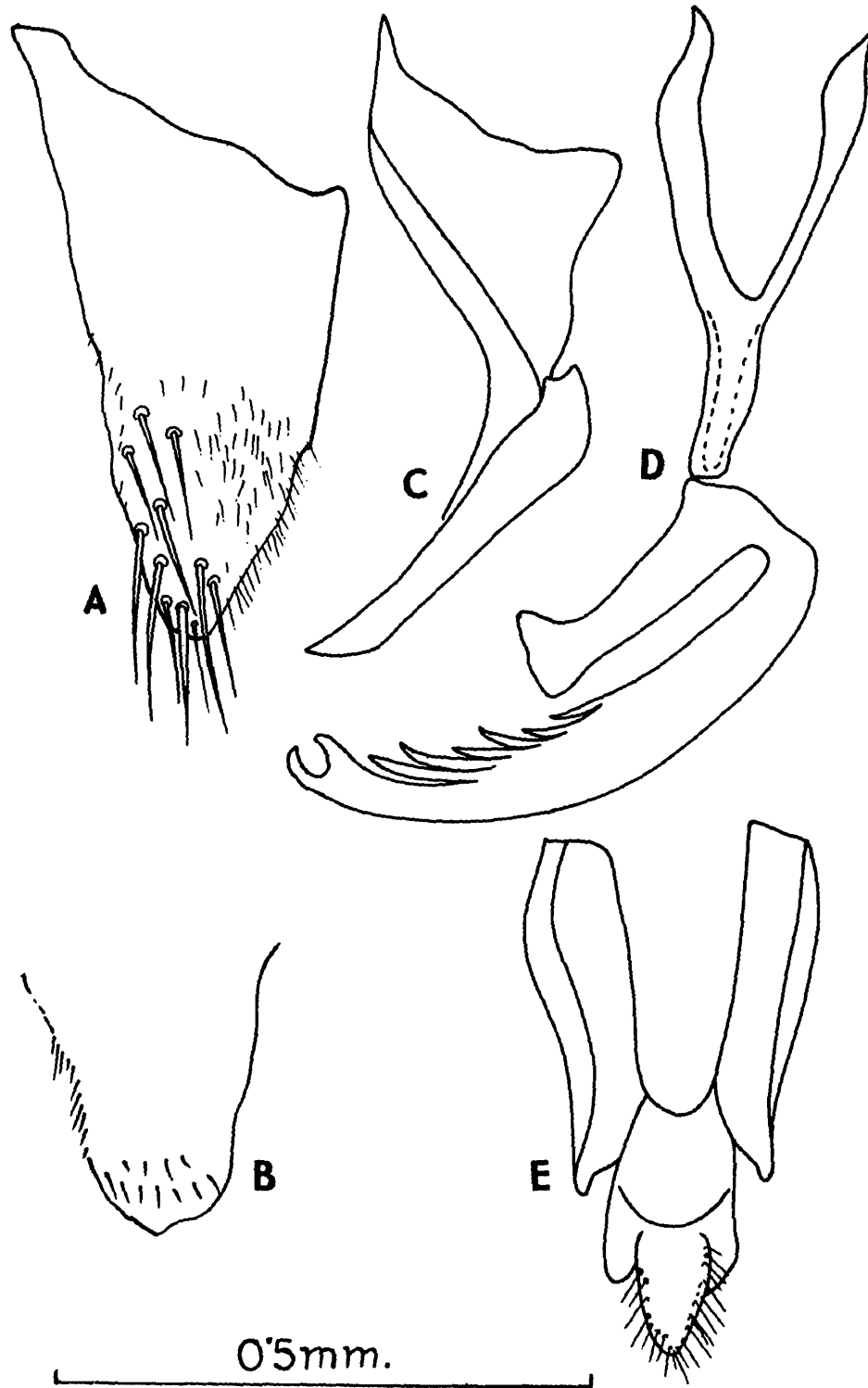
Text-fig. 5. A-D, *Idioscopus clypealis* (Lethierry); A, Male plate; B, Pygofer ; C, Style; D, Aedeagus.



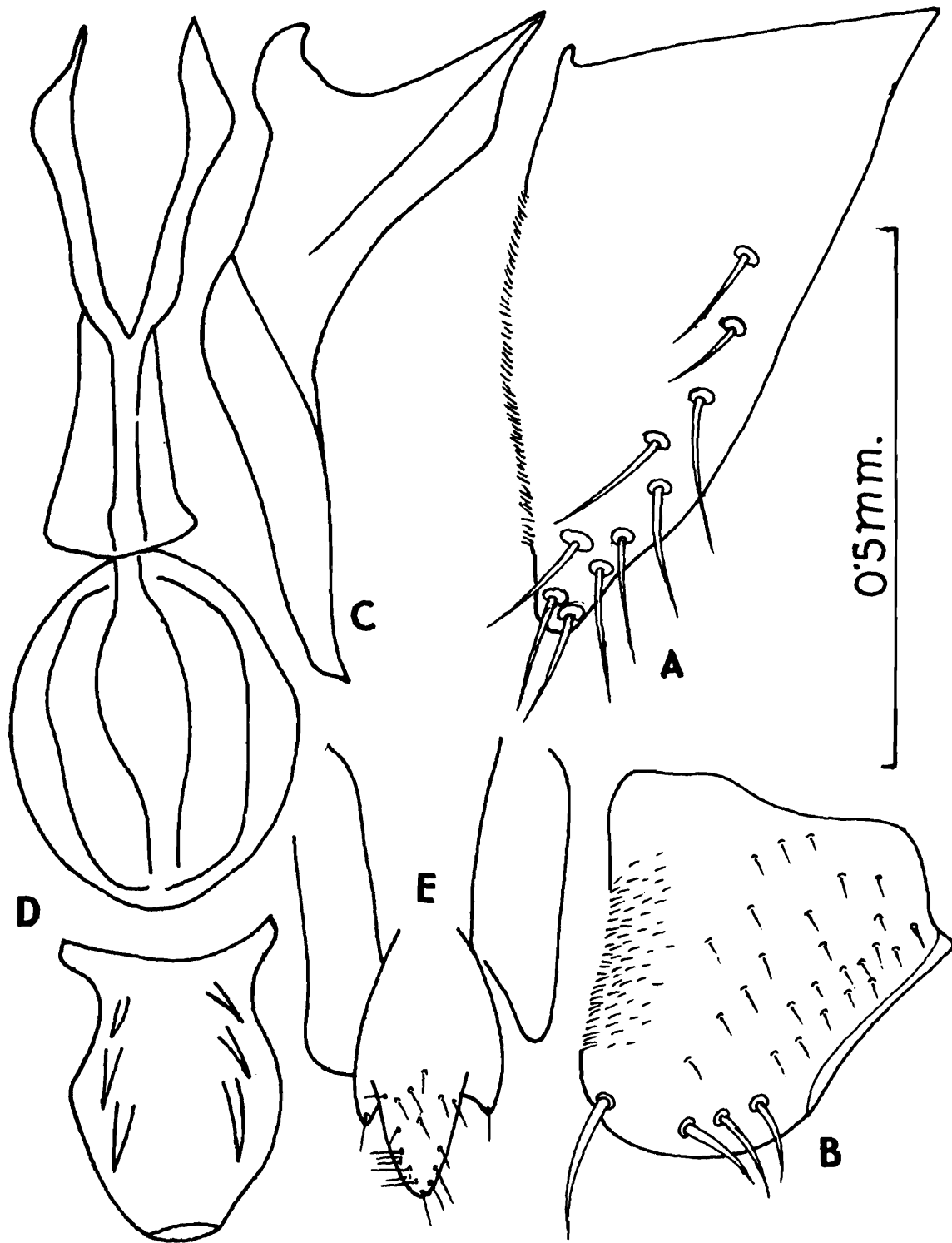
Text-fig. 6 A-E, *Exitianus indicus* (Distant); A, Male plate ; B, Pygofer; C, Style; D, Aedeagus; E, Anal tube.



Text-fig. 7 A-D, *Exitianus nanus* (Distant); A, Male plate; B, Pygofer; C, Style; D, Aedeagus.



Text-fig. 8 A-E, *Nephrotettix nigropicta* (Stal); A, Male plate; B, Pygofer; C, Style; D, aedeagus; E, Anal tube.



Text-fig. 9 Figs. A-E, *Nephotettix virescens* (Fabr.); A, Male plate; B, Pygofer; C, Style; D, Aedeagus; E, Anal tube.

**Distribution** : India : Orissa (Bhisari, Puri); Bihar, The Punjab, West Bengal; elsewhere : Africa, Bangladesh ; Philippines ; Sri Lanka; Sumatra.

**Remarks** : The species is well known vector of the dwarf, yellow dwarf, Transitory yellowing or yellowish orange leaf of rice in southeast Asia (Bindra 1973).

### 9. \**Nephotettix virescens* (Fabricius)

Text-fig. 9

1803. *Nephotettix bipunctatus* Fabricius, *Syst. Rhyn.* : 78.

1971. *Nephotettix virescens* (Fabricius); Ghauri, *Bull. ent. Res.*, 60 : 481-512.

**Material examined** : 2 ♀♀ and 1 ♂, Orissa, Bhisari, Puri distt., 1.i.1974, coll. R. L. Chowdhury.

**Diagnosis** : Vertex pale white, clypeus on each side with a black spot in male, in female such spot usually absent; pronotum greenish; tegmina with a spot near at the middle, the apical 2/5 portion black. Abdominal sternite with blackish circular patches. **Genitalia** : Male plate (Text-fig. 9A) broad at base, gradually narrowed, with a few long setae from posterior middle half, lateral margin spinulate, without setae; pygofer (Text-fig. 9B) somewhat rectangulate, mesal margin densely spinulate, lateral margin wavy; discal setae sparse, minute, posteromesal margin with a long sharp spur and a few short spurs and with stout spines towards subapical margin. Style (Text-fig. 9C) elongate, flattened, strongly oblique laterally and obliquely truncate at apex. Aedeagus (Fig. 9D) flattened, stout, with three pairs of spurlike superior processes ; connective "Y"- shaped. (Text-fig. 9D), stem moderately long.

**Length** : ♀♀ 4-4.5 mm; ♂ 4 mm.

**Distribution** : India : Orissa (Bhisari, Puri distt.), Bihar, J. & K. state, the Punjab, West Bengal.

**Remarks** : The species occurs in swarms at night during the end of rainy season and is very common in India. It is recorded transmitting tungro and yellow diseases to rice crops. The species is a new record from Orissa.

### SUMMARY

The paper is based upon the collections made by various survey parties of the Zoological Survey of India. It deals with 9 species belonging to 7 genera in 4 subfamilies. 3 species, viz., *Exitianus nanus* (Distant), *Nephotettix virescens* (Fabricius) and *Thomsoniella porrecta* (Walker) are new records from Orissa. For each of 9 species, is given diagnosis based on morphological characters including genitalic armatures. Keys to various taxa are given. Keys to genera and species are chiefly based upon genitalic characters. Besides, synonymic references, measurements, distributional records within the state and elsewhere, biological notes, if any, for each species are also given in the paper.

### ACKNOWLEDGEMENT

The authors are grateful to Professor M. S. Jairajpuri, Director, Zoological Survey of India, Calcutta for Laboratory facilities. Necessary literature help rendered by Dr. B. Datta, Scientist 'SE', Z.S.I. is thankfully acknowledged. Gratitude is expressed Dr. O. B. Chhotani, Scientist 'SF' of the Department for his constructive criticism of the paper.



## REFERENCES

- Atkinson, E.T. 1885. Notes on Indian Rhynchota no. 3. *J. Asiatic Soc. Bengal*, **54** (3) : 91-113.
- Bindra, O.S. & Singh Joginder, 1970. Biology and bionomics of *Orosius albicinctus* Dist., the Jassid Vector of Sesamum phyllody virus. *Indian J. agric Sci.*, **40** (4) : 340-55.
- Datta. B. 1969. On Indian Cicadellidae (Homoptera)-I. *Zool. Anz.*, **182** (5/6) : 391-392.
- Datta. B. 1973. On Indian Cicadellidae (Insecta : Homoptera)-XXII, *Zool. Anz.*, **191** (5/6) : 443-447.
- Datta. B. & Ghosh L. K. 1973. Three new species of Typhlocybininae (Homoptera : Cicadellidae) from the Himalayan Region. *Zool. Anz.*, **191** (5/6) : 415-419.
- Datta. B. & Dhar, M. 1984. On some collections of cicadellids (Homoptera : Cicadellidae). *Bull. Zool. Surv. India.*, **6** (1-3) : 181-207.
- Distant, W. L. 1908. *Fauna Brit. India, Rhynchota* (Homoptera) Taylor and Francis, London, Vol. iv : 157-414
- Distant. W. L. 1916. *Fauna Brit. India., Rhynchota* (Homoptera), VI : 217-40.
- Distant, W. L. 1918. *Fauna Brit. India, Rhynchota*, VII : 1-109.
- Dworakowska, I. 1977. On some North Indian Typhlocybininae (Homoptera, Auchenorrhyncha, Cicadellidae). *Reichenbachia*, **16** (29) : 283-306.
- Ghauri, M.S.K. 1963a. New fig leaf hoppers (Homoptera : Cicadelloidea) from India with redescription of allied species under new genera. *Ann. Mag. nat. Hist.*, **6** : 465-75.
- Ghauri, M.S.K. 1963b. A new genus based on *Orosius maculata* and generic reassignment of Pruthi's species of Cicadelloidea (Auchenorrhyncha : Homoptera). *Ann. Mag. nat. Hist.*, **6** : 559-563.
- Ghauri, M.S.K. 1966. Revision of the genus *Orosius* Distant (Homoptera : Cicadelloidea). *Bull. Br. Mus. nat. Hist. Ent.*, **18** (7) ; 231-252.
- Ghauri, M.S.K. 1967. New mango leafhopper from the Oriental and Austro-Oriental regions (Homoptera : Cicadelloidea). *Proc. R. ent. Soc. London. (B)* : **36** (11-12) : 159-166.
- Ghauri, M.S.K. 1975. A new genus and species of Idiocerine leafhopper (Cicadelloidea, Auchenorrhyncha, Homoptera) on pear tree from Simla. *Novu. Rev. Ent.*, **5** : 287-290.
- Ishihara, T. 1969. Families and genera of leaf-hopper vectors. *In viruses, vectors and vegetation edited by K. Maramorosch, John Wiley and sons* : 235-254.
- Malhotra, Y. R. & Sharma, Baldev 1974. A new species of *Litura* from Jammu, India (Homoptera ; Cicadellidae). *Oriental Ins.*, **11** (1) : 27-29.
- Malhotra, Y. R. & Sharma, Baldev 1977. Key to identification of common leaf-hopper (Homoptera : Cicadellidae) of Jammu Division of J. & K. State. *Off Prints from the University Review* : 1-19.
- Pruthi, H. S. 1930. Studies on Indian Jassidae (Homoptera) Part I. Introductory and description of some new genera and species. *Mem. Indian Mus.*, **II** (1) : 1-68.

- Pruthi, H.S. 1934. Studies on Indian Jassidae (Homoptera) Part II. Description of the genotypes of some of the genera founded by W.L. Distant with a revision of the genus *Moonia* Distant. *Mem. Indian Mus.*, 11 (2) : 69-99.
- Pruthi, H. S. 1936. Studies on Indian Jassidae (Homoptera) part III. Description of some new genera and species, with first records of some known species from India. *Mem. Indian Mus.* 11 (3) : 101-131.
- Pruthi, H. S. 1940. Description of some new species of *Empoasca* Walsh (Eupterygidae, Jassoidea from North India. *India J. Ent.*, 2 (1) : 1-9.
- Ramakrishna, U & Menon, M. G. R. 1972. Studies on Indian Typhlocybinæ (Homoptera : Cicadellidae) 3. Three new genera with four new Typhlocybini. *Oriental Ins.*, 6 (1) : 111-129.
- Ramakrishna, U. & V, M. G. R. 1973. Studies on Indian Typhlocybinæ (Homoptera : Cicadellidae) 4. Seven new genera with fourteen new species of Erythroneurini. *Oriental Ins.*, 7 (1) : 15-48.
- Ramakrishna, U. & V, M. G. R. 1974. Studies on Indian Typhlocybinæ (Homoptera : Cicadellidae) 5. The tribe of Erythroneurini. *Oriental Ins.*, 8 (4) : 433-455.
- Singh, S. 1969. Fifteen new species of Jassids (Cicadellidae) from Himachal Pradesh and Chandigarh.- *Res. Bull. (N.S.) Punjab University*, 20 : 339-361.
- Sohi, A.S. 1972. *Cestius (cestius) indicus* new species (Homoptera : Cicadellidae) from Punjab, India, *Oriental Ins.*, 6 (1) 131-132.
- Sohi, A. S. 1977. New genera and species of Typhlocybinæ from India. *Oriental Ins.*, 11 (3) : 347-362.
- Viraktamath, C. A. 1976. Four new species of Idiocerine Leafhoppers from India with a note on male *Balocha astuta* (Melichar) (Homoptera : Cicadellidae : Idiocerinae). *Mysore J. agric, Sci.*, 10 : 234-244.

**INSECTA: LEPIDOPTERA : HETEROCERA : NOCTUIDAE**

D.K. MANDAL and D. R. MAULIK

*Zoological Survey of India, Calcutta.*

**INTRODUCTION**

The Noctuidae is one of the very large moth families found in varied niches. Basically of nocturnal habit, their food plants are of varied types (Nyar, *et al*, 1976). Twenty-five species in all are so far recorded from only the Ganjam district of southern Orissa (Cotes and Swinhoe, 1887-'89; Hampson, 1894, 1895, 1903, 1905, 1908, 1909, 1910, 1912, 1913a, 1913b, 1926; Kapur and Arora, 1971).

The present work deals with the study of material of forty-three species collected from different districts of Orissa by various scientists of the Zoological Survey of India. The species reported earlier from Ganjam, but not available in the present collections, are reviewed from literature. The hitherto unknown male of *Bocula hypenoides* (Moore) is described. The classification of Hampson (*loc.cit.*), as modified for certain species under different subfamilies after Warren (1910, 1911, 1913), Kostrowicki (1961), Ramamani and Subba Rao (1965) and Kapur and Arora (*loc. cit.*), has been followed here.

**SYSTEMATIC ACCOUNT**

Family NOCTUIDAE

Subfamily (i) MELICLEPTRIINAE

**1. *Adisura marginalis* (Walker)**

1857. *Anthophila marginalis* Walker, *Cat.Lép.Het. Brit.Mus.*, 12 : 830.

1903. *Adisura marginalis* : Hampson, *Cat-Lép. Phal. Brit. Mus.*, 4 : 121, pl. 58, fig. 27.

*Material examined* : 2 ♂♂, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party coll.

*Wing expanse* : 36 mm (24-30 mm, *vide* Hampson, 1903).

*Distribution* : INDIA : Orissa (Districts Sundargarh and Ganjam), West Bengal, Sikkim, Punjab and Tamil Nadu. Elsewhere : Thailand and Ambon Island.

*Remarks* : The species, typical of the tropical Orient, was earlier known from Ganjam. While Hampson (1903) had put the genus under Agrotinae, Warren (1911) considered it under the subfamily as adopted here.

Subfamily (ii) AGROTINAE

**2. *Agrotis spinifera* (Hübner)**

1827. *Noctua spinifera* Hübner, *Samm. Eur. Schmett.*, Noct., fig.389.

1971. *Agrotis spinifera* : Kapur and Arora, *Rec. zool. Surv. India*. 65 (1-4) : 107, figs. 1c, 2d, 6a-d.

*Material examined* : One ♂, 1 ♀, Sambalpur (Dist. Sambalpur), 3.x.1972, J.M. Julka and party coll.

*Wing expanse* : 30 - 31 mm.

*Distribution* : INDIA : Orissa (Districts Sambalpur and Ganjam); also almost all over the

mainland and Andaman and Nicobar Islands. Elsewhere : All over the Indian subregion and also Africa, Middle-East and Europe.

*Remarks* : The species, earlier known from Ganjam, also occurs in Sambalpur.

### 3. *Agrotis ypsilon* (Rottenburg)

1776. *Noctua ypsilon* Rottenburg, *Naturf.*, 11 : 141.

1971. *Agrotis ypsilon* : Kapur and Arora, *Rec. zool. Surv.India*, 65 (1-4) : 112, pl. I, fig. 3; figs. Id, 2e-g, 8a-d.

*Material examined* : One ♀, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party coll; 1 ♀, Keyney (Dist. Cuttack), 1 ♀, Bio-Fishery Research Institute (Dist. Puri), 17.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 35-36 mm, (♀♀ 41-48.5/mm, vide Kapur and Arora, 1971).

*Distribution* : INDIA : Orissa (Districts Sundargarh, Cuttack and Puri, new record), West Bengal, Bihar, Sikkim, Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh and Punjab. Elsewhere : Pakistan and Sri Lanka in the Indian subregion, Tibet, and China in the Chinese subregion and Java in the Malayan subregion of the Oriental and also Australo-Papuan, Ethiopian, Palaearctic, Hawaiian, Nearctic and Neotropical Regions.

### 4. *Agrotis flammatra* (Schiffer-miiler)

1776. *Noctua flammatra* Schiffer-Miiler, *Wien.Verz.* : 80.

1971. *Agrotis flammatra* : Kapur and Arora, *Rec. zool.Surv. India*, 65 (1-4) : 116, pl.I, fig.4;figs. 1e,2h-j,9a-e.

*Distribution* : INDIA: Orissa (District Ganjam, earlier record) and almost all over the mainland; also Andaman and Nicobar Islands. Elsewhere : Pakistan, Nepal and Bhutan in Indian subregion and Tibet in the Chinese subregion of the Oriental and also Palaearctic and Neotropical Regions.

## Subfamily (iii) HADENINAE

### 5. *Dasygaster reversa* (Moore)

1884. *Aletia reversa* Moore, *Lép. Ceylon*, 3 : 6,pl.144,fig. 5.

1905. *Dasygaster reversa* : Hampson, *Cat. Lép. Phal.Brüt. Mus.*, 5 : 477, fig. 144.

*Distribution* : INDIA : Orissa(District Ganjam, earlier record); also rest of eastern and southern Peninsula and East to West Himalaya. Elsewhere : Southern Burma, Sri Lanka and Australo-Papua.

### 6. *Hyphilare loreyi* (Duponche)

1827. *Noctua loreyi* Duponchel, *Hist. nat. Lép. Fr.*, 7 : 81, pl. 105, fig. 7 (nec *Leucania*, 4 : Mandal, 1984).

1910. *Hyphilare loreyi* : Warren, *In Seitz, Macrolep.World*, 1 (3) : 96, pl.23 e,f.

*Material examined* : One ♀, Jaipur (Dist. Koraput), 19.iii. 1972, K.V.S. Rao and party coll.

*Wing expanse* : 32mm (34-44mm,vide Hampson, 1905).

*Distribution* : INDIA:Orissa (District Koraput), Himachal Pradesh, Uttar Pradesh, Punjab, Madhya Pradesh, Karnataka and Tamil Nadu. Elsewhere: Pakistan and Southern Burma in Indian subregion, Taiwan in Chinese subregion and Java and Philippines in Malayan subregion of Oriental and also Australian, Ethiopian and Palaearctic Regions.

*Remarks* : A new record for Orissa, the species was not hitherto known from the eastern

Peninsula of India. It was also recorded for the first time from the western Garhwal Himalaya of Uttar Pradesh (Mandal, 1984).

### 7. *Cirphis compta* (Moore)

1881. *Leucania compta* Moore, *Proc. zool. Soc. Lond.*, 1881: 336, pl. 37, fig. 8.

1905. *Cirphis compta* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 5 : 531.

*Distribution* : INDIA: Orissa (Dist. Ganjam, earlier record), Karnataka and Tamil Nadu. Elsewhere: Southern Burma, Sri Lanka, Singapore and Borneo. Restricted to the tropical Orient.

### 8. *Pseudaletia separata* (Walker)

1865. *Leucania separata* Walker, *Cat. Lép. Het. Brit. Mus.*, 32 : 626.

1965. *Pseudaletia separata* : Ramamani and Subba Rao, *Indian J. Ent.*, 27 (3) : 363.

*Material examined* : One ♀, Keonjhar (Dist. Keonjhar), 26.ix.1972, K. Rai and party coll.

*Wing expanse* : 44 mm.

*Distribution* : INDIA: Orissa (District Keonjhar, new record), West Bengal, Bihar, Sikkim, Assam, Meghalaya, Manipur, Tripura, (first record by Mandal and Ghosh, *in press*), Jammu and Kashmir, Himachal Pradesh, Punjab, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu and Kerala. Elsewhere: Pakistan, Bhutan, Burma, Sri Lanka, Java and China of Oriental and also Australo-Papuan, Ethiopian, Palearctic, Nearctic and Neotropical Regions.

Subfamily (iv) AMPHIPYRINAE  
(=Acronyctinae, pt., *vide* Hampson, 1908-'10)

### 9. *Prospalta capensis* (Guenée)

1852. *Apamea capensis* Guenée, *Spec. Gen. Lép. Noct.*, 1 : 213.

1911. *Prospalta capensis* : Warren, *In Seitz, Macrolep. World*, 1 (3) : 219, pl. 18 k.

*Material examined* : One ♀, Asana (Dist. Mayurbhanj), 16. viii. 1972, S.K. Mitra and party coll.

*Wing expanse* : 32 mm.

*Distribution* : INDIA : Orissa (District Mayurbhanj, new record), West Bengal, Sikkim, Nagaland, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Kerala, Andaman and Nicobars (Andaman Is.). Elsewhere : Burma, Sri Lanka, Western Malaysia, Sundaland, Philippines, China and Southern Yemen of Oriental and also Australo-Papuan, Ethiopio-Malagassic and Palearctic Regions.

### 10. *Iambia thwaitesi* (Moore)

1884. *Methorasa thwaitesi* Moore, *Lép. Ceylon*, 3 : 61, pl. 151, fig. 2.

1908. *Iambia thwaitesi* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 7 : 656, fig. 167.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record), North-West Himalaya and Karnataka. Elsewhere : Sri Lanka of Oriental and also Ethiopian Regions.

### 11. *Iambia rufescens* (Hampson)

1894. *Caradrina rufescens* Hampson, *Fauna Brit. India, Moths*, 2 : 263.

1908. *Iambia rufescens* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 7 : 658, pl. 123, fig. 6.

*Distribution* : India : Orissa (District Ganjam earlier record). Apparently endemic in Orissa.

### 12. *Pariambia pulla* (Swinhoe)

1885. *Acontia pulla* Swinhoe, *Proc. zool. Soc. Lond.*, 1885 : 456, pl. 27, fig. 15.

1910. *Pariambia pulla* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 9 : 519.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record), West Bengal, Himachal Pradesh, Uttar Pradesh, Punjab, Maharashtra and Tamil Nadu. Elsewhere : Sri Lanka of Indian subregion only.

### 13. *Delta intermedia* (Bremer)

1864. *Cloantha intermedia* Bremer, *Lép. Ost. Sib.*: 53, pl. 5, fig. 13.

1909. *Delta intermedia* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 8 : 192, fig. 37.

*Material examined* : One ♀, Sundargarh (Dist. Sundargarh). 25.x.1972, J.M. Julka and party coll.

*Wing expanse* : 32 mm.

*Distribution* : INDIA: Orissa (District Sundargarh), new record, Sikkim, Jammu and Kashmir, Himachal Pradesh and Tamil Nadu. Elsewhere: Sri Lanka of Oriental and also Ethiopian and Palaearctic Regions. Hitherto remained unrecorded from eastern Peninsula of India .

### 14. *Prodenia litura* (Fabricius)

1775. *Noctua litura* Fabricius, *Syst. Ent.*: 601.

1909. *Prodenia litura* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 8 : 245.

*Material examined* : 4 ♂♂, 2 ♀♀, Baripada (Dist. Mayurbhanj), 5.viii.1972, S.K. Mitra and party coll.; 1 ♂, Dhenkanol (Dist. Dhenkanol), 5.xii.1972, K. Rai and party coll.; 1 ♂, Tapta pani (Dist. Ganjam), 14.iii.1974, R.K. Kacker and party coll.; 1 ♂, Jaipur (District Koraput), 19.iii.1972, K.V.S. Rao and party coll.

*Wing expanse* : ♂ ♀ 36 40 mm.

*Distribution* : INDIA: Orissa (Districts Mayurbhanj, Dhenkanol, Koraput and Ganjam, new record), Sikkim, Tripura (First record, *vide* Mandal and Ghosh, *in press*), Himachal Pradesh, Uttar Pradesh, Punjab, Maharashtra, Karnataka, Tamil Nadu and Kerala. Elsewhere: Nepal, Southern Burma, Sri Lanka, Singapore, Borneo, Java and Taiwan of Oriental and also Australo-Papuan, Ethiopian, Palaearctic and Hawaiian Regions. Hitherto remained unknown from the eastern peninsula of India.

### 15. *Spodoptera pecten* Guenée

1852. *Spodoptera pecten* Guenée, *Hist. nat. Ins. Léop., Noct.*, 1 : 155.

1909. *Spodoptera pecten* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 8 : 252, fig. 63.

*Material examined* : One ♂, Central Rice Research Institute (Dist. Cuttack), 21. xii.1970, S. Khera and party coll.

*Wing expanse* : 28 mm.

*Distribution* : INDIA: Orissa (District Cuttack, new record), West Bengal, Sikkim and Nagaland. Elsewhere: Southern Burma, Taiwan, Perak, Singapore, Borneo and Java of Oriental and also Palaearctic Regions.

### 16. *Spodoptera mauritia* (Boisduval)

1833. *Hadena mauritia* Boisduval, *Fauna Ent. Madag. Léop.* : 92 pl. 13, fig. 9.

1909. *Spodoptera mauritia* : Hampson, *Cat. Lep. Phal. Brit. Mus.*, 8 : 256, fig. 66.

*Material examined* : One ♂, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party

coll.; 1 ♂, 1 ♀, Asana (Dist Mayurbhanj), 16.viii. 1972, S.K. Mitra and party coll.; 2 ♂♂, 3 ♀♀, Silwan (Dist. Keonjhar), 25.ix. 1972, K. Rai and party coll., 2 ♀♀, Central Rice Research Institute, (Dist. Cuttack), 22.xii. 1970, S. Khera and party coll.; 1 ♀ Bio-Fishery Research Unit (Dist. Puri), 17.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 32 40 mm.

*Distribution* : INDIA : Orissa (Districts Sundargarh, Mayurbhanj, Keonjhar, Cuttack and Puri, new record), West Bengal, Himachal Pradesh, Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra, Tamil Nadu, Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Pakistan, Southern Burma, Sri Lanka, Western Malaysia, Borneo, Java and Philippines of Oriental and also Australo-Papuan, Ethiopio-Malagassic and Hawaiian Regions.

### 17. *Laphygma exigua* (Hübner)

1808. *Noctua exigua* Hübner, *Eur. Schmett., Noct.* : 362.

1909. *Laphygma exigua* : Hampson, *Cat. Lep. Phal. Brit. Mus.*, 8 : 265, fig. 68.

*Material examined* : One ♂, Baripada (Dist. Mayurbhanj), 5.viii.1972, S.K. Mitra and party coll.

*Wing expanse* : 26 mm.

*Distribution* : INDIA : Orissa (District Mayurbhanj, new record), Sikkim, Tripura (First record, *vide* Mandal and Ghosh, *in Press*), Himachal Pradesh, Uttar Pradesh, Punjab and Tamil Nadu. Elsewhere : Southern Burma and Sri Lanka of Oriental and also Australian, Ethiopian, Palaearctic and Hawaiian Regions. Hitherto remained unrecorded from the eastern Peninsula of India.

### 18. *Athetis obtusa* (Hampson)

1891. *Caradrina obtusa* Hampson, *Ill. Het. Brit. Mus.*, 8 : 79, pl. 145, fig.6.

1909. *Athetis obtusa* : Hampson, *Cat. Lep. Phal. Brit. Mus.*, 8 : 344.

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record) and Tamil Nadu. Elsewhere: Southern Burma, Borneo and Hong Kong of Oriental and also Australia Regions.

### 19. *Athetis cognata* (Moore)

1882. *Graphiphora cognata* Moore, *Lep. Atk.* : 119.

1909. *Athetis cognata* : Hampson, *Cat. Lep. Phal. Brit. Mus.*, 8 : 347, pl. 130, fig. 16.

*Material examined* : One ♂, Baripada (Dist. Mayurbhanj), 5.viii.1972, S.K. Mitra and party coll.

*Wing expanse* : 19 mm (22mm, *Vide* Hampson, 1909).

*Distribution* : INDIA: Orissa (Dist. Mayurbhanj, new record). Sikkim, Madhya Pradesh, Maharashtra and Tamil Nadu. A typical Indian species hitherto remained unrecorded from eastern Peninsula.

## Subfamily (v) ERASTRIANAE

### 20. *Eublemma dimidialis* (Fabricius)

1794. *Phalaena dimidialis* Fabricius, *Ent. Syst.*, 3 (2) : 224.

1910. *Eublemma dimidialis* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 10 : 797.

*Distribution* : INDIA : Orissa (Dist. Ganjam, Earlier record), West Bengal, Andaman and Nicobar Islands (Andaman Is.). Elsewhere : Sri Lanka, China and Java of Oriental and also Australo-Papuan and Palaearctic Regions.

**21. Eublemma quadrilineate (Moore)**

1881. *Thalpocharis quadrilineata* Moore, *Proc. zool. Soc. Lond.*, 1881: 370, pl. 38, fig. 14.

1910. *Eublemma quadrilineata* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 10 : 79, fig. 37.

*Distribution* : INDIA:Orissa (Dist. Ganjam, earlier record), West Bengal and Uttar Pradesh. Elsewhere: Pakistan of Oriental and also Australian, Ethiopian and Palaeartic Regions.

**22. Eublemma anachoresis (Wallengren )**

1863. *Xanthoptera anachoresis* Wallengren, *Wien. Ent. Monat.*, 7 : 148.

1910. *Eublemma anachoresis* Hampson, *Cat. Léop. Phal. Brit. Mus.*, 10 : 131.

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record), West Bengal, Sikkim, Uttar Pradesh, Maharashtra, Andaman and Nicobar Islands (Andaman Is.). Elsewhere : Sri Lanka and Java of Oriental and also Australian and Ethiopian Regions.

**23. Lophorufa lunifera (Moore)**

1885. *Mestleta lunifera* Moore, *Lép. Ceylon*, 3 : 209, pl. 175, fig. 3.

1910. *Lophorufa lunifera* : Hampson, *Cat Léop. Phal. Brit. Mus.*, 10 : 227.

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record); also northern and southern Peninsula. Elsewhere : Sri Lanka of Oriental Region. Restricted in the Indian subregion.

**24. Erastroides curvifascia (Hampson)**

1891. *Ozarba curvifascia* Hampson, *III. Het. Brit. Mus.*, 8 : 76, pl. 145, fig. 23.

1910. *Erastroides curvifascia* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 10 : 496.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record), Karnataka and Tamil Nadu. Elsewhere : Southern Burma. Restricted to the Indian subregion.

**25. Tarache sp.**

*Material examined* : One ♀, Sundargarh (Dist. Sundargarh), 25.x.1972, J.M. Julka and party coll.

*Wing expanse* : 24 mm.

*Remarks* : This indetermined species is closely allied to *T. basifera* (Walker) from West Himalaya and all but the eastern Peninsula of India and also Burma, but differs from the latter by the fore wing suffused with grey-brown and costal area distinctly strigated.

**Subfamily (vi) EUTELIANAE****26. Bombotelia jocosatrix (Guenée)**

1852. *Penicillaria jocosatrix* Guenée, *Hist. nat., Ins. Léop., Noct.*, 2 : 304.

1912. *Bombotelia jocosatrix* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 11, fig. 6.

*Material examined* : One ♀, reared at the Central Rice Research Institute Laboratory (Dist. Cuttack), 23.xii.1970, S.Khera and party.

*Wing expanse* : 30 mm.

*Distribution* : INDIA : Orissa (District Cuttack, new record), Sikkim, Karnataka and Tamil Nadu. Elsewhere : Sri Lanka and Java of Oriental and also Australian Regions. Remained hitherto unrecorded from eastern Peninsula of India.



**27. *Eutelia favillatrix* Walker**1858. *Eutelia favillatrix* Walker, *Cat. Léop. Het. Brit. Mus.*, 15 : 1778.1912. *Eutelia favillatrix* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 45, fig. 18.*Material examined* : 2 ♂♂, Titillagarh (Dist. Bolangir), 14.xi.1972, J.M. Julka and party coll.*Wing expanse* : 28 30 mm.*Distribution* : INDIA : Orissa (District Bolangir, new record), Sikkim, Assam, Himachal Pradesh, Maharashtra, Tamil Nadu, Kerala, Andaman and Nicobar Islands (Andaman Is.). Elsewhere : Sri Lanka. Remained hitherto unrecorded from eastern Peninsula of India and restricted in the Indian subregion.**28. *Chlumetia transversa* (Walker)**1863. *Nachaba transversa* Walker, *Cat. Léop. Het. Brit. Mus.*, 27 : 114.1912. *Chlumetia transversa* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 68, fig. 25.*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record), West Bengal, Punjab and Maharashtra. Elsewhere : Southern Burma, Sri Lanka, Western Malaysia, Bali, Sulawesi and D'Entrecasteau Island. *Hab. auct.* for type ♀.**29. *Paectes subapicalis* (Walker)**1837. *Abrostola subapicalis* Walker, *Cat. Léop. Het. Brit. Mus.*, 12 : 833.1912. *Paectes subapicalis* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 116, fig. 43.*Material examined* : One ♀, Keonjhar (Dist. Keonjhar), 26.ix.1972, K. Rai and party coll.*Wing expanse* ; 32 mm.*Distribution* : INDIA : Orissa (District Keonjhar, new record), West Bengal, Sikkim, Meghalaya, Himachal Pradesh, Uttar Pradesh, Punjab and Madhya Pradesh. Elsewhere : Pakistan. Restricted to Indian subregion.

## Subfamily (vii) STICTOPTERINAE

**30. *Odontodes aleuca* Guenée**1852. *Odontodes aleuca* Guenée, *Hist. nat. Ins. Léop. Noct.*, 3 : 51.1912. *Odontodes aleuca* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 145, fig. 49.*Material examined* : One ♂, 1 ♀, Chandrabhaga Beach (Dist. Puri), 17.iii.1973, V.K. Premkumar and party coll.*Wing expanse* : 45 mm.*Distribution* : INDIA : Orissa (Dist. Puri, new record), West Bengal, Sikkim, Assam, Himachal Pradesh, Uttar Pradesh, Punjab, Tamil Nadu, Andaman and Nicobar Islands. Elsewhere : Burma, Sri Lanka and Singapore of Oriental and also Ethiopian Regions.**31. *Lophoptera quadrinotata* (Walker)**1864. *Gadirtha quadrinotata* Walker, *J.Linn. Soc. Zool.*, 7 : 162.1912. *Lophoptera quadrinotata* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 189, pl. 179, fig. 4.*Distribution* : INDIA : Orissa (District Ganjam, earlier record), Sikkim and Meghalaya. Elsewhere : Singapore, Borneo and Buru of Malayan subregion.

## Subfamily (viii) SARROTHRIPINAE

32. *Sarrothripus revayana* (Scopoli)1772. *Tortrix revayana* Scopoli, *Ann. nat.Hist.*, 5 : 116.1912. *Sarrothripus revayana* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 265, fig. 96.

*Distribution* : INDIA: Orissa (District Ganjam, earlier record), Jammu and Kashmir, Himachal Pradesh and Tamil Nadu. Elsewhere : Palaearctic and Nearctic Regions. *Hab. auct.* for types ♂, *favillana* Walk. and ♀♀, *latifasciella* Walk. and *metaspilella* Walk., all synonyms of *S. revayana* ).

33. *Aquis orbicularis* (Walker)1858. *Diomea orbicularis* Walker, *Cat. Léop.Het. Brit. Mus.*, 15 : 1804.1912. *Aquis orbicularis* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 387, fig. 147.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record) and Sikkim. Elsewhere : Sri Lanka, Singapore and Borneo of Oriental and also Papuan Regions.

34. *Barasa acronyctoides* Walker1862. *Barasa acronyctoides* Walker, *J.Linn. Soc. Zool.*, 6: 192.1912. *Barasa acronyctoides* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 389, fig. 148.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record), Karnataka and Tamil Nadu. Elsewhere : Bangladesh, Sri Lanka, Western Malaysia, Borneo and Sulawesi of Oriental Region.

35. *Risoba repugnans* (Walker)1856. *Thyatria repugnans* Walker, *Cat. Léop. Het. Brit. Mus.*, 9 : 9.1912. *Risoba repugnans* : Hampson, *Cat. Lep. Phal. Brit. Mus.*, 11: 426.

*Material examined* : One ♀, Tapta Pani (Dist. Ganjam), 15. iii. 1974, R.K. Kacker and party coll.

*Wing expanse* : 33 mm (36-40 mm, *vide* Hampson, 1912).

*Distribution* :INDIA : Orissa (District Ganjam, new record), Punjab, Maharashtra and Tamil Nadu. Elsewhere: Sri Lanka and Philippines of Oriental Region. Hitherto remained unrecorded from eastern Peninsula of India.

## Subfamily (ix) ACONTIANAE

36. *Earias fabia* (Stoll)1782. *Noctua fabia* Stoll, in Cramer, *Pap. Exot.*, 4 : pl.355, fig.H.1912. *Earias fabia* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 507.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record), West Bengal, Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra, Tamil Nadu, Andaman and Nicobar Islands (Andaman Is.) Elsewhere: Pakistan, Southern Burma, Sri Lanka and Java of Oriental and also Australian and Palaearctic Regions.

37. *Acontia intersepta* (Guenée)1852. *Xanthodes intersepta* Guenée, *Hist. nat. Ins. Léop., Noct.*, 2 : 212.1912. *Acontia intersepta* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 11 : 656, fig. 270.

*Material examined* : One ♂, Sundargarh (Dist.Sundargarh), 26.x.1972, J.M. Julka and party coll.

*Wing expanse* : 40 mm.

**Distribution** : INDIA : Orissa (District Sundargarh, new record), West Bengal, Sikkim, Assam, Himachal Pradesh, Andaman and Nicobar Islands. Elsewhere : Bangladesh, Southern Burma, Sri Lanka, Thailand, Java, Sulawesi, Philippines and Taiwan of Oriental and also Palaearctic Regions.

Subfamily (x) CATOCALINAE

38. *Entomogramma torsa* Guenée

1852. *Entomogramma torsa* Guenée, *Hist. nat. Ins. Lép., Noct.*, 3 : 204.

1913a. *Entomogramma torsa* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 314, fig. 53.

**Material examined** : One ♂, 1 ♀, Jaipur (Dist. Koraput), 19.iii.1972, K.V.S. Rao and party coll.

**Wing expanse** : 56 - 58 mm.

**Distribution** : INDIA : Orissa (District Koraput, new record), Assam, Punjab, Karnataka and Tamil Nadu. Elsewhere: Sri Lanka and Java of Oriental and also Australian Regions. Hitherto remained unrecorded from eastern Peninsula of India.

39. *Speiredonia suffumosa* Guenée

1852. *Speiredonia suffumosa* Guenée, *Hist. nat. Ins. Lép., Noct.*, 3 : 195.

1913a. *Speiredonia suffumosa* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 354.

**Material examined** : one ♀, Berbera (Dist. Puri), 20. vii.1973, A.K. Mandal and party coll.

**Wing expanse** : 67 mm.

**Distribution** : INDIA : Orissa (District Puri, new record), West Bengal, Sikkim, Assam, Meghalaya, Himachal Pradesh, Punjab, Haryana, Madhya Pradesh, Karnataka, Tamil Nadu, Kerala, Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Bangladesh, Southern Burma, Sri Lanka, Java and Philippines of Oriental and also Palaearctic Regions.

40. *Lagoptera dotata* (Fabricius)

1794. *Noctua dotata* Fabricius, *Ent. Syst.*, 3 (2) : 55.

1913a. *Lagoptera dotata* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 418, fig. 97.

**Material examined** : One ♂, Deogarh (Dist. Sambalpur), 9.vi.1972, 2 ♂♂, Dhunakhamund village (Dist. Bolangir), 23.vi.1972, D.P. Sanyal and party coll.

**Wing expanse** : 70 - 75 mm.

**Distribution** : INDIA : Orissa (Districts Bolangir, Sambalpur and Ganjam), West Bengal, Sikkim, Assam, Meghalaya, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu and Kerala. Elsewhere : Southern Burma, Sri Lanka, Singapore and Taiwan of Oriental and also Palaearctic Regions.

**Remarks** : The species, earlier known from Ganjam, also occurs in other districts of Orissa, as mentioned above.

41. *Anua coronata* (Fabricius)

1775. *Noctua coronata* Fabricius, *Syst. Ent.* : 596.

1913a. *Anua coronata* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 427, fig 101.

**Material examined** : One ♂, 1 ♀, Sundargarh (Dist. Sundargarh), 24.x.1972, J.M. Julka and party coll.; 4 ♂♂, 1 ♀, Dhenkanol (Dist. Dhenkanol), 5.x.1972, K. Rai and party coll.

**Wing expanse** : 73 - 90 mm.

**Distribution** : INDIA : Orissa (Districts Sundargarh and Dhenkanol, new record; also Ganjam, earlier record), West Bengal, Sikkim, Assam, Himachal Pradesh, Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra, Tamil Nadu, Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Nepal, Bangladesh, Southern Burma, Sri Lanka, Western Malaysia, Java and Philippines of Oriental and also Australian and Malagassic Regions.

#### 42. *Anua tirhaca* (Cramer)

1780. *Noctua tirhaca* Cramer, *Pap. Exot.*, 2 : 116, pl. 172, fig. E.

1913a. *Anua tirhaca* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 431, fig. 102.

**Material examined** : One ♂, reared at the Central Rice Research Institute Laboratory (Dist. Cuttack), 23.xii.1970, S.Khera and party.

**Wing expanse** : 62 mm (66-80 mm, *vide* Hampson, 1913a).

**Distribution** : INDIA : Orissa (District Cuttack, new record), West Bengal, Sikkim, Meghalaya, Himachal Pradesh, Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra and Tamil Nadu. Elsewhere : Sri Lanka and Philippines of Oriental and also Ethiopio-Malagassic and Palaearctic Regions.

#### 43. *Anua triphaenoides* (Walker)

1858. *Ophiodes triphaenoides* Walker, *Cat. Lép. Het. Brit. Mus.*, 14 : 1358.

1913a. *Anua triphaenoides* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 442, pl. 215, fig. 2.

**Material examined** : One ♀, Dhunakhmund village (Dist. Bolangir), 23.vi.1972, D.P. Sanyal and party coll.; 3 ♂♂, Mayurbhanj (Dist. Mayurbhanj), 13.viii. 1972, S.K. Mitra and party coll.

**Wing expanse** : 62-65 mm (46-60 mm, *vide* Hampson, 1913a).

**Distribution** : INDIA : Orissa (Districts Bolangir and Mayurbhanj, new record), West Bengal, Sikkim, Assam, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Karnataka and Kerala. Elsewhere: Southern Burma, Hong Kong and Taiwan of Oriental and also Palaearctic Regions.

#### 44. *Parallelia illibata* (Fabricius)

1775. *Noctua illibata* Fabricius, *Syst. Ent.*: 592.

1913a. *Parallelia illibata* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 559.

**Material examined** : 2 ♂♂, Sundargarh (Dist. Sundargarh), 24.x.1972, J.M. Julka and party coll.; 1 ♂, Mayurbhanj (Dist. Mayurbhanj), 13.viii.1972, S.K. Mitra and party coll.

**Wing expanse** : 73-75 mm (64-72 mm, *vide* Hampson, 1913a).

**Distribution** : INDIA: Orissa (Districts Sundargarh and Mayurbhanj, new record), West Bengal, Sikkim, Assam, and Madhya Pradesh. Elsewhere: Bangladesh, Southern Burma, Sri Lanka, Western Malaysia and Hong Kong of Oriental and also Palaearctic Regions.

#### 45. *Parallelia joviana* (Stoll)

1782. *Noctua joviana* Stoll, *in* Cramer, *Pap. Exot.*, 4 : 237, pl. 399, fig. B.

1913a. *Parallelia joviana* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 571, fig. 132.

**Material examined** : 2 ♀♀, Sundargarh (Dist. Sundargarh), 24.x.1972, J.M. Julka and party coll.; 1 ♀, Nandan Kanan Biological Park, (Dist. Cuttack), 27.iii. 1974, R.K. Kacker and party coll.

**Wing expanse** : 43-45mm (50-56mm, *vide* Hampson, 1913a).

**Distribution** : INDIA : Orissa (Districts Sundargarh and Cuttack, new record; also Ganjam, earlier record), West Bengal, Assam, Gujrat, Karnataka, Tamil Nadu, Kerala, Andaman and Nicobar Islands

(Andman Is.). Elsewhere: Southern Burma, Sri Lanka and Java of Oriental and also Australo-Papuan and Palaeartic Regions.

#### 46. *Parallelia conficiens* (Walker)

1858. *Ophiusa conficiens* Walker, *Cat. Lép. Het. Brit. Mus.*, 14 : 1432.

1913a. *Parallelia conficiens* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 586.

*Material examined* : One ♂, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party coll.

*Wing expanse* : 47mm. (54-56mm, *vide* Hampson, 1913a).

*Distribution* : INDIA : Orissa (District Sundargarh, new record), Himachal Pradesh, Uttar Pradesh, Punjab and Maharashtra. Hitherto remained unrecorded from eastern Peninsula of India and restricted to the mainland.

#### 47. *Parallelia algira* (Linnaeus)

1767. *Noctua algira* Linnaeus, *Syst. Nat.*, 12th Ed.: 836.

1913a. *Parallelia algira* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 12 : 596, fig. 133.

*Material examined* : One ♂, Sambalpur (Dist. Sambalpur), 3 x. 1972, J.M. Julka and party coll.

*Wing expanse* : 46 mm.

*Distribution* : INDIA : Orissa (Dist. Sambalpur, new record), Himachal Pradesh, Uttar Pradesh, Punjab, Madhya Pradesh, Gujarat, Maharashtra, Tamil Nadu and Kerala. Elsewhere: Sri Lanka of Oriental and also Ethiopio-Malagassic and Palaeartic Reigons. Hitherto remained unrecorded from eastern peninsular India.

#### 48. *Grammodes geometrica* (Fabricius)

1775. *Noctua geometrica* Fabricius, *Syst. Ent.* : 599.

1913b. *Grammodes geometrica* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 13 : 18, fig. 4.

*Material examined* : One ♀, Central Rice Research Institute (Dist. Cuttack), 22.xii.1970, S. Khera and party coll.; 1 ♂, Berbera (Dist. Puri), 20.vii.1973, A. K. Mandal and party coll.

*Wing expanse* : 36 38 mm.

*Distribution* : INDIA : Orissa (Districts Cuttack and Puri, new record), West Bengal, Sikkim, Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andaman and Nicobar Islands (Andaman Is.). Elsewhere : Bangladesh, Southern Burma, Sri Lanka, Singapore, Java, Pulo Laut and Taiwan of Oriental and also Australian, Ethiopian and Palaeartic Regions.

#### 49. *Chalciope hyppasia* (Cramer)

1779. *Noctua hyppasia* Cramer, *Pap. Exot.*, 3 : 99, pl. 250, fig. E.

1913b. *Chalciope hyppasia* : Hampson, *Cat. Lép. Phal. Brit. Mus.*, 13 : 27.

*Material examined* : One ♂, Sambalpur (Dist. Sambalpur), 10. vi. 1972, D.P. Sanyal and party coll.

*Wing expanse* : 40 mm.

*Distribution* : INDIA : Orissa (District Sambalpur, new record), West Bengal, Meghalaya, Tripura (First record, *vide* Mandal and Ghosh, *in Press*), Himachal Pradesh, Punjab, Uttar Pradesh, Maharashtra, Tamil Nadu, Andaman and Nicobar Islands. Elsewhere: Pakistan, Southern Burma, Sri Lanka, Sumatra, Java, Philippines and Taiwan of Oriental and also Australo-Papuan, Ethiopio Malagassic and Palaeartic Regions.

### 50. *Euclidisea mygdon* (Cramer)

1777. *Noctua mygdon* Cramer, *Pap. Exot.*, 2 : 94, pl. 156, fig.G.

1913b. *Euclidisea mygdon* : Hampson, *Cat. Léop. Phal. Brit.Mus.*, 13 : 42, fig. 10.

*Material examined* : One ♀, Berbera (Dist. Puri), 20.vii. 1973, A. K. Mandal and party coll.; 1 ♂, Gopalpur (Dist. Ganjam), 1. iv. 1973, V.K. Premkumar and party coll.

*Wing expanse* : 30 37 mm.

*Distribution* : INDIA : Orissa (Districts Puri and Ganjam, new record), West Bengal, Sikkim, Assam, Himachal Pradesh, Punjab, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Andaman and Nicobar Islands. Elsewhere: Southern Burma, Sri Lanka, Western Malaysia, Sumatra, Java, Borneo, Hong Kong and Taiwan of Oriental and also Palaearctic Regions.

### 51. *Mocis frugalis* (Fabricius)

1775. *Noctua frugalis* Fabricius, *Syst. Ent.* : 601.

1913b. *Mocis frugalis* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 13 : 87, fig. 23.

*Material examined* : One ♀, Banki (Dist. Sundargarh), 29.iii.1973, T.Sen and party coll.

*Wing expanse* : 42 mm.

*Distribution* : INDIA : Orissa (District Sundargarh, new record), West Bengal, Sikkim, Meghalaya, Himachal Pradesh, Punjab, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andaman and Nicobar Islands. Elsewhere: Pakistan, Bangladesh, Southern Burma, Sri Lanka, Western Malaysia, Sundaland and Taiwan of Oriental and also Australo-Papuan, Ethiopio-Malagassic, Palaearctic and Hawaiian Regions.

### 52. *Mocis undata* (Fabricius)

1775. *Noctua undata* Fabricius, *Syst. Ent.* : 600.

1913b. *Mocis undata* : Hampson, *Cat. Léop. Phal. Brit. Mus.*, 13 : 91, fig. 25.

*Material examined* : One ♂, Bhadrak (Dist. Blasore), 4.x.1974, B.C. Saha and party coll; 1 ♂, Dhenkanol (Dist. Dhenkanol), 5.x.1972, K. Rai and party coll.

*Wing expanse* : 50 mm.

*Distribution* : INDIA : Orissa (Districts Dhenkanol and Balasore, new record), West Bengal, Bihar, Assam, Meghalaya, Tripura (First record, *vide* Mandal and Ghosh, *in Press*), Himachal Pradesh, Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Kerala, Andaman and Nicobar Islands. Elsewhere: Bangladesh, Southern Burma, Sri Lanka, Western Malaysia, Philippines, Sundaland, Taiwan and Hainan of Oriental and also Ethiopio-Malagassic and Palaearctic Regions.

## Subfamily (xi) PHYTOMETRINAE

### 53. *Diachrysia orichalcea* (Fabricius)

1775. *Noctua orichalcea* Fabricius, *Syst. Ent.* : 607.

1961. *Diachrysia orichalcea* : Kostrowicki, *Acta zool. Cracov.*, Cracow, 6 : 385.

*Material examined* : 2 ♂♂, Nandan Kanan Biological Park, (Dist. Cuttack), 27.iii.1974, R. K. Kacker and party coll.

*Wing expanse* : 30 37 mm (38-48 mm, *vide* Hampson, 1913b).

*Distribution* : INDIA : Orissa (District Cuttack, new record), Bihar, Sikkim, Meghalaya, Jammu and Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Tamil Nadu and Kerala. Elsewhere: Pakistan,

Bangladesh, Sri Lanka and Java of Oriental and also Papuan, Ethiopio-Malagassic and Palaearctic Regions.

Subfamily (xii) NOCTUINAE

54. *Cosmophila erosa* Hübner

1818. *Cosmophila erosa* Hübner, *Zutr. Samml. Exot. Schmett.*, 2 : 19, fig. 287.

1913. *Cosmophila erosa*: Warren, *In Seitz, Macrolep. World*, 1 (3) : 360, pl. 66a.

*Material examined* : 2 ♂♂, Bonaigarh (Dist. Sundargarh), 13.ii.1972, P.K. Maiti and party coll.; 1 ♂, reared at the Central Rice Research Institute Laboratory (Dist. Cuttack), 23. xii.1970, S. Khera and party.

*Wing expanse* : 28-30 mm (38 mm, *vide* Hampson, 1894).

*Distribution* : INDIA : Orissa (Districts Sundargarh and Cuttack, new record), West Bengal, Sikkim, Himachal Pradesh, Madhya Pradesh, Maharashtra and Kerala. Elsewhere: Pakistan, Sri Lanka, Java and China of Oriental and also Australian, Ethiopio-Malagassic, Palaearctic, Nearctic and Neotropical Regions.

*Remarks* : Warren (1913) mentioned that the North American form appears to occur throughout the tropics under the name *indica* Guenée which was earlier treated by Hampson (1894) as a species from India and elsewhere.

55. *Pandesma quenavadi* Guenée

1852. *Pandesma quenavadi* Guenée, *Hist. nat. Ins. Lép., Noct.* 2 : 438.

1913. *Pandesma quenavadi* : Warren, *in Seitz, Macrolep. World*, 1 (3) : 367, pl. 67 g.

*Material examined* : One ♂, Bhawanipatna (Dist. Kalahandi), 29.i.1970, K. Rai and party coll.; 1♂, Jaipur (Dist. Koraput), 19.iii.1972, K.V.S. Rao and party coll.

*Wing expanse* : 46 - 48 mm.

*Distribution* : INDIA : Orissa (Districts Kalahandi and Koraput, new record), Jammu and Kashmir, Himachal Pradesh, Punjab, Madhya Pradesh and Maharashtra. Elsewhere: Pakistan and Bangladesh of Oriental Reigon. Hitherto remained unrecorded from eastern Peninsula of India and restricted till date to the Indian subregion.

56. *Baniana lunifera* Hampson

1894. *Baniana lunifera* Hampson, *Fauna Brit. India, Moths*, 2 : 515 (nec Quadrifinae).

*Distribution* : INDIA : Orissa (District Ganjam, earlier record). Apparently endemic in Orissa.

57. *Bocula sejuncta* (Walker)

1856. *Leucania sejuncta* Walker, *Cat. Lép. Het. Brit. Mus.*, 9 : 109.

1926. *Bocula sejuncta* : Hampson, *Descr. new genn. spp. Lép. Phal. Noct. Brit. Mus.*: 227.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record) and Kerala. Elsewhere: Southern Burma of Oriental Reigon. Restricted to the Indian subregion.

58. *Bocula hypenoides* (Moore)

1881. *Cosmia hypenoides* Moore, *Proc. zool. Soc. Lond.*, 1881: 354, pl. 38, fig. 19 (♀, Pareshnath, Bihar, nec "Bengal").

1896. *Bocula hypenoides* : Hampson, *Fauna Brit. India, Moths*, 4 : 533 (♀, Ganjam; nec *Borsippa*, nec *Quadrifinae*).

*Material examined* : One ♂, Nandan Kanan Biological Park (Dist. Cuttack), 27.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 35 mm. (30 mm, ♀, vide Hampson, 1894).

*Distribution* : INDIA : Orissa (Districts Cuttack, new record, and Ganjam, earlier record) and Bihar. Restricted to eastern Peninsula.

*Description of Male* : Ground colour chestnut-red. Antennae shortly bipectinate. Labial palpi black at base, slender and reaching vertex of head, 3rd segment minute. Thorax smoothly scaled; patagia minute and with elongate tuft of scales; a black spot on metathorax; tibiae fringed with hairs; fore wing apex rounded, with indistinct oblique antemedial and medial lines, postmedial line angled beyond cell and a submarginal series of indistinct dark specks; hind wing ventrally with a patch of curved woolly hairs from before middle of costa to Culb, M2 arising from lower angle of cell and, dorsally with a fine ochreous line. Abdomen smoothly scaled and without chitinous cap on the short anal tuft. *Genitalia* (fig. 1a-d): Uncus narrow, progninently curved and pointed at tip; tegumen long and narrow; vinculum "U"-shaped; clasper broad at middle, with distal margin hairy and basal part highly sclerotised; harpe prominent; juxta ventrally sclerotised; aedeagus short and stout, with a row of cornutii and a dorsal elongate process.

*Affinities* : The male, which is similar to the female in general facies, differs from that of *quadrilineata* (Walker) from Sikkim and Borneo and also other allied species mentioned by Hampson (1894, 1896) by the shortly bipectinate antennae, minute patagia, orientation of hind wing woolly hairs and the short anal tuft without chitinous cap.

#### 59. *Azazia rubricans* (Boisduval)

1833. *Ophiusa rubricans* Boisduval, *Fauna Ent. Madag., Lép.*: 106, pl. 16, fig. 1.

1913. *Azazia rubricans* : Warren, in Seitz, *Macrolep. World*, 1 (3) : 381, pl. 69 e-f.

*Material examined* : One ♂, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party coll.; 1 ♂, Keyney, 15.iii., 1 ♂, Nandan Kanan Biological Park, (Dist. Cuttack), 17.iii., 1 ♂, Tapta Pani (Dist. Ganjam), 27.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 35 - 42 mm.

*Distribution* : INDIA : Orissa (Districts Sundargarh, Cuttack and Ganjam, new record), Sikkim, Himachal Pradesh, Maharashtra, Andaman and Nicobar Islands (Andaman Is.). Elsewhere : Pakistan, Sri Lanka and Java of Oriental and also Ethiopain and Palaearctic Regions. Hitherto remained unrecorded from eastern Peninsula of India.

#### 60. *Hypocala deflorata* (Fabricius)

1794. *Noctua deflorata* Fabricius, *Ent. Syst.*, 3 : 472.

1894. *Hypocala deflorata* : Hampson, *Fauna Brit. India, Moths*, 2 : 453, (nec *Quadrifinae*).

*Material examined* : 2 ♀♀, Sundargarh (Dist. Sundargarh), 26.x.1972, J.M. Julka and party coll.; 2 ♀♀, Sambalpur (Dist. Sambalpur), 10.vi.1972, D.P. Sanyal and party coll.; 1 ♂, Central Rice Research Institute, 22.xii.1970, S.Khera and party coll., 1 ♀, Keyney (Dist. Cuttack), 2 ♂♂, Bio-Fishery Unit (Dist. Puri), 17.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 32 - 43 mm.

*Distribution* : INDIA : Orissa (Sundargarh, Sambalpur, Cuttack and Puri, new Record), Sikkim,



North-West Himalaya, Maharashtra, Karnataka and Tamil Nadu. Elsewhere: Sri Lanka of Oriental and also Ethiopian Regions. Hitherto remained unrecorded for eastern Peninsula of India.

#### 61. *Acantholipes trajectus* Walker

1865. *Acantholipes trajectus* Walker, *Cat. Léop. Het. Brit. Mus.*, 33 : 986.

1894. *Acantholipes trajectus* : Hampson, *Fauna Brit. India, Moths*, 2 : 521, fig. 292 (nec *Quadrifinae*).

*Material examined* : One ♂, Deogarh (Dist. Sambalpur), 9. vi.1972, D.P.Sanyal and party coll.

*Wing expanse* : 30 mm.

*Distribution* : INDIA : Orissa (District Sambalpur, new record), Maharashtra and Tamil Nadu. Elsewhere: Sri Lanka and Taiwan of Oriental Region. Hitherto remained unrecorded from eastern Peninsula of India.

#### 62. *Oglasa lagusalis* Walker

1858. *Oglasa lagusalis* Walker, *Cat. Léop. Het. Brit. Mus.*, 16 : 194.

1926. *Oglasa lagusalis* : Hampson, *Descr. new genn. spp. Léop. Phal. Noct. Brit. Mus.* : 217.

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record) and Nagaland. Elsewhere: Borneo of Oriental Region.

#### 63. *Gesonia plumipars* (Hampson)

1891. *Hemipsestra plumipars* Hampson, *Ill. Het.*, 8 : 84, pl.147, fig.23.

1926. *Gesonia plumipars* : Hampson, *Descr. new genn. spp. Léop. Phal. Noct. Brit. Mus.* : 294.

*Distribution* : INDIA : Orissa (District Ganjam, earlier record) and Tamil Nadu. Restricted to India.

#### 64. *Fodina cuneigera* Butler

1889. *Fodina cuneigera* Butler, *Ill. Het.*, 7 : 79, pl.132, fig. 5.

1894. *Fodina cuneigera* : Hampson, *Fauna Brit. India, Moths*, 2 : 530 (nec *Quadrifinae*).

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record), Himachal Pradesh and Tamil Nadu. Restricted to India.

#### 65. *Zethesides hesperioides* (Guenée)

1852. *Zethes hesperioides* Guenée, *Hist. nat. Ins. Léop. Noct.* 3 : 330.

1926. *Zethesides hesperioides* : Hampson, *Descr. new genn. spp. Léop. Phal. Noct. Brit. Mus.* : 594.

*Distribution* : INDIA: Orissa (Dist. Ganjam, earlier record). Elsewhere: Burma of Oriental region. Restricted to Indian subregion.

#### 66. *Egnasia ephyrodalis* Walker

1858. *Egnasia ephyrodalis* Walker, *Cat. Léop. Het. Brit. Mus.*, 16 : 217.

1926. *Egnasia ephyrodalis* : Hampson, *Descr. new genn. spp. Léop. Phal. Noct. Brit. Mus.* : 575.

*Material examined* : One ♂, central Rice Research Institute (Dist. Cuttack), 22.ii.1970, S. Khera and party coll.

*Wing expanse* : 30 mm (38mm. *vide* Hampson, 1895).

*Distribution* : INDIA : Orissa (Dist. Cuttack, new record), Bihar, Assam, Meghalaya, Nagaland and Tamil Nadu. Elsewhere: Bangladesh, Southern Burma and Sri Lanka of Oriental Region. Restricted to Indian subregion.

**67. Egnasia participalis Walker**

1858. *Egnasia participalis* Walker, *Cat. Lép. Het. Brit. Mus.*, 16 : 218.

1895. *Egnasia participalis* : Hampson, *Fauna Brit.India*, Moths, 3 : 16 (nec Focillinae).

*Distribution* : INDIA : Orissa (District Ganjam, earlier record). Elsewhere: Sri Lanka. Restricted to the Indian subregion.

**68. Thiacidias postica Walker**

1856. *Thiacidias postica* Walker, *Cat. Lép. Het. Brit. Mus.*, 5 : 1028 (nec Lymantriidae).

*Material examined* : One ♂, Sundargarh (Dist. Sundargarh), 26.x.1972, 1 ♂, 1 ♀, Sambalpur (Dist. Sambalpur), 3.x.1972, J. M. Julka and party coll.; 2 ♂♂, reared at Central Rice Research Institute Laboratory (Dist. Cuttack), 23.xii.1970, S. Khera and party.

*Wing expanse* : ♂♂, 25-34 mm, ♀, 34 mm (♂ 38 mm, ♀ 44 mm, *vide* Hampson, 1892).

*Distribution* : INDIA : Orissa (Districts Sundargarh, Sambalpur and Cuttack, new record), northern, western and southern Peninsula. Elsewhere: Pakistan, Nepal and Burma of Oriental Region. Hitherto remained unrecorded from eastern Peninsula of India.

*Remarks* : Nyar, et al (1976) referred the moth to the family Noctuidae.

**SUMMARY**

The Paper deals with sixty-eight species in fifty-two genera under twelve subfamilies of Noctuidae from the state of Orissa. Material for forty-three species collected from different localities in twelve districts of the state was available for study, while the remaining twenty-five species are reviewed from literature. Thirty-seven species constitute new records for Orissa, of which as many as sixteen were not even represented from eastern peninsular India. The hitherto unknown male of *Bocula hypenoides* (Moore) is described and genitalia figured.

**ACKNOWLEDGEMENT**

The authors are grateful to the Director, Zoological Survey of India, for kindly providing the laboratory facilities for their work.

**REFERENCES**

- Cotes, E.C. & Swinhoe, C. 1887-89. *Catalogue of Moths of India* : 812 pp. Calcutta.
- Hampson, G.F. 1892. *Fauna of British India, Moths*, 1 : xxiii + 527 pp. London (Taylor & Francis).
- Hampson, G.F. 1894. *Fauna of British India, Moths*, 2 : xxii + 609 pp. London (Taylor & Francis).
- Hampson, G.F. 1895. *Fauna of British India, Moths*, 3 : xxviii + 546 pp. London (Taylor & Francis).
- Hampson, G.F. 1896. *Fauna of British India, Moths*, 4 : xxviii + 594 pp. London (Taylor & Francis).
- Hampson, G.F. 1903. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 4 : xx + 689 pp. London (Taylor & Francis).

- Hampson, G.F. 1905. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 5 : xvi + 634 pp. London (Taylor & Francis).
- Hampson, G.F. 1908. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 7: xv + 709 pp. London (Taylor & Francis).
- Hampson, G.F. 1909. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 8 : xiv + 583 pp. London (Taylor & Francis).
- Hampson, G.F. 1910. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 10 : xix + 829 pp. London (Taylor & Francis).
- Hampson, G.F. 1912. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 11 : xvii + 689 pp. London (Taylor & Francis).
- Hampson, G.F. 1913a. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 12: xiii + 626 pp. London (Taylor & Francis).
- Hampson, G.F. 1913b. *Catalogue of the Lepidoptera Phalaenae in the British Museum*, 13 : xiv + 609 pp. London (Taylor & Francis).
- Hampson, G.F. 1926. *Descriptions of new genera and species of Lepidoptera Phalaenae of the subfamily Noctuinae (Noctuidae) in the British Museum* : 641 pp. London ( Taylor & Francis).
- Kapur, A.P. & Arora, G.S. 1971. Taxonomic studies on some Indian species of the genus *Agrotis* Oschenheimer and allied genera (Noctuidae, Lepidoptera). *Rec. zool. Surv. India*, 65 (1-4) : 89-166, 24 figs., 2 pls.
- Kostrowicki, A.S. 1961. Studies on the Palaearctic species of the subfamily Plusiinae (Lepidoptera, Phalaenidae). *Acta. zool. Cracov.*, 6 : 367-472, 154 figs. Cracow.
- Mandal, D.K. 1984. Account of the Indian Tons Valley Expedition-1972 with an annotated list of species and re-description of *Colias electo fieldi* Ménériés (Order Lepidoptera) from the Indo-Palaearctic Region. *Rec. zool. Surv. India*, Occ. Paper No. 57 : 1-31, 1 map, 1 table.
- Mandal, D.K. & Ghosh, S.K. (*in Press*). On little-known moths of Tripura, India: T.S. pp. 1-57, 2 tables (for *Rec. zool. Surv. India* ).
- Nayar, K., Ananthakrishnan, T.N. & David, B.V. 1976. *General and Applied Entomology* : x + 589 pp. New Delhi.
- Ramamani, S. & Subbarao, B.R. 1965. On the identity and nomenclature of Paddy Cutworm commonly referred to as *Cirphis unipuncta* Haworth. *Indian J. Ent.*, 27 : 363-365, 6 figs. New Delhi.
- Warren, W. 1910. In Seitz, Palaearctic Noctuidiform Phalaenae: Noctuidae. *Macrolepidoptera of the World*, 1 (3): 78-156, pls. Stuttgart.
- Warren, W. 1911. In Seitz, Palaearctic Noctuidiform Phalaenae: Noctuidae. *Macrolepidoptera of the World*, 1 (3) : 157 - 261, pls. Stuttgart.
- Warren, W. 1913. In Seitz, Palaearctic Noctuidiform Phalaenae: Noctuidae. *Macrolepidoptera of the World*, 1 (3) : 284 - 444, pls. Stuttgart.
- Publisher : Zoological Survey of India, Calcutta.**



INSECTA : LEPIDOPTERA : HETEROCERA :  
SPHINGIDAE AND GEOMETRIDAE

D. K. MANDAL and D. R. MAULIK

Zoological Survey of India, Calcutta.

INTRODUCTION

The Sphingidae comprises the robust, strong-flying and nocturnal moths with food habit ranging from oligophagy to polyphagy. The Geometridae, on the other hand, is a very large family of slender, weak-flying and mostly diurnal insects with food habit rather restricted to monophagy. Both the families prefer tropico-temperate wet forests amidst hills and mountains to the open grasslands and dry plains. Only two species of Sphingidae, one each from the Balasore and Ganjam districts, and five of Geometridae from Ganjam were recorded by Cotes and Swinhoe (1887) and Hampson (1895).

The present work is based on the Hampsonian system revised by Bell and Scott (1937) for the Sphingidae and Prout (1912, 1912a, 1913, 1915, 1934) for the Geometridae. It deals with the systematic account of nineteen species including seven of the former family and five of the latter collected from different districts of the state. The remaining species of both the families, the material of which is not available for study, are reviewed from literature.

SYSTEMATIC ACCOUNT

Family I SPHINGIDAE

Group SPHINGIDAE-ASEMANOPHORAE

Subfamily ACHERONTIINAE

Tribe Acherontiini

1. *Acherontia lachesis* (Fabricius)

1798. *Sphinx lachesis* Fabricius, *Ent-Syst., Suppl.* : 434.

1937. *Acherontia lachesis* : Bell and Scott, *Fauna Brit. India, Moths*, 5 : 55, figs. 9A, B, pl. I, figs. 1, 2, pl. VII, fig. 8, pl. XII, fig. 1.

*Distribution* : INDIA : Orissa (District Balasore); throughout the rest of Peninsula, East and West Himalaya and Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Pakistan, Bhutan, Bangladesh, Burma, Sri Lanka, China and South Moluccas.

*Remarks* : The species is known only from Balasore and reportedly common in hills and forests of the tropical Orient and fowls bee-hives. The moth measures 92-134 mm in expanse (Hampson 1892, Bell and Scott 1937).

2. *Acherontia styx styx* (Westwood)

1848. *Sphinx (Acherontia) styx* Westwood, *Cab.Or.Ent.* : 88, pl. 42, fig. 3.

1937. *Acherontia styx styx* : Bell and Scott, *Fauna Brit. India, Moths*, 5 : 58, figs. 9C-E, pl. VIII, figs. 1, 2.

party coll.

*Wing expanse* : 122 mm.

*Distribution* : INDIA : Orissa (District Sundargarh) and throughout the rest of Peninsula and East to West Himalaya. Elsewhere: Pakistan, Bhutan, Bangladesh, Burma, Sri Lanka and Malaya.

*Remarks* : The moth is known to be very common in open country also desert localities. It is a serious pest of *Sesum indicum* (Pedaliaceae).

### 3. *Herse convolvuli convolvuli* (Linnaeus)

1758. *Sphinx convolvuli* Linnaeus, *Syst. Nat.*, 1 (10th ed.) : 490.

1937. *Herse convolvuli convolvuli* : Bell and Scott, *Fauna Brit. India*, Moths, 5 : 61, figs. 10 A-D, pl. IX, figs. 1-7.

*Material examined* : One ♂, 1 ♀, Nandan Kanan Biological Park (Dist. Cuttack), 23.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 84 108 mm.

*Distribution* : INDIA: Orissa (Dist. Cuttack, new record); also throughout the rest of Peninsula and East to West Himalaya. Elsewhere: Pakistan, Burma, Sri Lanka, China, Malaya, Africa, U.S.S.R. and Europe.

*Remarks* : The subspecies is known to be common up to c 2130 metres. It feeds on tubular flowers with its extremely long proboscis. It is also known to devastate cultivated pulses (*Phaseolus* spp.).

Subfamily SPHINGINAE

Tribe Sphingini

### 4. *Psilogramma menephron menephron* (Cramer)

1780. *Sphinx menephron* Cramer, *Pap. Exot.*, 3 : 164, pl. 285, fig. A.

1937. *Psilogramma menephron menephron* : Bell and Scott, *Fauna Brit. India*, Moths, 5 : 77, figs. 13 A-F, pl. I, figs. 4, 5, pl. VIII, fig. 5, pl. XIII, fig. 2.

*Material examined* : 2 ♂♂, Keonjhar (Dist. Keonjhar), 20.ix. 1972, K. Rai and party coll.

*Wing expanse* : 100 115 mm.

*Distribution* : INDIA: Orissa (District Keonjhar, new record); also throughout the rest of Peninsula and East and West Himalaya. Elsewhere: Bangladesh, Burma, Sri Lanka, China and the Solomon Islands.

*Remarks* : The subspecies is reportedly common up to c 1825 metres.

Subfamily AMBULICINAE

### 5. *Marumba poliotis* Hampson

1911. *Marumba poliotis* Hampson, *J. Bombay nat. Hist. Soc.*, 20 : 86, pl. F, fig. 23.

1937. *Marumba poliotis* : Bell and Scott, *Fauna Brit. India*, Moths, 5 : 187, fig. 39.

*Distribution* : INDIA : Orissa (District Ganjam); also throughout the rest of eastern and southern Peninsula.

*Remarks* : Earlier known from Ganjam, the species is confined in peninsular India. It is of rare status and occurs below 300 metres amidst forests with heavy rainfall.

Group SPHINGIDAE-SEMANOPHORAE  
Subfamily SESIINAE  
Tribe Sesiini

**6. Cephonodes hylas hylas (Linnaeus)**

1771. *Sphinx hylas* Linnaeus, *Mant.Plant* : 539.

1937. *Cephonodes hylas hylas* : Bell and Scott, *Fauna Brit. India, Moths*, 5 : 247, figs. 64 A-C, pl.III, figs.8,9.

*Material examined* : One ♂, 1 ♀, Barsuan (Dist.Sundargarh), 13, ix. 1972, S. Khera and party coll.; 2 ♂♂, 1 ♀, Badand, 20.ix., 1 ♂, Angul (Dist. Dhenkanol), 1.x.1972, K. Rai and party coll.

*Wing expanse* : 58 65 mm.

*Distribution* : INDIA:Orissa (Districts Sundargarh and Dhenkanol, new record); also throughout the rest of Peninsula and East to West Himalaya. Elsewhere: Bhutan, Burma, Sri Lanka, China and Japan.

*Remarks* : The moth is common in hills and plains and known as a sporadic defoliator of Rubiaceous plants.

Subfamily PHILAMPELINAЕ  
Tribe Nephelini

**7. Macroglossum gyrans (Walker)**

1856. *Macroglossa gyrans* Walker, *List Lep.Ins.Brit. Mus.*, 8 : 91.

1937. *Macroglossum gyrans* : Bell and Scott, *Fauna Brit. India, Moths*, 5 : 356, figs. 90 E,F.

*Material examined* : 2 ♂♂, Barsuan, 13.ix.1972 1 ♂, Trensa Colony, 14.ix.1972, S. Khera and party coll., 1 ♂, Sundargarh (Dist. Sundargarh), 20.ix.1972, K. Rai and party coll.; 1 ♂, Dhutura Village (Dist. Sambalpur), 18.ix.1972, S. Khera and party coll.; 1 ♂, Nandan Kanan (Dist. Cuttack), 23.iii.1974, R.K. Kacker and party coll.

*Wing expanse* : 45 48 mm.

*Distribution* : INDIA : Orissa (Districts Sundargarh, Sambalpur and Cuttack, new record); also throughout the rest of Peninsula and East to West Himalaya. Elsewhere: Pakistan, Burma, Sri Lanka, Malaya and Papua.

*Remarks* : The species is not rare in open upland country with light rainfall. It is oligophagous on *Morinda tinctoria* and *M. citrifolia* (Rubiaceae).

Subfamily CHOEROCAMPINAE

**8. Hippotion boerhaviae (Fabricius)**

1775. *Sphinx boerhaviae* Fabricius, *Syst. Ent.* : 542.

1937. *Hippotion boerhaviae* : Bell and Scott, *Fauna Brit. India, Moths*, 5 : 424, figs. 105, J,K, fig. 109, pl.V, figs.9-12.

*Material examined* : 2 ♂♂, Barsuan, 13.ix.1972, S.Khera and party coll., 4 ♂♂, 2 ♀♀, Sundargarh (Dist. Sundargarh), 23.x.1972, J.M. Julka and party coll.; 1 ♀, Dhenkanol (Dist. Dhenkanol), 5.x.1972, K.Rai and party coll; 1 ♀, Bolangir (Dist. Bolangir), 18.xii.1972, S. Khera and party coll.

*Wing expanse* : 55-65 mm.

*Distribution* : INDIA : Orissa (Districts Sundargarh, Bolangir and Dhenkanol, new record); also

throughout the rest of Peninsula and East to West Himalaya. Elsewhere: Pakistan, Bhutan, Sri Lanka, Malaya, Philippines and Southern China.

*Remarks* : The species is common in open country. Bell and Scott (1937) observed this moth in "hundreds on board a ship sailing between Aden and Bombay during a cyclone"

### 9. *Theretra clotho clotho* (Drury)

1773. *Sphinx clotho* Drury. *Illus. Exot. Ins.*, 2 : 48, pl.28, figs.1.

1937. *Theretra clotho clotho* : Bell and Scott, *Fauna Brit. India*, Moths, 5 : 434, figs. 110 C, 112, pl.V. figs.18-20, pl.XII, fig. 5, pl.XV. fig. 12.

*Material examined* : One ♂, 1 ♀, Dhenkanol (Dist. Dhenkanol), 5.x1972, K.Rai and party coll.

*Wing expanse* : 91 98 mm.

*Distribution* : INDIA: Orissa (District Dhenkanol, new record); also throughout the rest of Peninsula, East to West Himalaya and Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Bhutan, Bangladesh, Burma, Sri Lanka, Malaya, Philippines and China.

*Remarks* : The moth is known to be common in areas of medium to heavy rainfall.

## Family II GEOMETRIDAE

### Subfamily OENOCHROMINAE

#### 1. *Ozola microniaria* Walker

1862. *Ozola microniaria* Walker, *List. Lep. Het. Brit. Mus.*, 24 : 1080.

1912. *Ozola microniaria* : Prout, *Lep. Cat.*, 8 : 75.

*Distribution* : INDIA: Orissa (Dist. Ganjam); also rest of the eastern and southern Peninsula, North-West and East Himalaya. Elsewhere: Sri Lanka and ? Philippines.

*Remarks* : The species is known from the earlier report from the Ganjam district of Orissa. It lives on low plants. Prout (1912 a) cited "Philippinen" as part distribution of the moth with doubt.

### Subfamily HEMITHEINAE

#### 2. *Cyclothea disjuncta* (Walker)

1861. *Thalera disjuncta* Walker, *List. Lep. Het. Brit. Mus.*, 22 : 595.

1913. *Cyclothea disjuncta* : Prout, *Lep. Cat.*, 14 : 124.

*Distribution* : INDIA : Orissa (Dist. Ganjam, earlier record); also rest of the eastern and southern Peninsula and East Himalaya. Elsewhere: Sri Lanka, Taiwan and Sumatra.

*Remarks* : The moth is reported to occur amidst green foliage and exhibit marked protective resemblance by virtue of concolourous pattern of the wings.

### Subfamily STERRHINAE

#### 3. *Scopula opicata* (Fabricius)

1798. *Phalaena opicata* Fabricius, *Ent. Syst., Suppl.*: 457.

1934. *Scopula opicata* : Prout, *Lep. Cat.*, 63 : 206.

*Distribution* : INDIA: Orissa (Dist. Ganjam, earlier record); also rest of the eastern and southern Peninsula. Elsewhere: Sri Lanka, Malaya, Philippines, Timor, Papua, China (Hainan) and Africa.



**4. Scopula adeptaria (Walker)**1861. *Acidalia adeptaria* Walker, *List Lep. Het. Brit. Mus.*, 22 : 753.1934. *Scopula adeptaria* : Prout, *Lep. Cat.*, 63 : 206.

**Distribution** : INDIA : Orissa (District Ganjam, earlier record); also rest of the eastern and western Peninsula. Elsewhere: Sri Lanka, Malaya, Philippines and Southern China.

**Remarks** : The species shows sexual dimorphism. The female differs from the male by the ground colour suffused fuscous and fore wing submarginal dark line externally white-bordered.

**5. Scopula caesaria (Walker)**1861. *Acidalia caesaria* Walker, *List Lep. Het. Brit. Mus.*, 22 : 750.1934. *Scopula caesaria* : Prout, *Lep. Cat.*, 63 : 210.

**Distribution** : INDIA: Orissa (District Ganjam, earlier record); also rest of the eastern and southern Peninsula. Elsewhere: Sri Lanka, Maldives, Malaya, Philippines, Australo-Papua, Southern China, Africa and Malagasy.

**6. Scopula remotata (Guenée)**1858. *Acidalia remotata* Guenée, *Spec. Gén. Lép.*, 9 : 458.1934. *Scopula remotata* : Prout, *Lep. Cat.*, 63 : 265.

**Material examined** : One ♂, Deogarh (Dist. Sambalpur), 23. iv. 1975, J.K. Sen and party coll.

**Wing expanse** : 26 mm (18 mm, *vide* Prout 1913a).

**Distribution** : INDIA: Orissa (District Sambalpur); also rest of the eastern Peninsula and East Himalaya. The species constitutes new locality record for Orissa and is hitherto restricted to India.

## Subfamily GEOMETRINAE

**7. Petelia medardaria Herring-Schäffer**1843-'56. *Petelia medardaria* Herring-Schäffer, *Samml. ausserer. Schmett* : pl. 94, fig. 534.1888. *Petelia medardaria* : Cotes and Swinhoe, *Cat. Moths India*, 4 : 512 (nec Boarmidae).

**Material examined** : One ♂, reared in the laboratory of Central Rice Research Institute (Dist. Cuttack), adult emerged on 23.xii.1970, S. Khera and party.

**Wing expanse** : 38 mm.

**Distribution** : INDIA: Orissa (Dist. Cuttack, new record); also throughout the rest of Mainland. Elsewhere: Burma and Sri Lanka.

**Remarks** : The species was placed under the subgenus *Petelia* Herr.-Schäffer of the genus *Deilinia* Hübner by Hampson (1895), but Prout (1915) treated *Petelia* Herr.-Schäffer as a full genus. The moth shows sexual dimorphism; the male differs from the female by the fore wing without black apical patch and both wings with prominent lines.

**8. Pseudomiza sp.**

**Material examined** : One ♀, Asana (Dist. Mayurbhanj), "at light", 16.viii. 1972, S.K. Mitra and party coll.

**Wing expanse** : 38 mm.

**Remarks** : The genus is reported for the first time from Mayurbhanj district of Orissa, but the species could not be identified. It is, however, closely allied to *P. castanearia* (Moore) from the East

Himalaya, but differs from the latter by the fore wing with ante - and postemedial lines on upperside not reaching costa, underside with cell-spot and hind wing with the median line curved. The wing expanse is also much less as compared to that of the female of *castanearia* (38mm vs. 48 mm). The moth probably belongs to a new species, but it can not be ascertained because of the single specimen available for study.

### 9. *Macaria fasciata* (Fabricius)

1775. *Phalaena fasciata* Fabricius, *Syst. Ent.*: 629.

1895. *Macaria fasciata* : Hampson, *Fauna Brit. India*, Moths, 3 : 202, fig.114.

*Material examined* : 2 ♀♀, along hillstream towards south from the camp, Purnakote(Dist. Dhenkanol), 26.ii.1975, R.L. Chowdhury and party coll.

*Wing expanse* : 39 - 40 mm.

*Distribution* : INDIA:Orissa (District Dhenkanol, new record); also throughout the rest of mainland and Andaman and Nicobar Islands (Andaman Is.). Elsewhere: Burma and Sri Lanka.

*Remarks* : The species is reported to exhibit sexual dimorphism; the female is irrorated fuscous, with wings having grey band and ventrally the outer area suffused orange amidst white blotches.

### 10. *Hyposidra successaria* (Walker)

1860. *Lagyra successaria* Walker, *List Lep.Het. Brit.Mus.*, 20 : 60.

1895. *Hyposidra successaria* : Hampson, *Fauna Brit. India*, Moths, 3 : 214.

*Material examined* : One ♂, Deogarh (Dist. Sambalpur),23.iv. 1973, J.K. Sen and party coll.

*Wing expanse* : 40 mm.

*Distribution* : INDIA:Orissa(District Sambalpur, new record); also throughout the rest of mainland. Elsewhere: Burma, Sri Lanka and Java.

*Remarks* : The two sexes of this moth are known to be very diferent in size, besides the shape and wing venation. The female is about 1.5 times large than the male in expanse.

## SUMMARY

The paper deals with the systematic accout of nineteen species (nine species of Sphingidae and ten of Geometridae) from Orissa. Of these, two species of Sphingidae and five of Geometridae, reported earlier from Balasore and Ganjam districts, were not available in the recent collections from other districts of the state.

## ACKNOWLEDGEMENT

The authors are grateful to the Director, Zoological Survey of India, for kindly providing the laboratory facilities for their work.

## REFERENCES

- Bell, T.R.D. & Scott, F.B.1937. *The Fauna of British India*, Moths, 5 : xviii + 537, figs.,pls., table and map.Taylor & Francis, London.
- Cotes, E.C. & Swinhoe, C.1887. *A catalogue of the Moths of India*, 1 : 40. Trustees of the Indian Museum, Calcutta.

Hampson, G.F.1892. *The Fauna of British India, Moths, 1*: xxiii + 527, figs. London, Taylor & Francis.

Hampson, G.F.1895. *The Fauna of British India, Moths, 3*: xxviii + 546, figs. London, Taylor & Francis.

Prout, L.B. 1912. *Lepidopterorum Catalogus, 8* : 1-94, W. Junk, Berlin W.

Prout, L.B. 1912a. Seitz, *Macrolepidoptera of the World, 4* : 2-10, pls. Stuttgart.

Prout, L.B. 1913. *Lepidopterorum Catalogus, 14* : 1-192. W. Junk, Berlin, W.

Prout, L.B. 1915. In Seitz, *Macrolepidoptera of the World, 4* : 297-408, pls. Stuttgart.

Prout, L.B. 1934. *Lepidopterorum Catalogus, 63* : 177-432. W. Junk, Berlin W.



INSECTA : LEPIDOPTERA : RHOPALOCERA :  
NYMPHALIDAE : DANAINAE

D.K. MANDAL and D.R. MAULIK  
Zoological Survey of India, Calcutta

INTRODUCTION

The danaines are predominantly of tropical origin and found in dry humid niches rich with food plants like figs, nettles, dogbanes, oleanders and milkweeds. About a dozen of species occur in the Indian Peninsula, of which seven were so far known from the Puri and Ganjam districts of southern Orissa (Taylor and de Nicéville, 1888; Annandale and Dover, 1921).

The present work is based on the system *sensu* Ackery and Vane-Wright (1984), but with the infraspecific nomenclature being compared with Talbot (1947). It deals with the systematic account of all the seven species and subspecies together with their available forms from the State. Of these, five species, collected between 1970 and 1975, are reported from districts other than Puri and Ganjam, The remaining two species, viz., *Parantica aglea aglea* (Stoll) and *Euploea sylvester coreta* (Godart), are reviewed from literature.

SYSTEMATIC ACCOUNT

Subfamily DANAINAE  
Tribe Danaini  
Subtribe Amaurina

1. *Parantica aglea aglea* (Stoll)

1782. *Papilio aglea* Stoll, in Cramer, *Pap. Exot.*, 4 : 173, pl.377, fig.E.

1984. *Parantica aglea aglea* : Ackery and Vane-Wright, *Milkweed Butterflies* : 175, pl. 1, fig. 2.

**Distribution** : INDIA: Orissa (Khurda, District Puri); throughout the rest of the Peninsula. Elsewhere: Sri Lanka.

**Remarks** : This is a rare subspecies as mentioned by Taylor and de Nicéville (1888).

Subtribe Danaina

2. *Tirumala limniace leopardus* (Butler)

1866. *Danais limniace* var. *leopardus* Butler, *Proc. zool. Soc. Lond.*, 1866 : 52.

1984. *Tirumala limniace leopardus* : Ackery and Vane-Wright, *Milkweed Butterflies* : 198.

**Material examined** : 6 ♂♂, 4 ♀♀: Anandapur and Ghatgaon (Dist. Keonjhar); Banglabada (Dist. Koraput); Paradip Mangrove Forest (Dist. Cuttack); Tikarpara (Dist. Dhenkanol). Collected during spring, winter and monsoon between 1972 and 1974.

**Wing expanse** : ♂♂ 80-96, ♀♀ 75-91 mm (♂ ♀ 90-100 mm, *vide* Talbot, 1947).

**Distribution** : INDIA: Orissa (Districts Keonjhar, Koraput, Dhenkanol, Cuttack and Ganjam), Himachal Pradesh, Uttar Pradesh, Sikkim, Assam, Manipur, Nagaland, Punjab, Madhya Pradesh,

Bengal, Karnataka, Tamil Nadu and South Nicobar Islands. Elsewhere: Pakistan, Burma, Sri Lanka, Western Malaysia, Vietnam and South-East China.

*Remarks* : The element, earlier recorded from Khurda, District Puri and Barkuda Island, Chilka Lake, District Ganjam, is reported from several other districts, as mentioned above.

### 3. *Danaus (Salatura) genutia genutia* (Cramer)

1779. *Papilio genutia* Cramer, *Pap. Exot.*, 3 : 23, pl. 206, figs. C, D.

1984. *Danaus (Salatura) genutia genutia* : Ackery and Vane-Wright, *Milkeed Butterflies* : 205, pl. 16, fig. 94.

*Material examined* : 20 ♂♂, 12 ♀♀ : Banki (Dist. Sundargarh); Baripada (Dist. Mayurbhanj); Mandua (Dist. Keonjhar); Bank of River Mahanadi, Hirakud Dam (Dist. Sambalpur); Angul, Bagmunda, Tikarpara and Manjhipara (Dist. Dhenkanol); Madanpur and Nakjhari (Dist. Kalahandi); Kotagarh (Dist. Baudhkhondmals); Chhapragaon village (Dist. Koraput); Barang, Botanical Garden (Dist. Cuttack). Collected during winter and spring seasons between 1972 and 1974.

*Wing expanse* : ♂♂ 75-92, ♀♀ 75-80 mm.

*Distribution* : INDIA : Orissa (Districts Sundargarh, Mayurbhanj, Keonjhar, Sambalpur, Dhenkanol, Kalahandi, Baudhkhondmals, Koraput, Cuttack, Puri and Ganjam), Himachal Pradesh, Uttar Pradesh, Sikkim, Assam, Arunachal Pradesh, Manipur, Nagaland, Mizoram, Punjab, Madhya Pradesh, Rajasthan, West Bengal, Karnataka, Tamil Nadu, Andaman and Nicobar Islands. Elsewhere: Afghanistan, Pakistan, Nepal, Burma, Sri Lanka, Thailand, Vietnam, South-East China and the Riu Kiu Islands (Japan).

*Remarks* : The specimens examined may be referred to the form *gryniion* (Fruhstorfer), being common in Orissa.

### 4. *Danaus (Salatura) melanippus indicus* (Fruhstorfer)

1899. *Salatura melanippus indicus* Fruhstorfer, *Berl. Ent. Zeit.*, 44 : 75.

1984. *Danaus (Salatura) melanippus indicus* : Ackery and Vane-Wright, *Milkweed Butterflies* : 207.

*Material examined* : 16 ♂♂, 2 ♀♀ : Badand (Dist. Keonjhar); Paradip Mangrove Forest (Dist. Cuttack). Collected during the dewy season of 1972.

*Wing expanse* : ♂♂ 70-90, ♀♀ 85-87 mm. (♂ ♀ 80-95mm, *Vide* Talbot, 1947).

*Distribution* : INDIA : Orissa (Dists. Keonjhar, Cuttack and Puri), Assam and West Bengal. Elsewhere: Nepal, Southern Burma, Thailand, Malaya and Sumatra.

*Remarks* : The subspecies, earlier known from Puri, is reported here from Cuttack and Keonjhar districts and not rare in Orissa. The authors reserve their comments on the statement made by Talbot (1947) and Wynter-Blyth (1957) that the butterfly "extends sparsely" to Orissa.

### 5. *Danaus (Anosia) chrysippus chrysippus* (Linnaeus)

1758. *Papilio chrysippus* Linnaeus, *Syst. Nat.*, 1 (10th Ed.): 471.

1984. *Danaus (Anosia) chrysippus chrysippus* : Ackery and Vane Wright, *Milkweed Butterflies* : 209, pl. 19, fig. 112, pls. IX, X, figs. 98, 115.

*Material examined* : 118 ♂♂, 66 ♀♀ : Jharsuguda, Sundargarh, Mohantipur, Panposh Teak Plantation, Rourkela and Banki (Dist. Sundargarh); Titillagarh, Rangiapara and Bolangir (Dist. Bolangir); Bangriposhi and Baripada (Dist. Mayurbhanj); Anandapur, Badand, Baigonpal, Bambada, Barsasoni, Tagenpadsai and Upardhia (Dist. Keonjhar); Badrama, Bank of River Mahanadi and Sambalpur (Dist. Sambalpur); Tikarpara, Angul, Bagmunda, Gudianali, Jubilee Town and Shankarpur

(Dist. Dhenkanol); Barang, Central Rice Research Institute, Madhupatna and Kaluri (Dist. Cuttack); Baleshwar, Gohaligaon, Kajalkaltapur, Raigaon and Sero (Dist. Balasore); Balugaon and Puri (Dist. Puri); Rambha (Dist. Ganjam). Collected during all the seasons but summer between 1971 and 1974.

*Wing expanse* : ♂♂ 50-85, ♀♀ 51-80 mm. (♂ ♀ 70-80mm, *vide* Talbot, 1947).

*Distribution* : INDIA : Orissa (Districts Sundargarh, Bolangir, Mayurbhanj, Keonjhar, Sambalpur, Dhenkanol, Cuttack, Balasore, Puri and Ganjam); also throughout the outer Himalaya and rest of the Peninsula. Elsewhere: Almost common in other belts of the Oriental Region, extending to Japan in the Far East and Asia Minor in the Middle East.

*Remarks* : The subspecies was earlier known from Puri and Ganjam districts. In at least one of the specimens examined, the cell-end ventrally of left fore wing has a short, narrow, irregular, white line; it is interrupted in the right fore wing. All the specimens examined may be referred to the form *amplifascia* Talbot. The form *alcippoides* (Moore), earlier recorded as "*Danais (Limnas) alcippoides*" from Khurda of Puri district by Taylor and de Nicéville (1888), is, however, not found in the present collections available to the authors from other districts.

Tribe Euploeini

Subtribe Euploeina

#### 6. *Euploea sylvester coreta* (Godart)

1819. *Danais coreta* Godart, in Latreille and Godart, *Encyc.Méth.*, 9 : 178.

1984. *Euploea sylvester coreta* : Ackery and Vane-Wright, *Milkweed Butterflies* : 213, pl. 21, fig. 124.

*Distribution* : INDIA : Orissa (Dist. Puri); also the southern Peninsula.

*Remarks* : The subspecies was earlier recorded as "*Euploea (Narmada) coreoides Moore*" from Puri by Taylor and de Nicéville (1888) who mentioned its status as rare. In fact, Talbot (1947) stated that the butterfly is not common even in its limited peninsular habitat of India and that it is hardly seen in dry months. It is known to be fond of damp places.

#### 7. *Euploea core core* (Cramer)

1780. *Papilio core* Cramer, *Pap.Exot.*, 3 : 133, pl.267, figs. E, F.

1984. *Euploea core core* : Ackery and Vane-Wright, *Milkweed Butterflies* : 228, pl. 39, figs. 222, 223.

*Material examined* : 78 ♂♂, 58 ♀♀ : Barsuan, Jharsuguda, Rani Bagicha, Trensa House Colony and Raurkela (Dist. Sundargarh); Bolangir, Rangiapara and Titillagarh (Dist. Bolangir); Amarda, Bangriposhi and Baripada (Dist. Mayurbhanj); Anandapur, Atei Forest, Bambada, Balajari Reserve Forest, Barsasoni and Ghatgaon village (Dist. Keonjhar); Bank of River Mahanadi, Dhutura village, Hirakud Dam and Sambalpur (Dist. Sambalpur) ; Angul, Gudianali, Jubilee Town, Meghasoni and Shankarpur (Dist. Dhenkanol); Madanpur (Dist. Kalahandi); Kotagarh (Dist. Baudhkhondmals); Jaipur (Dist. Koraput); Bhagwanpur, Barang, National Biological Park, Central Rice Research Institute and Madhupatna (Dist. Cuttack); Baleshwar and Raigaon (Dist. Balasore) ; Balugaon and Tikarpara (Dist. Puri). Collected during all the seasons but summer between 1970 and 1975.

*Wing expanse* : ♂♂ 60-94, ♀♀ 65-93mm (♂ ♀ 85-95mm, *vide* Talbot, 1947).

*Distribution* : INDIA: Orissa (Dists. Sundargarh, Bolangir, Mayurbhanj, Keonjhar, Sambalpur, Dhenkanol, Kalahandi, Baudhkhondmals, Koraput, Cuttack, Balasore, Puri and Ganjam), Uttar Pradesh, Sikkim, West Bengal, Karnataka, Tamil Nadu and Andaman Islands. Elsewhere : Pakistan, Nepal and Southern Burma.

*Remarks* : The subspecies, earlier known from Puri and Ganjam, is very common throughout Orissa. The specimens examined are referable to the form *core* (Cramer).

#### SUMMARY

The paper deals with the study of as many as 380 specimens of Danainae collected from 2 number of localities of all the thirteen districts in the state of Orissa during different seasons between 1970 and 1975. Of the seven species reported, five are recorded from different localities and the remaining two, which appear to be rare, are from literature records.

#### REFERENCES

- Ackery, P.R. & Vane-Wright, R.I. 1984. *Milkweed Butterflies, Their Cladistics and Biology, being an Account of the Natural History of the Danainae, a Subfamily of the Lepidoptera, Nymphalidae*, vii + 425 pp., pls., figs., tables. *Brit. Mus. (Nat.Hist.)*, London.
- Annandale, N. & Dover, C. 1921. The butterflies of Barkuda Island. *Rec. Indian Mus.*, 22 (4) : 349-375.
- Talbot, G. 1947. *The Fauna of British India, Butterflies*, 2 : xv + 506 pp., pls., figs., map. London.
- Taylor, W.C. & De Niceville, L. 1888. *List of the Butterflies of Khorda in Orissa*. Calcutta.
- Wynter-Blyth, M.A. 1957. *Butterflies of the Indian Region*, xx + 523 pp., pls., figs. Bombay.



**INSETA : COLEOPTERA : CICINDELIDAE**

**S.K. SAHA, S. BISWAS and S.K. HALDER**

*Zoological Survey of India, Calcutta*

**INTRODUCTION**

Annandale and Horn (1909) are the first to have studied the tiger beetles (Cicindelidae) from Orissa. They recorded six species from Balighai and two from Barkuda Islands, Chilka lake. Besides these eight species, no other records of tiger beetle from the state of Orissa are available in the Fauna of British India by Fowler (1912). Since the publication of the Fauna Volume (Fowler 1912), Annandale and Dover (1921) and Dover and Ribeiro (1921,1923) have contributed to the knowledge of these beetles from the State. In all 18 species recorded by the above mentioned authors are catalogued by Haynes-Wood and Dover (1928). Besides these two more species marked with asterisk (\*) have been recorded by the present authors, thus presently 20 species belonging to 3 genera under 2 subfamilies are known from the State. A systematic list of these species with their distribution in Orissa state and a key for identification of these insects are given in this contribution.

**SYSTEMATIC LIST OF CICINDELIDAE FROM ORISSA**

**Family CICINDELIDAE**

**Subfamily (i) COLLYRINAE**

**Genus 1. Neocollyris Horn**

**1. *Neocollyris bonelli* (Gurini)**

(Barkuda Is, Chilka Lake)

**2. *Neocollyris distincta* (Chaudoir)**

(Balighai, near Puri)

**3. *Neocollyris crassicornis* (Dejean)**

(Chandipore; Gopkunda Is, Chilka Lake)

**Subfamily (ii) CICINDELINAE**

**Genus 2. Prothyma Hope**

**4. *Prothyma proxima* Chaudoir**

(Balugaon; Cuttack)

**Genus 3. Cicindela Linnaeus**

**5. *Cicindela tetrastacta* (Widemann)**

(Barkuda Is.)

**6. *Cicindela fastidiosa* Dejean**

(Barkuda Is.)

7. *Cicindela undulata* Dejean  
(Balugaon; Barkuda Is., Gopkunda Is, Chilka Lake)
8. *Cicindela destinguenda* Dejean  
(Barkuda Is.)
9. *Cicindela cognata* Wiedmann  
(Cuttack, Bank of River Mahanadi)
10. *Cicindela minuta* Olivier  
(Cuttack, Bank of River Mahanadi)
11. *Cicindela agnata* Fleutiaux  
(Cuttack, Bank of River Mahanadi; balighai near Puri)
12. *Cicindela sexpunctata* Fabricius  
(Angul; Keonjhar, first record from Orissa)
13. *Cicindela aurovittata* Brulle  
(Barkuda Is.)
14. *Cicindela laemorrhodalis* Wiedemann  
(Ganjam)
15. *Cicindela multiguttata* Dejean  
(Chandipor, first record from Orissa)
16. *Cicidela cancellata* Dejean  
(Balighai; Cheria Is.)
17. *Cicindela catena* Fabricius  
(Barkuda Is. , Chilka Lake)
18. *Cicindela albina* Wiedemann  
(Balighai, Cheria Is.)
19. *Cicindela biramosa* Fabricius  
(Balighai; Chandipore)

#### KEYS FOR IDENTIFICATION OF CICINDELID BEETLES FROM ORISSA

(A) *Key to subfamilies of family Cicindelidae*

- 1(2) Metepisternum very narrow, more or less strongly furrowed; third segment of maxillary pulpus equal to fourth segment.....Collyrinae
- 2(1) Metepisternum broad and smooth; third segment of maxillary pulpus shorter than the fourth..... Cicindelinae

(B) *Key to genera of the subfamily Cicindelinae*

- 1(2) Underside entirely without pubescence.....*Prothyma*
- 2(1) Underside with variable but distinct pubescence ..... *Cicindela*

(C) *Key to species of the genus Neocollyris*

- 1(4) Size medium (length 13-15 mm.) pronotal collum short; elytral punctures not elongated behind; apical segments of the antennae not compact.
- 2(3) Pronotum strongly dilated before basal constriction.....*N. bonelli*
- 3(2) Pronotum slightly dilated before basal constriction.....*N. distincta*
- 4(1) Size larger (length 16-18 mm.); Pronotal collum distinct; elytral punctures elongated behind; apical segments of antennae compact .....*N. crassicornis*

(D) *Key to species of genus Cicindela*

- 1(8) Pubescence of underside weak, partial or entirely absent
- 2(3) Intermediate tarsi dilated in male; size small, length 9-10 mm..... *C. tetrastacta*
- 3(4) Intermediate tarsi not dilated in male; size moderate length 12-19 mm.
- 4(5) Elytra oblong with sides parallel and shoulders well marked [abdomen with apex broadly red; elytra with three spots, a small one at shoulders, largest at middle and one of medium size before apex]..... *C. haemorrhoidalis*
- 5(4) Elytra more or less rounded at sides and shoulders not well marked
- 6(7) Sides of pronotum without setae .....*C. sexpunctata*
- 7(6) Sides of pronotum with pronounced setae..... *C. aurovittata*
- 8(1) Pubescence of underside always strong at sides
- 9(20) Size small, average length 8-10 mm.
- 10(15) Genae bare; elytra with spots or simple markings
- 11(12) Elytra with side margins from shoulders to apices rather broadly and almost continuously whitish testaceous, but slightly interrupted at about anterior and posterior fourth; markings of elytra almost like *C. lencoloma*.....*C. fastidiosa*
- 12(11) Elytra more or less with side margins and apical margins narrowly whitish testaceous but always with distinct interruptions; each elytron with an inverted 'V' shaped, hooks or sinuate marking proceeding from the centre of the light marginal border
- 13(14) Elytra of female with a more or less distinct, smooth and shining patch on each in front near the suture; labrum white; pronotum quadrate, surface rugose..... *C. undulata*
- 14(13) Elytra of female without any shining patch; labrum testaceous; pronotum subquadrate, surface not rugose.....*C. distinguenda*
- 15(10) Genae pubescent; elytra with more or less intricate whitish markings
- 16(19) Elytra with whitish margins very plainly interrupted in two or three places; colour obscure green
- 17(18) Elytral markings very conspicuous; size relatively larger (length 9 1/2-10 mm) and robust; underside thickly tomentose .....*C. cognata* Wied

- 18(19) Elytral markings thin and obscure; size smaller (8-8 1/2 mm); underside thickly pubescent at sides.....*C. minuta* Olivier
- 19(16) Elytra with light margins almost continuous from shoulder to apex, except nearly interrupted just before the oblique truncation of apex; colour brownish coppery
- 20(9) Size medium (Length 11-16 mm)
- 21(23) Elytra whitish or whitish testaceous and with antler shaped markings; genal bare or pubescent
- 22(23) Underside entirely and thickly tomentose; elytral markings thin, proceeding from dark longitudinal line on each side of suture; head and pronotum covered with thick whitish decumbent pubescence; genae pubescent..... *C. albina*
- 23(22) Underside thickly pubescent at the sides only; elytral markings broader proceeding from the suture; head with a few hairs near inner posterior angles of eyes and pronotum with scanty hairs on margins; genae bare.....*C. cancellata*
- 24(21) Elytra dark and without any particular pattern of markings beyond spots and patches; genae always pubescent.....*C. multiguttata*

#### ACKNOWLEDGEMENTS

The authors are grateful to the Director, Zoological Survey of India, for providing facilities. Thanks are also due to Dr. T. Sengupta, Deputy Director and Dr. O.B. Chhotani, Joint Director, for valuable suggestions and help

#### SUMMARY

20 species of Cicindelids, 3 of genus *Neocollyris*, one of *Prothyma* and 16 of *Cicindela* have been listed from Orissa, including first record for 2 species. Key to the subfamilies, genera and species of Orissa Cicindelidae are also provided.

#### REFERENCES

- Annandale, N. & Dover, C. 1921. Cicindelid beetles of Barkuda Island. *Rec. Indian Mus.*, 22 : 335-337.
- Annandale, N. & Horn, W. 1909. *Annotated list of the Asiatic Beetles on the collection of the Indian Museum. Part I. Family Carabidae, Subfamily Cicindelinae.* Pp.1-31 + Pl.I (S.P. D'Rozrio, Calcutta).
- Dover, C. & Ribeiro, S. 1921. Records of some Indian Cicindelidae. *Records Indian Mus.*, 22 : 721-727.
- Dover, C. & Ribeiro, S. 1923. A list of the Indian Cicindelidae with localities. *Rec. Indian Mus.*, 25: 345-363.
- Fowler, W.W. 1912. *Fauna Brit. India. Coleoptera. General Introduction, Cicindelidae* : 219-443.
- Heynes-Wood, M. and Dover, C. 1928. *Catalogue of Insects. Part 13. Cicindelidae* : 1-138.

**INSECTA : COLEOPTERA : SCARABAEIDAE**

**S. BISWAS and S. K. CHATTERJEE**

*Zoological Survey of India,  
New Alipore, Calcutta - 700 053*

**INTRODUCTION**

Scarabaeidae is one of the largest families of Coleoptera. These insects vary greatly in their food habits and general behaviour. Some feed on dung and decaying vegetative or animal matters and others are leaf-feeders. Of the last mentioned group *ie* leaf-feeders, some have become serious pests of agricultural and plantation crops. The knowledge of Indian Scarabaeidae is mainly based on the valuable contributions of Brenske (1898), Arrow (1910, 1917, 1931) and Balthasar (1963, 1964). In recent years regional faunal works have been initiated by Mittal (1981) and Biswas (unpublished Ph. D thesis) from Northern and North Eastern India, respectively but no comprehensive work on the Scarabaeid fauna of Orissa is available. However, material from some parts of Orissa has been collected and stray published records are available from the beginning of this century. Arrow (1910) recorded three species and in 1917 added 7 more species from Orissa. In 1923, while dealing with the coleopteran collection from Chilka lake Survey he reported 33 species of which 4 species have been synonymised and three species were not determined upto species level. In 1933, he added 7 more species from the State thus altogether 43 species of Scarbaeid beetles were recorded from Orissa. As many as 80 species have been dealt with in this paper, of which the Material (both identified and unidentified) available in the collection of Zoological Survey of India, including 37 recorded for the first time from the State.

The species of which no material was available, have been taken into account here from literature.

**LIST OF SPECIES RECORDED FROM ORISSA**

- Family SCARABAEIDAE
- Subfamily I. CETONINAE
- Genus 1. **Clinteria** Burmeister
1. *Clinteria klugi* (Hope)
- Genus 2. **Anthrachophore** Burmeister
2. *Anthrachophora crucifera* (Olivier)
- Genus 3. **Protaetia** Burmeister
3. *Protaetia peregrina* (Herbst)
- Subfamily II. DYNASTINAE
- Genus 4. **Eophileurus** Arrow
4. *Eophileurus platypterus* (Wiedemann)

Genus 5. **Alissonotum** Arrow

- 5.
- Alissonotum piceum*
- (Fabricius)

Genus 6. **Oryctes** Illiger

- 6.
- Oryctes rhinoceros*
- (Linnaeus) \*

Genus 7. **Heteronychus** Burmeister

- 7.
- Heteronychus lioderes*
- (Redtenbacher) \*

Genus 8. **Dipelicus** Hope

- 8.
- Dipelicus cantator*
- Arrow

Genus 9. **Phyllognathus** Eschscholtz

- 9.
- Phyllognathus dionysius*
- (Fabricius)

## Subfamily III. RUTELINAE

Genus 10. **Anomala** Samouelle

- 10.
- Anomala angulicollis*
- Arrow

- 11.
- Anomala grandis*
- (Hope)

- 12.
- Anomala obtusicollis*
- Arrow

- 13.
- Anomala seminitens*
- Arrow

- 14.
- Anomala varicolor*
- (Gyllenthal)

Genus 11. **Adoretus** Castelnau

- 15.
- Adoretus bicaudatus*
- Arrow

- 16.
- Adoretus bimarginatus*
- Ohaus

- 17.
- Adoretus lasiopygus*
- Burmeister

## Subfamily IV. MELOLONTHINAE

Genus 12. **Apogonia** Kirby

- 18.
- Apogonia ferruginea*
- (Fabricius)

- 19.
- Apogonia nigricans*
- Hope

- 20.
- Apogonia*
- sp.

Genus 13. **Schizonycha** Blanchard

- 21.
- Schizonycha fuscusceus*
- Blanchard \*

- 22.
- Schizonycha ruficollis*
- Fabricius

Genus 14. **Autoserica** Brenske

- 23.
- Autoserica iridescens*
- Blanchard

- 24.
- Autoserica*
- sp.

Genus 15. **Neoserica** Brenske

- 25.
- Neoserica bombycina*
- Karsch

Genus 16. **Merieserica** Brenske

- 26.
- Merieserica chilkensis*
- Arrow

- Genus 17. **Holotrichia** Hope
27. *Holotrichia* sp.
- Subfamily V. **CHIRONINAE**
- Genus 18. **Chiron** M'Leay
28. *Chiron cylindrus* (Fabricius)
- Subfamily VI. **ORPHININAE**
- Genus 19. **Orphnus** M'Leay
29. *Orphnus impressus* Westwood \*
30. *Orphnus mysoriensis* Westwood
31. *Orphnus parvus* Wiedemann
- Subfamily VII. **HYBOSORINAE**
- Genus 20. **Hybosorus** M'Leay
32. *Hybosorus orientalis* Westwood \*
- Genus 21. **Phaeochrous** Castelnau
33. *Phaeochrous emarginatus* Castelnau
- Subfamily VIII. **COPRINAE**
- Genus 22. **Scarabaeus** Linnaeus
34. *Scarabaeus erichsoni* (Harold)
35. *Scarabaeus sanctus* (Fabricius) \*
- Genus 23. **Gymnopleurus** Illiger
36. *Gymnopleurus cyaneus* (Fabricius)
37. *Gymnopleurus gemmatus* Harold \*
38. *Gymnopleurus miliaris* (Fabricius)
- Genus 24. **Sisyphus** Latreille
39. *Sisyphus indicus* Hope \*
40. *Sisyphus longipes* (Olivier) \*
41. *Sisyphus neglectus* Gory
- Genus 25. **Heliocopris** Burmeister
42. *Heliocopris bucephalus* (Fabricius) \*
- Genus 26. **Catharsius** Hope
43. *Catharsius grannulatus* Sharp \*
- Genus 26. **Catharsius** Hope
43. *Catharsius grannulatus* Sharp \*
44. *Catharsius molossus* (Linnaeus)
45. *Catharsius pithecius* (Fabricius)
46. *Catharsius sagax* (Quens.) \*

**Genus 27. Copris Geoffroy**

- 47. *Copris indicus* Gillet
- 48. *Copris repertus* Walker \*

**Genus 28. Phalops Erichson**

- 49. *Phalops divisus* Wiedemann

**Genus 29. Caccobius Thomson**

- 50. *Caccobius indicus* Harold

**Genus 30. Onthophagus Latreille**

- 51. *Onthophagus bonasus* (Fabricius)
- 52. *Onthophagus bronzeus* Arrow
- 53. *Onthophagus catta* (Fabricius)
- 54. *Onthophagus coeruleicollis* Arrow
- 55. *Onthophagus dama* (Fabricius)
- 56. *Onthophagus furculus* (Fabricius)
- 57. *Onthophagus hystrix* Boucomont
- 58. *Onthophagus laevigatus* (Fabricius)
- 59. *Onthophagus ludio* Boucomont
- 60. *Onthophagus militaris* Boucomont
- 61. *Onthophagus orissanus* Arrow
- 62. *Onthophagus quadridentatus* (Fabricius)
- 63. *Onthophagus ramosus* (Wiedemann)
- 64. *Onthophagus sagittarius* Fabricius
- 65. *Onthophagus tritinctus* Boucomont

**Genus 31. Delopleurus Erichson**

- 66. *Delopleurus parvus* (Sharp) \*

**Genus 32. Ponerotrogus Silvestri**

- 67. *Ponerotrogus annandalei* Silvestri \*

**Genus 33. Liatongus Reitter**

- 68. *Liatongus rhadamistus* (Fabricius) \*

**Genus 34. Oniticellus Serveille**

- 69. *Oniticellus spinipes* Roth \*

**Genus 35. Drepanocerus Kirby**

- 70. *Drepanocerus setosus* (Wiedemann) \*



Genus 36. *Onitis* Fabricius

71. *Onitis falcatus* (Wulfen) \*  
 72. *Onitis philemon* Fabricius \*  
 73. *Onitis* sp. nr. *virens* Lansberge \*

## Subfamily IX. APHODINAE

Genus 37. *Aphodius* Illiger

74. *Aphodius lividus* (Olivier) \*  
 75. *Aphodius moestus* Fabricius \*  
 76. *Aphodius ovatulus* Harold  
 77. *Aphodius putearius* Reitter \*

Genus 38. *Chaetopisthes* Westwood

78. *Chaetopisthes heimi* Wasmann \*

Genus 39. *Termitopisthes* Wasmann

79. *Termitopisthes Wasmanni* (Schmidt) \*

Genus 40. *Stenocorythoderus* Wasmann

80. *Stenocorythoderus braminus* Wasmann \*

---

\* New record for the State.

## TAXONOMIC ACCOUNT

Family SCARABAEIDAE

Subfamily I. CETONINAE

Genus 1. *Clinteria* Burmeister

1. *Clinteria klugi* (Hope)

1831. *Cetonia klugi* Hope, *Gray's Zool. Misc.*, : 25.  
 1910. *Clinteria klugi*, Arrow, *Fauna Brit. India (Lamellicornia : Cetoniinae)*, 1 : 187-188.  
 1923. *Clinteria klugi* : Arrow, *Rec. Indian Mus.*, 25(2) : 261

*Material examined* : 1 ex., Barkuda Island, Chilka lake (Ganjam Dist.), 21.vii.1914. det. G. J. Arrow.

*Distribution* : India : Orissa, Maharashtra (Bombay) Karnataka, West Bengal, Bihar.

Genus 2. *Anthracophora* Burmeister

2. *Anthracophora crucifera* (Oliver)

1789. *Cetonia crucifera* Olivier, *Ent.*, 1 (6) : 39, pl.5. fig.29.  
 1923. *Anthracophora crucifera* : Arrow, *Rec. Indian mus.*, 25(2) : 261.

*Material examined* : 3 exs., Berhampur (Ganjam Dist.), (no often data, det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island, Berhampur), Bihar (Sahibganj, Pusa, Purneah Dist.), West Bengal, Uttar Pradesh (Dehra Dun), Gujarat (Surat), Karnataka (Bangalore).

Genus 3. **Protaetia** Burmeister3. **Protaetia peregrina** (Herbst)

1790. *Cetonia peregrina* Herbst, *Natursyst. Kaf.*, 3 : 236. pl. 30.

1910. *Protaetia peregrina* : Arrow, *Fauna Brit. India*, (Lamellicornia : Cetoniinae), 1 : 144-145.

*Distribution* : India : Orissa (Ganjam, Berhampur), Maharashtra (Poona), Karnataka (Mysore), West Bengal (Murshidabad).

*Remarks* : Arrow (1910) mentioned "Ganjam, Berhampur" under Madras but is now is Orissa state.

## Subfamily II. DYNASTINAE

Genus 4. **Eophileurus** Arrow4. **Eophileurus platypterus** (Wiedemann)

1823. *Geotrupes platypterus* Wiedemann, *Zool. Mag.* 2(1) : 5.

1923. *Eophileurus platypterus* : Arrow, *Rec. Indian Mus.*, 25(2) : 261.

*Material examined* : 5 exs., Chilka lake (Ganjam Dist), 15-22.II.1916, 3-19. vii. 1919, *F. H. Gravely* coll. 3 exs, Chilka lake (Ganjam Dist), 25.vii - 4.viii.1919, *N. Annandale* coll. det. G. J. Arrow. Chilka lake).

*Distribution* : India : Orissa (Barkuda Island), Maharashtra (Bombay), Tamil Nadu, Bihar.

Genus 5. **Alissonotum** Arrow5. **Alissonotum piceum** (Fabricius)

1775. *Scarabaeus piceus*, Fabricius, *Syst. Ent.*, 1 : 14.

1910. *Alissonotum piceum* : Arrow, *Fauna Brit. India* (Lamellicornia : Dynastinae), 1 : 299.

*Material examined* : 1 ex, Cuttack Dist., 6.ix.1972, *Y. Chaturvedi* coll.; 1 ex, Angul (Dhenkanal Dist), 2.x.1972, *K. Rai* coll.

*Distribution* : India : Orissa (Chilka, Cuttack, Dhenkanal), Tamil Nadu, Kerala, West Bengal, Sri Lanka, Bangladesh.

Genus 6. **Oryctes** Illiger6. **Oryctes rhinoceros** (Linnaeus) \*

1758. *Scarabaeus rhinoceros* Linnaeus, *Syst. Nat.* 1 : 346.

1910. *Oryctes rhinoceros* : Arrow, *Fauna Brit. India*, (Lamellicornia : Dynastinae), 1 : 278-281.

*Material examined* : 1 ex., Barbera (Puri Dist.), 20.vii.1973, *A. K. Mondal* coll.

*Distribution* : India : Orissa (Barbera), Tamil Nadu, Kerala, Maharashtra, Karnataka, West Bengal. Sri Lanka, Burma; Singapore, Indonesia, Formosa, Korea, Hongkong, Philippines.

*Remarks* : The species is a serious pest of coconut plantations and probably much more widely Distributed in India than the records available in literature.

Genus 7. **Heteronychus** Burmeister7. **Heteronychus lioderes** (Redtenbacher) \*

1867. *Heteronychus lioderes* Redtenbacher, *Reise der Novara, Zool.*, 2. Col. : 75.

1910. *Heteronychus lioderes* : Arrow, *Fauna Brit. India*, (Lamellicornia : Dynastinae), 1 : 295.

*Material examined* : 1 ex, Paradip, (Cuttack Dist), 30.I.1972, *K. Rai* coll.

**Distribution** : India : Orissa (Paradip), Bihar West Bengal, Nepal, Bangladesh, Burma, Malaysia, Indonesia : Sulawesi.

### Genus 8. *Dipelicus* Hope

#### 8. *Dipelicus cantator* Arrow

1910. *Dipelicus cantator* Arrow, *Fauna Brit. India*, (Lamellicornia : Dynastinae), 1 : 313.

**Material examined** : 1 ex, Keonjhar (Keonjhar Dist.), 20.ix.1972; 1 ex, Angul (Dhenkanal Dist.) 2.x.1972, K. Rai coll.

**Distribution** : India : Orissa (Berhampur, Keonjhar, Angul).

### Genus 9. *Phyllognathus* Eschscholtz

#### 9. *Phyllognathus dionysius* (Fabricius)

1792. *Scarabaeus dionysius* Fabricius, *Ent. Syst.*, 1 : 20.

1910. *Phyllognathus dionysius* : Arrow, *Fauna Brit. India*. (Lamellicornia : Dynastinae), 1 : 307-309.

**Material examined** : 1 ex, Angul (Dhenkanal Dist.), 1913, J. Taylor coll.

**Distribution** : India : Orissa (Berhampur, Angul), Maharashtra (Belgaum), Karnataka, Bihar (Purnea District, Chotanagpur), West Bengal (Kurseong, Calcutta). Sri Lanka.

### Subfamily III. RUTELINAE

#### Genus 10. *Anomala* Samouelle

#### 10. *Anomala angulicollis* (Arrow)

1917. *Anomala angulicollis* Arrow, *Fauna Brit. India* (Lamellicornia : Rutelinae), 1 : 222.

**Material examined** : 2 exs, Orissa, nr. Balasore, Chandipore, 3-7.vi.1915, F. H. Gravely coll.

**Distribution** : India : Orissa (Chandipore, near Balasore).

**Remarks** : Arrow (1917) mentioned that types of this species are deposited in the British Museum and the Indian Museum. The Zoological Survey of India inherited all the Zoological collections of the Indian Museum and these two above mentioned specimens bear the collection data which corresponds to the original data given by Arrow. Though these specimens do not bear any type label, they belong to the type series.

#### 11. *Anomala grandis* (Hope)

1840. *Euchlora grandis* Hope, *Mag. Nat. Hist.*, (2) 4 : 284.

1917. *Anomala grandis* : Arrow, *Fauna Brit. India*, (Lamellicornia : Rutelinae), 2 : 234-235.

**Distribution** : India : Orissa (Gautam Dist., Berhampur), Bihar (Sahibganj), Assam (Sibsagar, Goalpara), Bangladesh, Burma.

#### 12. *Anomala obtusicollis* Arrow

1917. *Anomala obtusicollis* Arrow, *Fauna Brit. India*, (Lamellicornia : Rutelinae), 2 : 225-226.

**Material examined** : 1 ex, Puri (Puri Dist.), 6-13.xi.1910, Kemp Coll.

**Distribution** : India : Orissa (Puri).

**Remarks** : The specimen studied belongs to type series.

13. *Anomala seminitens* Arrow1917. *Anomala seminitens* Arrow, *Fauna Brit. India*, 2 : 233.*Distribution* : India : Orissa (Ganjam, Berhampur).*Remarks* : The species has been described from a single male specimen and this type is in the British Museum.14. *Anomala varicolor* (Gyllenthal)1817. *Melolontha varicolor* Gyllenthal; *Schönh. Syn. Ins.*, 1(3) : 114.1917. *Anomala varicolor* : Arrow, *Fauna Brit. India*, 2 : 152-153.*Material examined* : 1 ex, Chandipore, Balasore (Balasore Dist.), v-1916, F. H. Gravely coll.*Distribution* : India : Orissa (Ganjam Dist.), Uttar Pradesh (Jolikote), Sikkim (Gopaldhara, Rung bong valley), Bihar (Sarda, Pusa, Buxer Duars), Karnataka (Bangalore), Tamil Nadu (S. Arkot, Palni), Sri Lanka.Genus 11. *Adoretus* Castelnau15. *Adoretus bicaudatus* Arrow1914. *Adoretus bicaudatus* Arrow, *Ann. Mag. Nat. Hist.*, (8) 13 : 587.*Distribution* : India : Orissa (Ganjam, Berhampur), West Bengal (Calcutta, Sundarbans), Sri Lanka, Bangladesh.16. *Adoretus bimarginatus* Ohaus1914. *Adoretus bimarginatus* Ohaus, *Deut. Ent. Zeit.*, 480, fig.12.1917. *Adoretus bimarginatus* : Arrow, *Fauna Brit. India*, 2 : 328-329.*Distribution* : India : Orissa (Berhampur, Ganjam Dist.), Bihar (Pusa, Chapra), Uttar Pradesh (Dehra Dun), West Bengal (Pashok, Darjeeling).17. *Adoretus lasiopygus* Burmeister1855. *Adoretus lasiopygus* Burmeister, *Handb. Ent.*, 12(6) : 530.1893. *Adoretus cardoni* Brenske, *Ann. Soc. Ent. Belg.*, 37 : 41.1923. *Adoretus lasiopygus* : Arrow, *Rec. Indian Mus.*, 25(2) : 161.*Material examined* : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), N. Annandale coll., det. G. J. Arrow.*Distribution* : India : Orissa (Barkuda Island), Uttar Pradesh (Allahabad), Bihar (Tetara, Pusa, Sarda, Ranchi, Tinpahar and Rajmahal), West Bengal (Calcutta, Mungphu), Assam (Tejpur, Mangaldia), Tamil Nadu (Madras, S. Arkot, Coimbatore, Trichinopally), Karnataka (Ballary Dist.), Maharashtra (Godavari Dist.), Bangladesh, Sri Lanka.

## Subfamily IV. MELOLONTHINAE

Genus 12. *Apogonia* Kirby18. *Apogonia ferruginea* (Fabricius)1781. *Melolontha ferruginea* Fabricius, *Spec. Inst.*, 1 : 41.1850. *Apogonia ferruginea* : Blanchard, *Cat. Coll. Ent.*, 1 : 228.*Material examined* : 3 exs, Barkuda Island, Chilka lake (Ganjam Dist.), N. Annandale coll. 9.vi.1922, det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island), South India (Coromondal).

19. *Apogonia nigricans* Hope

1831. *Apogonia nigricans* Hope, *In Gray, Zool. Miscell*, 1 : 23.

*Material examined* : 3 exs, Keonjhargarh (Keonjhar Dist.), 23.ix.-2.x.1972, K. Rai coll.

*Distribution* : India : Orissa (Barkuda Island, Keonjhargarh), Himachal Pradesh (Kulu), Nepal.

20. *Apogonia* sp.

*Material examined* : 6 exs, Angul (Dhenkanal Dist.), 1-2,x.1972, K. Rai coll; 4 exs, Keonjhargarh (Keonjhar Dist.), 21-26-ix.1972, K. Rai coll.

*Distribution* : India : Orissa (Angul, Keonjhargarh).

*Remarks* : These specimens could not be identified up to species level, they seems to be close to *Apogonia carinata* Brenske.

Genus 13. *Schizonycha* Blanchard

21. *Schizonycha fuscescens* Blanchard \*

1850. *Schizonycha fuscescens* Blanchard, *Cat. Coll. Ent.*, 1 : 151.

*Material examined* : 2 exs, Keonjhargarh (Keonjhar Dist.), 23.ix.1972, K. Rai coll.

22. *Schizonycha ruficollis* Fabricius

1781. *Melolontha ruficollis* Fabricius, *Spec. Ins.*, 7 : 39.

1850. *Schizonicha ruficollis* : Blanchard, *Cat. Coll. Ent.*, 1 : 151.

1923. *Shizonicha ruficollis*, Arrow, *Rec. Indian Mus.* 25(2) : 260.

*Material examined* : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), 25.vii., 4.viii.1917, N. Annandale coll. det G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island), Bengal, Assam, South India (Coromandal), Pondicherry.

Genus 14. *Autoserica* Brenske

23. *Autoserica iridescens* Blanchard

1850. *Omalia iridescens* Blanchard, *Cat. Coll. Ent.*, 1 : 77.

1894. *Autoserica iridescens* : Brenske, *Mem. Soc. Ent. Belg.* 2 : 8.

*Material examined* : 3 exs, Barkuda Island, Chilka lake (Ganjam Dist.). 3-19.vii.1919, F. H. Gravely coll. det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island), North India, West Bengal, Andaman Island.

24. *Autoserica* sp.

*Remarks* : Arrow (1923) recorded this species but we could not find any material.

Genus 15. *Neoserica* Branske

25. *Neoserica bombycina* Karsch

1882. *Neoserica bombycina* Karsch, *Berl. Ent., Zeitscher.*, 26 : 387.

1923. *Neoserica bombycina* : Arrow, *Rec. Indian Mus.*, 25(2) : 260.

*Distribution* : India : Orissa (Barkuda Island), Sri Lanka.

*Remarks* : On the basis of a single specimen Arrow, 1923, recorded this species from India. We, however, could not find any material for study. This species was earlier known from Sri Lanka.

Genus 16. *Mericserica chilensis* Arrow

1923. *Mericserica chilensis* Arrow, *Rec. Indian Mus.*, 25(2) : 260.

Genus 17. *Holotrichia* Hope

27. *Holotrichia* sp.

*Material examined* : 4 exs, Keonjhar (Keonjhar Dist.), 20-23.ix.1972, K. Rai coll.

*Remarks* : This species could not be identified upto the species level.

Subfamily V. CHIRONINAE

Genus 18. *Chiron* M'Leay

28. *Chiron cylindrus* (Fabricius)

1798. *Scarites cylindrus* Fabricius, *Ent. Syst. Suppl.*, p.44.

1840. *Chiron digitatus* Castelnau, *Hist. nat. Ins. Col.*, 2 : 177.

1912. *Chiron cylindrus* : Schmidt, *Cal. Cat.*, Pars 42, p.10-11.

*Material examined* : 1 ex, Keonjhar (Keonjhar Dist.), 26.ix.1972, K. Rai coll.; 1 ex, Ganjam District, Barkuda Island, Chilka lake, 23.x.1920, N. Annandale coll., 1 ex, Barkuda Island, 4-10.x.1919, F. H. Gravely coll.

*Distribution* : India : Orissa (Keonjhar, Barkuda Island, Chilka lake, Ganjam), Rajasthan, Uttar Pradesh.

*Remarks* : In Coleoptera catalogue the Distribution of this species is given as "Ost India". In the collection of Zoological Survey of India, specimens of India, specimens of this species are present from Rajasthan, Uttar Pradesh and Orissa.

Subfamily VI. ORPHINAE

Genus 19. *Orphnus* M'Leay

29. *Orphnus impressus* Westwood \*

1846. *Orphnus impressus* Westwood, *Trans. ent. Soc. Lond.*, 4 : 177.

*Material examined* : 3 exs, Raikia (Phulbani Dist.), 30.vi.1974; 2 exs, Balliguda (Phulbani Dist.), 1.vii.1974; 2 exs, Boudh (Phulbani Dist.), 28.vi.1974. A. K. Mondal coll.

*Distribution* : India : Orissa (Raikia, Balliguda, Boudh), Bihar.

*Remarks* : In Coleoptera Catalogue the Distribution of the species is given as North India. In the collection of Zoological Survey of India, besides from Orissa, specimens are present from Namkum and Ranchi in Bihar.

30. *Orphnus mysoriensis* Westwood

1923. *Orphnus mysoriensis* : Arrow, *Rec. Indian Mus.*, 25(3) : 259.

*Material examined* : 10 exs, Orissa, Barkuda Island, Chilka lake (Ganjam Dist.). det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island), Southern India. Sri Lanka.

**Remarks** : It is very common in southern India and Sri Lanka.

**31. *Orphnus parvus* Wiedemann**

1823. *Orphanus parvus* Wiedemann, *Zool. Marg.*, 6(1) : 6.

1904. *Orphnus parvus* : Arrow, *Trans. Ent. Soc. Lond.*, p.747.

**Material examined** : 1 ex, Boudh (Phulbani Dist.), 28.iv.1974; 1 ex, Balliguda (Phulbani Dist.), 1.vii.1974, A. K. Mondal coll.; Barkuda Island (Chilka lake).

**Distribution** : India : Orissa (Boudh, Balliguda, Barkuda Island), West Bengal.

Subfamily VIII. HYBOSORINAE

Genus 20. **Hybosorus** M'Leay

**32. *Hybosorus orientalis* Westwood \***

1845. *Hybosorus orientalis* Westwood, *Trans. Ent. Soc. Lond.*, 6 : 159.

**Material examined** : 1 ex, Angul (Dhenkanal Dist.), 2.ix.1972; 1 ex, Keonjhar (Keonjhar Dist.), 21.ix.1972, K. Rai coll.

**Distribution** : India : Orissa (Angul, Keonjhar), Rajasthan, Uttar Pradesh, Sikkim, West Bengal, Tamil Nadu, Kerala, Pakistan.

Genus 21. **Phaeochrous** Castelnau

**33. *Phaeochrous emarginatus* Castelnau \***

1840. *Phaeochrous emarginatus* Castelnau, *Hist. Nat. Ins.*, 2 : 109.

**Material examined** : 2 exs, Boudh (Phulbani Dist.), 28.vi.1974; 1 ex, Raikia (Phulbani Dist.), 30.vi.1974, A. K. Mondal coll.

**Distribution** : India : Orissa (Boudh, Balliguda, Berbera, Raikia), West Bengal, Manipur.

Subfamily VIII. COPRINAE

Genus 22. **Scarabaeus** Linnaeus

**34. *Scarabaeus erichsoni* (Harold)**

1867. *Ateuchus erichsoni* Harold, *Col. Hefte*, 2 : 94.

1923. *Scarabaeus erichsoni* : Arrow, *Rec. Indian Mus.*, 25(2) : 259.

**Material examined** : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), vi.1920, N. Annandale coll. det. G. J. Arrow.

**Distribution** : India : Orissa (Barkuda Island), Karnataka (Bangalore), Andhra (Kodia kanal, Sri Lanka).

**35. *Scarabaeus sanctus* (Fabricius)**

1798. *Copris sanctus* Fabricius, *Ent. Syst.*, Suppl, p.34.

1913. *Scarabaeus sanctus* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae), 3 : 45.

**Material examined** : 1 ex, Ghatgaon (Keonjhar Dist.), 1.iv.1973, S. K. Gupta coll.

**Distribution** : India : Orissa (Ghatgaon), Bihar, Karnataka, Tamil Nadu, Kerala, Sri Lanka.

Genus 23. *Gymnopleurus* Illiger36. *Gymnopleurus cyaneus* (Fabricius)1798. *Copris cyaneus* Fabricius, *Ent. Syst. Suppl.*, p.34.1923. *Gymnopleurus cyaneus* : Arrow, *Rec. Indian Mus.*, 25(2) : 259.

*Material examined* : 2 exs, Barkuda Island, Chilka lake (Ganjam Dist.), 3-19.viii.1919, F. H. Gravely coll., all det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Islands), Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Karnataka, Kerala, Bangladesh, Sri Lanka.

37. *Gymnopleurus gemmatus* Harold \*1871. *Gymnopleurus gemmatus* Harold, *Col. Hefte*, 8 : 117.1931. *Gymnopleurus gemmatus* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae) 3 : 55-54.

*Material examined* : 8 exs, Barahal, Keonjhar (Keonjhar Dist.), 25.ix.1972, K. Rai coll.; 1 ex, Ghatgaon (Keonjhar Dist.), 1.iv.1973, S. K. Gupta coll.; 1 ex, Nowrangpur (Ganjam Dist.), 7.x.1972, Y. Chaturvedi coll.

*Distribution* : India : Orissa (Barahal, Ghatgaon, Nowrangpur), West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Karnataka, Maharashtra, Kerala, Pondicherry, Sri Lanka.

38. *Gymnopleurus miliaris* Fabricius1775. *Scarabaeus miliaris* Fabricius, *Syst. Ent.* p.817.1923. *Gymnopleurus miliaris* : Arrow, *Rec. Indian Mus.*, 25(2) : 259.

*Distribution* : India : Orissa (Barkuda Island, Puri), Madhya Pradesh, Maharashtra, Karnataka, Uttar Pradesh, Kashmir, Tamil Nadu, West Bengal, Sri Lanka, Pakistan.

Genus 24. *Sisyphus* Latreille39. *Sisyphus indicus* Hope1831. *Sisyphus indicus* Hope, *Gray's Zool. Misc.* p.22.1931. *Sisyphus indicus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 75-76.

*Material examined* : 1 ex, Baripada (Mayurbhanj Dist.), 17.xii.1955, T. G. Vazirani coll.; 4 exs, Keonjhar Dist., 19.iii.1972, S. K. Mitra coll.

*Distribution* : India : Orissa (Baripada, Barkuda Island, Keonjhar), Kashmir, West Bengal, Punjab, Meghalaya, Nagaland, Nepal, Bangladesh.

40. *Sisyphus longipes* (Oliver) \*1789. *Scarabaeus longipes* Oliver, *Entom.*, 1(3) : 164, pl.19, fig.177.1931. *Sisyphus longipes* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 71-73.

*Material examined* : 4 exs, Keonjhar (Keonjhar Dist.), 19.iii.1972, S. K. Mitra coll.

*Distribution* : India : Orissa (Keonjhar), West Bengal, Madhya Pradesh, Maharashtra, Tamil Nadu, Sri Lanka, Burma.

41. *Sisyphus neglectus* Gory1833. *Sisyphus neglectus* Gory, *Mon. Sisyphus*, p.14.1931. *Sisyphus neglectus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 73-74.



*Material examined* : 4 exs, Cuttack (Cuttack Dist.), 29.iii.1972; 1 ex, Biol. Fish Research Station, 17.iii.1974, R. K. Kackar coll.

*Distribution* : India : Orissa (Cuttack), Maharashtra, Karnataka, Gujarat, Madhya Pradesh, Uttar Pradesh, Pakistan.

#### Genus 25. *Heliocopriss* Burmister

##### 42. *Heliocopriss bucephalus* (Fabricius) \*

1775. *Scarabaeus bucephalus*, Fabricius, *Syst. Ent.*, p.24.

1931. *Heliocopriss bucephalus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 88-90.

*Material examined* : 2 exs, Dhenkanal (Dhenkanal Dist.), 7.x.1972, K. Rai coll.

*Distribution* : India : Orissa (Dhenkanal), Bihar, West Bengal, Uttar Pradesh, Madhya Pradesh, Maharashtra, Burma, Malay Peninsula, Indonesia.

#### Genus 26. *Catharsius* Hope

##### 43. *Catharsius granulatus* Sharp \*

1975. *Catharsius granulatus* Sharp, *Col. Hefte*, 13 : 41.

1931. *Catharsius granulatus*, Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 95-96.

*Material examined* : 2 exs, Banpur (Puri Dist.), 21.vii.1973; 1 ex, Barbera (Puri Dist.), 20.vii.1973, A. K. Mondal coll.; 1 ex, Orissa Survey, 5.xi.1972, J. K. Sen coll. (No other detail information); 1 ex, Dhenkanal (Dhenkanal Dist.), 7.x.1972, K. Rai Coll.

*Distribution* : India : Orissa (Banpur, Barbera, Dhenkanal), Sikkim, West Bengal, Bihar, Uttar Pradesh, Pakistan, Sri Lanka.

*Remarks* : The species is very similar to *C. molossus* but can be Distinguished by the absence of smooth area adjoining each eye.

##### 44. *Catharsius molossus* (Linnaeus)

1758. *Scarabaeus molossus* Linnaeus, *Syst. Nat.*, ed 10 : 347.

1931. *Catharsius molossus*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 94-95.

*Material examined* : 1 ex, 3.vii.1974; 4 exs, 23.viii.1973, Kalingo (Baudhkhondmals Dist.), 1 ex, Banpur (Puri Dist.), A. K. Mondal coll.; 1 ex, Bonaigurh (Sundargarh Dist.), 7.i.1973, S. K. Mitra coll.; 1 ex, Balugaon, (Puri Dist.), 2.ix.1972, Y. Chaturvedi coll.; 1 ex, Dhenkanal (Dhenkanal Dist.), 7.x.1972; 1 ex, Keonjhar (Keonjhar Dist.), 28.ix.1972, K. Rai coll.; 1 ex, Lulung Forest Bunglow, 28.xi.1972, J. K. Sen coll.

*Distribution* : India : Orissa (Kalingo, Banpur, Boraigurh, Balugaon, Dhenkanal, Keonjhar), Sikkim, West Bengal, Meghalaya, Assam, Bihar, Maharashtra, Uttar Pradesh, Himachal Pradesh, Karnataka, Kerala, Andaman Island, Sri Lanka.

*Remarks* : It is widely Distributed in India.

##### 45. *Catharsius pithecius* (Fabricius)

1775. *Scarabaeus pithecius* Fabricius, *Syst. Ent.*, p.21.

1931. *Catharsius pithecius*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 100-101.

*Material examined* : 4 exs, Banpur (Puri Dist.), 21.vii.1973 and 2 exs, Baliguda (Phulabauli Dist.), 1.vii.1974; A. K. Mondal coll.; 3 exs, Dhenkanal (Dhenkanal Dist.), 7.x.1972 and 1 ex, Lingarajori, Angul (Dhenkanal Dist.), 13.x.1972, K. Rai coll.

*Distribution* : India : Orissa (Banpur, Baliguda, Angul), Bihar, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Sri Lanka.

46. *Catharsius sagax* (Quenstedt) \*

1806. *Copris sagax* Quenstedt, *Schönh. Syn. Ins.*, 1 : 43.

1931. *Catharsius sagax*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 96-97.

*Material examined* : 1 ex, Kalpal Forest, 6.xi.1972; 1 ex, Purnakota, (Dhenkanal Dist.), 30.xi.1972; 1 ex, Barbera (Puri Dist.), 20.vii.1973; 1 ex, Banpur (Puri Dist.), 21.vii.1973, all A. K. Mondal coll.; 1 ex, Kendumur, Bauguitori (Dhenkanal Dist.), 13.x.1972 and 1 ex, Linga rajori, Angul (Dhenkanal Dist.), 13.x.1972, K. Rai coll.

*Distribution* : India : Orissa (Purnakot, Barbera, Banpur, Kendumur, Angul), West Bengal, Bihar, Madhya Pradesh, Maharashtra, Tamil Nadu, Kerala. Bhutan, Pakistan, Sri Lanka.

Genus 27. *Copris* Geoffroy

47. *Copris indicus* Gillet

1910. *Copris indicus* Gillet, *Notes Leyd. Mus.*, 32 : 5.

1923. *Copris fricator* Fabr.; Arrow, *Rec. Indian Mus.*, 25(2) : 259.

1931. *Copris indicus*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 106-107.

*Material examined* : 1 ex, Barbera (Puri Dist.), 20.xii.1973, A. K. Mondal coll.; 5 exs, Barkuda Island, Chilka lake, Ganjam Dist., 4.x.1920, N. Annandale coll. and 1 ex, Barkuda Island, 1-19.x.1919, F. H. Gravely coll. det. G. J. Arrow.

*Distribution* : India : Orissa (Barbera), Kerala, Karnataka, Sri Lanka.

48. *Copris repertus* Walker \*

1858. *Copris repertus* Walker, *Ann. Mag. Nat. Hist.*, 3(2) : 208.

1931. *Copris repertus*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 116-117.

*Material examined* : 5 exs, Keonjhar (Keonjhar Dist.), 26-27.ix.1972 and 1 ex, Dhenkanal (Dhenkanal Dist.), 7.x.1972, K. Rai coll.; 2 ex, Ghatgaon (Keonjhar Dist.) and 1 ex, Cuttack (Cuttack Dist.), S. K. Mitra coll.; 2 ex, Orissa, Manbhunj (Mayurbhanj Dist.), 24.iii.1973, S. K. Gupta coll.

*Distribution* : India : Orissa (Keonjhar, Dhenkanal, Ghatgaon, Cuttack), Bihar, Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu, Kerala. Burma, Sri Lanka.

Genus 28. *Phalops* Erichson

49. *Phalops divisus* (Wiedemann)

1823. *Copris divisus* Wiedemann, *Zool. Mag.* 2(1) : 12.

1923. *Phalops divisus*; Arrow, *Rec. Indian Mus.* 25(2) : 259.

*Material examined* : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), vii.1914, det G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island, Chilka lake), Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Kerala, Sri Lanka.

Genus 29. *Caccobius* Thomson

50. *Caccobius indicus* Harold

1867. *Caccobius indicus* Harold, *Col. Hefte*, 2 : 12.

1923. *Caccobius indicus*; Arrow, *Rec. Indian Mus.* 25(2) : 259.

**Material examined** : 2 exs, Barkuda Island, Chilka lake (Ganjam Dist.), 22.vii.-4.viii.1917 and 13.ix.1920, N. Annandale coll., det. G. J. Arrow.

**Distribution** : India : Orissa (Barkuda Island, Chilka lake), Karnataka (Bangalore), Tamil Nadu.

### Genus 30. *Onthophagus* Latreille

#### 51. *Onthophagus bonasus* (Fabricius) \*

1775. *Scarabaeus bonasus* Fabricius, *Syst. Ent.*, p.23.

1931. *Onthophagus bonasus*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 231-232.

**Material examined** : 7 exs, Bolangir, 28.v.-4.vi.1972, D. P. Sanyal coll.

**Distribution** : India : Orissa (Bolangir), Maharashtra, Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh, Tamil Nadu, Karnataka, Pakistan, Burma, Campuchiea, Vietnam, Thailand.

#### 52. *Onthophagus bronzeus* Arrow \*

1907. *Onthophagus bronzeus* Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 192-193.

**Material examined** : 2 exs, Keonjhar (Keonjhar Dist.), 20.viii.1972, S. K. Mitra coll.

**Distribution** : India : Orissa (Keonjhar), Maharashtra, Tamil Nadu.

#### 53. *Onthophagus catta* (Fabricius) \*

1787. *Scarabaeus catta* Fabricius, *Mant. ins.* 1 : 12.

1931. *Onthophagus catta*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 230-231.

**Material examined** : 18 exs, Saras (Keonjhar Dist.), 26.ix.1972 and 6 exs, Barahat (Keonjhar Dist.), 25.ix.1972, K. Rai coll.; 3 exs, Baripada (Mayurbhanj Dist.), 18.iii.1973, S. K. Mitra coll., 4 exs, Bolangir (Bolangir Dist.), 25-31.v.1972, D. P. Sanyal coll.; 1 ex, Boudh (Phaulabani Dist.), 28.vi.1974 and 1 ex, Banpur (Puri Dist.), A. K. Mondal coll.

**Distribution** : India : Orissa (Saras, Barahat, Baripada, Bolangir, Boudh, Banpur), Maharashtra, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, Pakistan, Arabia, Africa, Madagascar.

#### 54. *Onthophagus coeruleicollis* Arrow \*

1907. *Onthophagus coeruleicollis* Arrow, *Ann. Mag. Nat. Hist.*, (7) 19 : 430.

1931. *Onthophagus coeruleicollis*; Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 185-186.

**Material examined** : 2 exs, Keonjhar (Keonjhar Dist.), 20.viii.1972, S. K. Mitra coll.

**Distribution** : India : Orissa (Keonjhar), Maharashtra.

#### 55. *Onthophagus dama* (Fabricius) \*

1798. *Copris dama* Fabricius, *Ent. Syst. Suppl.*, p.32.

1931. *Onthophagus dama* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 280-281.

**Material examined** : 6 exs, Keonjhar (Keonjhar Dist.), 26.ix.1972, K. Rai coll.; 1 ex, Daikia, 30.vi.1972, A. K. Mondal coll.

**Distribution** : India : Orissa (Keonjhar, Daikia), Madhya Pradesh, Maharashtra, Tamil Nadu, Karnataka, Nepal, Bhutan, Sri Lanka.

#### 56. *Onthophagus furculus* (Fabricius)

1798. *Copris furculus* Fabricius, *Ent. Syst. Suppl.*, p.33.

1914. *Onthophagus furculus* : Boucomont. *Ann. Mus. Civ. Stor. Nat. Genova*, 46 : 232.

1923. *Caccobius furculus* : Arrow, *Rec. Indian Mus.* 25(2) : 259.

1931. *Onthophagus furculus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 205-206.

*Material examined* : 2 exs, Barkuda, Island, Chilka lake (Ganjam Dist.), 13.ix.1920, N. Annandale coll., det G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island, Chilka lake), Tamil Nadu (Pondicherry).

#### 57. *Onthophagus hystrix* Boucomont

1914. *Onthophagus hystrix* Boucomont, *Ann. Mus. Civ. Stor. Nat. Genova*, 46 : 238.

1923. *Caccobius hystrix* : Arrow, *Rec. Indian Mus.* 25(2) : 259.

1931. *Onthophagus hystrix* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 146-165.

*Material examined* : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), vii.1914. Chilka lake survey, det. G. J. Arrow 'C. hystrix'

*Distribution* : India : Orissa (Barkuda Island, Chilka lake), Bihar (Pusa, Chapra), Uttar Pradesh (Dehra Dun, Fyzabad), Madhya Pradesh (Baihar, Balaghat, Motinala, S. Mandla), Maharashtra (Nagpur, Belgaun), Tamil Nadu (Chipurupalle, Vizagapatam District, Coimbatore, Trichinopoly), Kerala (Trivandrum), Sri Lanka, Burma.

#### 58. *Onthophagus laevigatus* (Fabricius) \*

1798. *Copris laevigatus* Fabricius, *Ent. Syst., Suppl.* p.35.

1931. *Onthophagus laevigatus* : Arrow *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 284-285.

*Material examined* : 4 exs, Keonjhar (Keonjhar Dist.), 26.ix.1972, K. Rai coll.

*Distribution* : India : Orissa (Keonjhar), Tamil Nadu, Kerala, Sri Lanka.

#### 59. *Onthophagus ludio* Boucomont

1914. *Onthophagus ludio* Boucomont, *Ann. Mus. Civ. Stor. Nat. Genova*, 46 : 218.

1931. *Onthophagus ludio* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae), 3 : 346-347.

*Distribution* : India : Orissa, Barkuda Island, Chilka lake (Ganjam Dist.), Maharashtra (Nagpur, Bombay, Belgaum), Tamil Nadu (Madras city, Samal Kot, Sidapur, Coorg, Nilgiri hills), Sri Lanka.

#### 60. *Onthophagus militaris* Boucomont

1914. *Onthophagus militaris* Boucomont, *Ann. Mus. Civ. Stor. Nat. Genova*, 46 : 234.

1923. *Onthophagus militaris* : Arrow, *Rec. Indian Mus.*, 25(2) : 259.

*Material examined* : 2 exs, Barkuda Island, Chilka lake (Ganjam Dist.), 3-19.viii.1919, F. H. Gravely coll. and 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), 21.vii.1914, Chilka lake Survey all det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island), Sri Lanka.

#### 61. *Onthophagus orissanus* Arrow

1931. *Onthophagus orissanus* Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 257.

*Distribution* : India : Orissa (Barkuda Island).

#### 62. *Onthophagus quadridentatus* (Fabricius) \*

1798. *Copris quadridentatus* Fabricius, *Ent. Syst. Suppl.* p.34.

1801. *Copris quadricornis* : Fabricius, *Syst. Eleuth.*, 1 : 54.

1931. *Onthophagus quadridentatus* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae), 3 : 282-283.

*Material examined* : 8 exs, Keonjhar (Keonjhar Dist.), 26.ix.1972, K. Rai coll.

**Distribution** : India : Orissa (Keonjhar), Arunachal Pradesh, West Bengal, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Kerala, Sri Lanka.

**63. *Onthophagus ramosus* (Wiedemann) \***

1823. *Copris ramosus* Wiedemann, *Zool. Mag.*, 2(1) : 13.

1931. *Onthophagus ramosus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 236-237.

**Material examined** : 1 ex, Soras, Keonjhar, (Keonjhar Dist.) 20.ix.1972, K. Rai coll.

**Distribution** : India : Orissa (Soras), Kashmir, Punjab, Uttar Pradesh, Madhya Pradesh, Bihar, Maharashtra, Karnataka, Tamil Nadu, Thailand.

**64. *Onthophagus sagittarius* Fabricius \***

1775. *Onthophagus sagittarius* Fabricius, *Syst. Ent.* p.21.

1913. *Onthophagus sagittarius* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae), 3 : 304-305.

**Material examined** : 2 exs, Soras (Keonjhar Dist.), 26.ix.1972, K. Rai coll.

**Distribution** : India : Orissa (Soras), Uttar Pradesh, Madhya Pradesh, West Bengal, Burma, Malay Peninsula, Java, S. China.

**65. *Onthophagus tritinctus* Boucomont**

1914. *Onthophagus tritinctus* Boucomont, *Ann. Mus. Civ. Stor. Nat. Genova*, 46 : 217.

**Material examined** : 1 ex, Barkuda Island, Chilka lake (Ganjam Dist.), 17.viii.1920, 1 ex, Barkuda Island, Chilka lake, 25.vii.-4.viii.1917, N. Annandale coll. det. G. J. Arrow.

**Distribution** : India : Orissa (Barkuda Island), Kerala (Coonoor, Nandidrug), Maharashtra (Nagpur), Sri Lanka.

**Genus 31. *Delopleurus* Erichson**

**66. *Delopleurus parvus* (Sharp)**

1875. *Coptorrhina parvus* Sharp, *Col. Hefte*, 8 : 47.

1831. *Delopleurus parvus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 410-411.

**Material examined** : 1 ex, Athgarh (Cuttack Dist.), 28.vii.1982, S. K. Mitra coll.

**Distribution** : India : Orissa (Athgarh), Tamil Nadu, Kerala.

**Genus 32. *Ponerotrogus* Silvestri**

**67. *Ponerotrogus annandalei* Silvestri \***

1924. *Ponerotrogus annandalei* Silvestri, *Rec. Ind. Mus.*, 26 : 586.

**Material examined** : 1 ex, Bonaigarh (Sundargarh Dist.), 17.vi.1972, D. P. Sanyal coll.

**Distribution** : India : Orissa (Bonaigarh), Tamil Nadu.

**Genus 33. *Liatongus* Reitter**

**68. *Liatongus rhadamistus* (Fabricius) \***

1775. *Scarabaeus rhadamistus* Fabricius, *Syst. Ent.* p.75.

1931. *Liatongus rhadamistus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 374-375.

**Material examined** : 1 ex, Bolangir (Bolangir Dist.), 25.v.1972, D. P. Sanyal coll.

**Distribution** : India : Orissa (Bolangir), Madhya Pradesh, Maharashtra, Tamil Nadu, Sri Lanka.

Genus 34. *Oniticellus* Serveille69. *Oniticellus spinipes* Roth \*1851. *Oniticellus spinipes* Roth, *Arch. f. Nat.*, 17(1) : 128.1931. *Oniticellus spinipes* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 378-379.

*Material examined* : 1 ex, Keonjhar (Keonjhar Dist.), 26.ix.1972, K. Rai coll. 1 ex, Baripada (Mayurbhanj Dist.), 9.v.1972, S. K. Mitra coll.

*Distribution* : India : Orissa (Keonjhar, Baripada), Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Kerala, Africa.

Genus 35. *Drepanocerus* Kirby70. *Drepanocerus setosus* (Wiedemann) \*1823. *Copris setosa* Wiedemann, *Zool. Mag.*, 2(1) : 19.1931. *Drepanocerus setosus* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 381-382.

*Material examined* : 1 ex, Sundargarh (Sundargarh Dist.), 10.i.1972, P. K. Maiti coll.

*Distribution* : India : Orissa (Sundargarh), Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Sri Lanka.

Genus 36. *Onitis* Fabricius71. *Onitis falcatus* (Wulfen) \*1786. *Scarabaeus falcatus* Wulfen, *Descr. Cap. Ins.* p.14. pl.2, fig.17.1876. *Onitis falcatus* : Lansburge, *Ann. Soc. Ent. Belg.*, 18 : 126.1931. *Onitis falcatus* : Arrow, *Fauna Brit. India*, (Lamellicornia : Coprinae), 3 : 392-393.

*Material examined* : 1 ex., Perlekimundi (Ganjam Dist.), 17.vii.1973, A. K. Mondal coll.

*Distribution* : India : Orissa (Perlekimundi), Uttar Pradesh, Maharashtra, Tamil Nadu, Kerala, Bihar, West Bengal, Bangladesh, Burma, Malay Peninsula, Phillipine, South China.

72. *Onitis philemon* Fabricius \*1801. *Onitis philemon* Fabricius, *Syst. Eleut.*, 1 : 30.1931. *Onitis philemon* : Arrow, *Fauna Brit. India* (Lamellicornia : Coprinae), 3 : 393-394.

*Material examined* : 1 ex, Balangir, (Balangir Dist.), 25.v.1972, D. P. Sanyal coll.

*Distribution* : India : Orissa (Balangir), Punjab, Bihar, Uttar Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Tamil Nadu, Sri Lanka.

73. *Onitis* sp. nr. *virens* Lansberge \*

*Material examined* : 1 ex, Baripada (Mayurbhanj Dist.), 18.iii.1973, S. K. Mitra coll.

*Distribution* : India : Orissa (Baripada).

*Remarks* : The specimen under study is small male. It generally agrees with the description of *O. virens* but for the normal front tibia, not elongate and prolonged into a long blunt spine.

## Subfamily IX. APHODINAE

Genus 37. *Aphodius* Illiger74. *Aphodius (Nialus) lividus* (Olivier) \*1789. *Scarabaeus lividus* Olivier, *Ent. Col.*, 1(3) : 86.

*Material examined* : 1 ex, Phulbani (Baudhkhondmal Dist.), 18.iii.1973, S. K. Gupta coll.

*Distribution* : India : Orissa (Phulbani).

*Remarks* : The species is almost cosmopolitan but from India no detail Distributional information is available.

**75. *Aphodius (Calaphodius) moestus* Fabricius \***

1801. *Aphodius moestus* Fabricius, *Syst. Eleuth.* 1 : 78.

*Material examined* : 15 exs, Orissa, Keonjhar (Keonjhar Dist.), 20.ix.-2.x.1972, K. Rai coll.; 2 exs., Baripada (Mayurbhanj Dist.), 9.v.1974, S. K. Mitra coll.

*Distribution* : India : Orissa (Keonjhar, Baripada), Afghanistan, Sri Lanka, East and South Africa, Madagascar.

*Remarks* : The species is widely Distributed and forms local races. In India, the detailed Distribution of the species is not precisely know. Two specimens collected in May, 1974 (supra) are very pale in the colouration and appear to be nature.

**76. *Aphodius ovatulus* Harold**

1861. *Aphodius ovatulus* Harold, *Berl. Ent. Zeit.* 5 : 108.

*Material examined* : 1 ex., Barkuda Island (Ganjam Dist.), 3-19.vii.1919, F. H. Gravely coll., det. G. J. Arrow.

*Distribution* : India : Orissa (Barkuda Island). Sri Lanka.

**77. *Aphodius putearius* Reitter \***

1895. *Aphodius putearius* Reitter, *Wien. Ent. Zeit.* 14 : 208.

*Material examined* : 9 exs., Keonjhar (Keonjhar Dist.), 20.ix.1972, K. Rai coll.

*Distribution* : India : Orissa (Keonjhar), Kashmir, China, Taiwan, Indonesia.

*Remarks* : The specimens under study agrees more with the subspecies *nigellus* Schmidt from java having closer and stronger cephalic punctures, rounded clypeus and strong punctures on elytral interval and suture.

**Genus 38. *Chaetopisthes* Westwood**

**78. *Chaetopisthes (Neochaetopisthes) heimi* Wasmann \***

1902. *Chaetopisthes heimi* Wasmann, *Zool. Jahrb. Syst.* 17 : 149.

1964. *Chaetopisthes (Neochaetopisthes) heimi* : Balthasar, *Monographic der Scarabaeidae and Aphodiidae, der palaearktischen and Orientalischen Region (Coleoptera : Lamellicornia)*, 3 : 630-631.

*Material examined* : 1 ex., Baripada (Mayurbhanj Dist.), 16.ix.1972, S. K. Gupta coll.

*Distribution* : India : Orissa (Baripada), Gujarat.

**Genus 39. *Termitopisthes* Wasmann**

**79. *Termitopisthes wasmanni* (Schmidt) \***

1911. *Chaetopisthes wasmanni* Schmidt, *Stett. Ent. Zeit.* 72 : 33.

1918. *Termitopisthes wasmanni* : Wasmann, *Wien. ent. Zeit.*, p.14.

*Material examined* : 2 exs., Baripada (Mayurbhanj Dist.), 16.iii.1972, S. K. Gupta coll.

*Distribution* : India : Orissa (Baripada), Bihar (Chotanagpur).

Genus 40. *Stenocorythoderus* Wasmann80. *Stenocorythoderus braminus* Wasmann \*

1918. *Stenocorythoderus braminus* Wasmann, *Wien. Ent. Zeit.*, 37 : 12.

*Material examined* : 5 exs., Baripada (Mayurbhanj Dist.), 16.iii.1972, S. K. Gupta coll.

*Distribution* : India : Orissa (Baripada), Gujarat.

## SUMMARY

The present paper deals with 80 species under 40 genera belonging to 9 subfamilies, namely Cetoniinae, Dynastinae, Rutelinae, Melolonthinae, Chironinae, Orphinae, Hybosorinae, Coprinae and Aphodiinae. Thirty seven species are reported for the first time from the state of Orissa.

## ACKNOWLEDGEMENTS

Authors are thankful to Director, Zoological Survey of India, Calcutta, for the facilities of work provided during this faunistic work and are also thankful to Dr. O. B. Chhotani, Joint Director, for going through the manuscript and suggestions for its improvement.

## REFERENCES

- Arrow, G. J. 1910. *The Fauna of British India, including Ceylon and Burma Coleoptera : Lamellicornia* (Cetoniinae and Dynastinae), Taylor and Francis, London. 1 : 1-322, 2 pls.
- Arrow, G. J. 1917. *The Fauna of British India, including Ceylon and Burma. Coleoptera : Lamellicornia* (Rutelinae). Taylor and Francis, London. 2 : 1-387, 5 pls.
- Arrow, G. J. 1923. Certain Coleoptera of Barkuda. *Rec. Indian Mus.*, Calcutta, 25(2) : 259-263.
- Arrow, G. J. 1931. *The Fauna of British India, including Ceylon and Burma. Coleoptera : Lamellicornia* (Coprinae). Taylor and Francis, London. 3 : i-xii + 428 pp, 13 pls.
- Balthasar, V. 1963. *Monographic der Scarabaeidae und Aphodiidae der palaearktischen und Orientalischen Region* (Coleoptera : Lamellicornia), 2 : 1-627 + I-XVI. (Czechoslovak Academy of Sciences Prague).
- Balthasar, V. 1963. *Monographic der Scarabaeidae und Aphodiidae der palaearktischen und Orientalischen Region* (Coleoptera : Lamellicornia), 3 : 1-625 + pl. I & II. (Czechoslovak Academy of Sciences Prague).
- Brenske, E. 1898. Serica-Arten der Erde. *Berl. Ent. Ztschr.*, 43 : 205-404.