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ON LAND AND FRESHWATER MOLLUSCS OF PUNE DISTRICT, MAHARASTRA.

By

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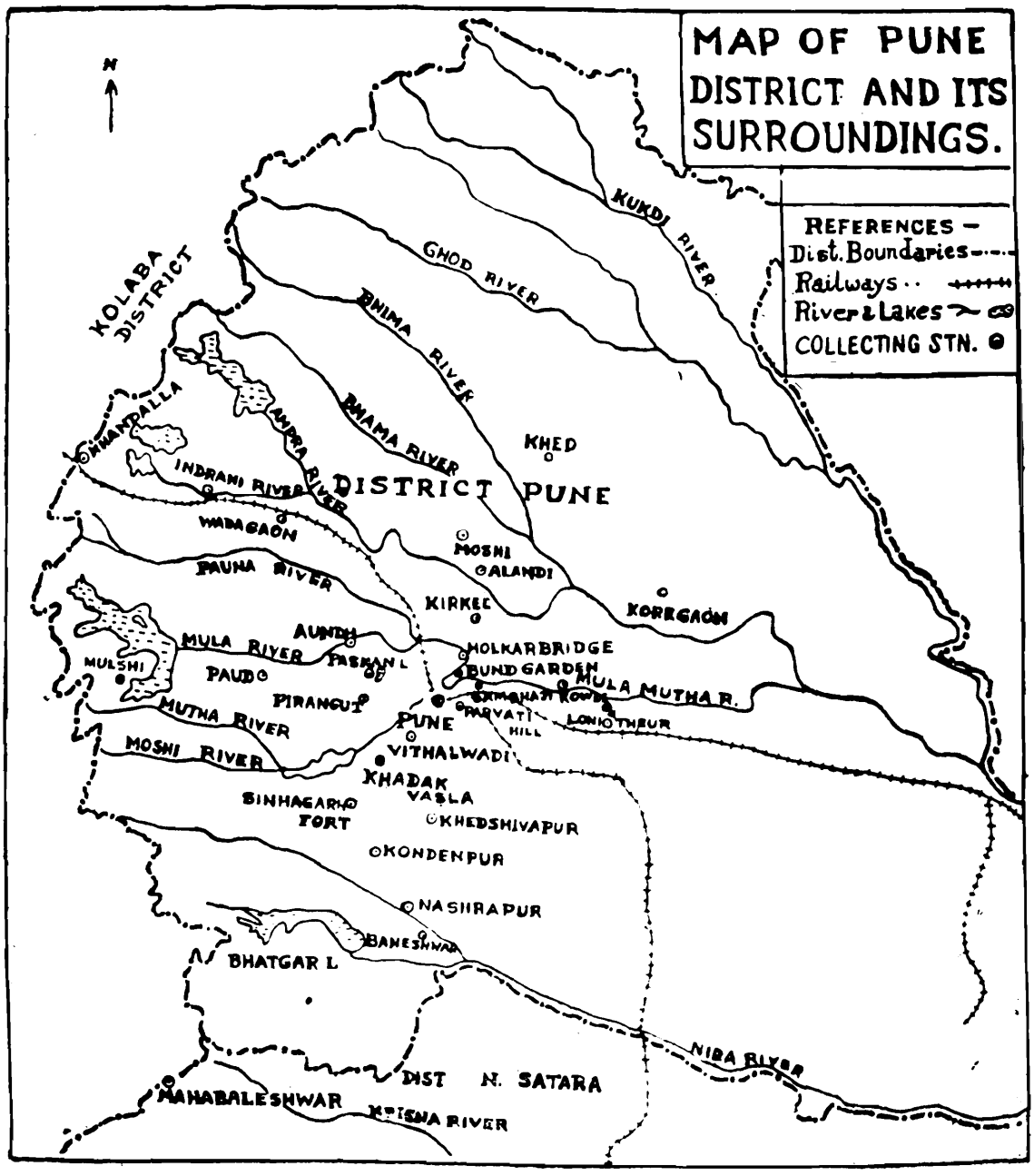
(With 1 Text-figure)

INTRODUCTION

The Pune district lying between 17°54′ and 19°24′ N latitude and 73°10′ and 75°10′ E longitude is bordered on its west by Western Ghats consisting of Sahyadris and other minor ranges. Numerous small streams are running through these hills and forming water falls in the course. Besides these natural streams and rivers, the district has some important artificial lakes and reservoirs. With its preponderance of aquatic bodies the district has ideal habitats for aquatic invertebrates. Yet information about these animals, especially molluscs is poor.

References about the molluscs from the Pune District are few and scattered notwithstanding the fact that type-localities of several species of aquatic and land molluscs are located within the district. Annandale (1919), Annandale & Prashad (1919), and Hora (1925, 1926) made some interesting observations on the hill-stream fauna of the district. A little more than a decade back Tonapi and Mulherkar (1963) and recently Tonapi (1971), published an account of freshwater mollusca of Pune including a few land forms—totalling 53 species. The nomenclature used by them for certain species is backdated and obsolete, and tends to create confusion. Moreover, in those papers no distinction was made between land and freshwater molluscs. In the present paper an attempt has been made to give an adequate picture of the molluscan fauna of Pune District, including an uptodate checklist. As a result of the present study ten species are now being added to the faunal list of molluscs o. Pune district and Maharashtra.

The bulk of the material available for the present study was collected by different survey parties of the Western Regional Station, Zoological Survey of India, Pune, during the years 1959-1969. Besides the



Text-fig. 1. Map of Pune District and its surroundings.

Regional Station's material a few othe: collections from the private parties are also included here. A number of parties from the Head Quarters of the Zoological Survey of India have also periodically surveyed the area and brought some collections, which are deposited in the Mollusca Section. In addition to all these recent collections, the unnamed and named material preserved in the Zoological Survey of India was also examined and references in literature were consulted. The resulting taxonomic view projects a total of about 130 species and varieties falling into 22 families and 51 genera as occurring in the Pune, District. The identified material is preserved either in the Western Regional Station, Pune or in the Headquarters of the Survey at Calcutta and in a few instances the material was returned to the party concerned.

The molluscs are well represented in the fauna of the district. A further intensive survey may bring more species into light.

The collecting stations are shown in the map attached herewith. So as to economise space, only the number of examples studied are given for each species, without the details like exact locality, name of the collector and date of collection.

Abbreviations used : H = Height, W = Width, L = Length.

A COMPLETE LIST OF LAND AND FRESHWATER MOLLUSCS SO FAR KNOWN FROM PUNE (ARRANGED IN PHYLOGENITICAL ORDER).

(*The species present in the collection and studied by us.
** New records for Pune District.)

Class GASTROPODA

Order MESOGASTROPODA

Family CYCLOPHORIDAE

1. *Cyclophorus* (*Glossostylus*) *indicus* (Deshayes)
2. *C.* (*G*) *stenomphalus* Pfeiffer
3. *C.* (*Annularia*) *aurantiacus* (Schumacher)
4. *C.* (*Litostylus*) *involvulus* (Müller)
5. *Cyathopoma deccanense* Blanford
6. *Nicida liricincta* Blanford
7. *Opisthostoma fairbanki* Blanford

Family POMATIASIDAE

*8. *Cyclotopsis semistriata* (Sowerby)

Family VIVIPARIDAE

*9. *Viviparus bengalensis* form *bengalensis* (Lamarck)
*10. *V. bengalensis form doliaris* (Gould)
*11. *V bengalensis form incrassatus* Annandale
*12. *Viviparus bengalensis* form *mandiensis* Kobelt
*13. *V. dissimilis* (Müller)

Family PILIDAE (= AMPULLARIIDAE)

14. *Pila globosa* (Swainson)
*15. *Turbinicola saxea* (Reeve)

Family HYDROBIIDAE

*16. *Alocinma orcula* (Benson)
*17. *A. orcula* var. *producta* (Nevill)

18. *Sataria evezardi* (Blanford)
19. *Bithynia stenothyroides* Dohrn (= *Bulimus stenothyroides Dohrn*)
*20. *Digoniostoma pulchella* (Benson)

Family THIARIDAE (= Melanidae)

Subfamily THIARIINAE

*21. *Thiara scabra* (Müller)
*22. *T. scabra* var. *elegans* (Benson)
*23. *Melanoides pyramis* (Hutton)
**24. *M. pyramis* var. *puteicola* Annandale & Prashad
*25. *M. pyramis* var. *leopardina* Annandale & Prashad
26. *M. riqueti* (Grateloup)
*27. *M. (Melanoides) tuberculatus* (Müller)

Subfamily PALUDOMINAE

*28. *Paludomus obesa* Philippi
29. *P. tanschaurica* var. *malabarica* Nevill
30. *P. (Stomatodon) stomatodon* Benson
31. *Sulcospira (Sulcospira) hugeli* var. *compacta* Nevill

Family LITTORINIDAE

*32. *Cremnoconchus (Cremnoconchus) syhadrensis* (Blanford)
*33. *C. (Lissoconchus) conicus* Blanford
*34. *C. conicus* var. *edecollata* Nevill

Order BASOMMATOPHORA

Family LYMNAEIDAE

35. *Lymnaea (Pseudosuccinea) acuminata* (Lamarck)
*36. *L. (P.) acuminata* f. *typica* Lamarck
*37. *L. (P.) acuminata* f. *gracilior* Martens
*38. *L. (P.) acuminata* f. *patula* Troschel
*39. *L. (P.) acuminata* f. *rufescens* Gray
*40. *L. (P.) acuminata* var. *nana* Annandale
*41. *L. (P.) acuminata* sub sp. *tonapii* Ray & Roy Chaudhury
*42. *L. (P.) luteola* (Lamarck)
*43. *L. (P.) luteola* f. *typica* Lamarck
*44. *L. (P.) luteola* f. *australis* Annandale & Rao
*45. *L. (P.) luteolo* f. *impura Troschel*
*46. *L. (P.) luteola* f. *succinea* Deshayes
47. *L. auricularia* (Draparnaud)
48. *L. pinguis* Dohrn

Family PLANORBIDAE

*49. *Indoplanorbis exustus* (Deshayes)
*50. *Gyraulus convexiusculus* (Hutton)
51. *G. labiatus* (Benson)

Order SYSTELLOMMATOPHORA

Family VERONICELLIDAE

*53. *Laevicaulis alte* (Ferussac)
**53. *Semperula birmanica* (Theobald)
54. *Semperula maculata* (Templeton)
**55. *Sarasinula plebeja* (Fischer)

Order STYLOMMATOPHORA

Family SUCCINEIDAE

*56. *Succinea raoi* Subba Rao and Mitra
*57. S. *bensoni* pfeiffer
*58. *S. collina* Hanley & Theobald
*59. *S. tornadri* Rao
*60. *Indosuccinea khandalla* Rao
*61. *Lithotis rupicola* Blanford
*62. *L. tumida* Blanford

Family ENIDAE

Subfamily NAPAEINAE

63. *Cerastus abyssinicus* (Pfeiffer)
64. *C. densus* (Pfeiffer)
65. *C. distans* (Pfeiffer)
66. *C. jerdoni* (Reeve)
67. *C. jerdoni* var. *redfieldi* (Pfeiffer)
68. *C. moussonianus* (Petit)
*69. *Rachis punctatus* (Anton)
70. *Rachisellus bengalensis* Lamarck
71. *R. praetermissus* Blanford

Family SUBULINIDAE

*72. *Opeas gracile* (Hutton)
73. *Zootecus chion* (Pfeiffer)
*74. *Z. insularis* (Ehrenberg)

Family GLESSULIDAE

*75. *Glessula arthuri* (Benson)
76. *G. brevis* (Pfeiffer)
77. *G. chessoni* (Benson)
*78. *G. ceylanica* (Pfeiffer)
*79. *G. gemma* (Reeve)
80. *G. lyrata* Blanford
**81. *G. illustris* var. *tumida* Godwin-Austen
*82. *G. notigena* (Benson)
83. *G. pulla* Blanford
84. *G. rugata* Blanford
*85. *G. dikrangense* Godwin-Austen
86. *G. singhurensis* Blanford
87. *G. tornensis* Blanford
88. *G. hebes* (Blanford)

Family ARIOPHANTIDAE

Subfamily ARIOPHANTINAE

*89. *Ariophanta bajadera* (Pfeiffer)
90. *A. laevipes* (Müller)
*91. *Cryptozona* (*Nilgiria*) *semirugata* (Beck)
92. *C.* (*Xestina*) *belangeri* var. *bombayana* (Pfeiffer)
*93. *C.* (*X*) *bistrialis* (Beck)
94. *Euplecta subdecussata* Pfeiffer

Subfamily HELICARIONINAE

*95. *Eurychlamys platychamys* Blanford
96. *Pseudaustenia atra* Godwin-Austen

Subfamily KALIELLINAE

97. *Kaliella barrackporensis* Pfeiffer

Subfamily MACROCHLAMYDINAE

98. *Macrochlamys pedina* (Benson)
99. *M. petrosa* (Hutton)
**100. *M. petasus* (Benson)
101. *M. infaustra* Blanford
**102. *M. indica* Godwin-Austen
*103. *M. tenuicula* (H. Adams)

Subfamily GIRASIINAE

104. *Mariaella dussumieri* Gray

Subfamily DURGELLINAE

**105. *Sitala denselirata* Preston

Family TROCHOMORPHIDAE

**106. *Trochomorpha* (*Sivela*) *billiana* (Mörch)

Family PLEURODONTIDAE

107. *Chloritis leithi* Gude
108. *C. propinqua* (Pfeiffer)
109. *Planispira footei* Stoliczka
110. *P. proxima* (Ferussac)
*111. *P.* (*Trachia*) *crassicostata* (Benson)

Family FRUTICICOLIDAE

**112. *Eulota scalpturita* (Benson)

Family VALLONIDAE

*113. *Pupisoma evezardi* (Blanford)

Family STREPTAXIDAE

114. *Streptaxis scalptus* Blanford

Class BIVALVIA

Order EULAMELLIBRANCHIATA

Family UNIONIDAE

*115. *Indonaia caerulea* (Lea)
*116. *I. khadakvaslaensis* Ray
*117. *Lamellidens consobrinus* (Lea)
*118. *L. corrianus* (Lea)
*119. *L. marginalis* (Lamarck)
*120. *L. marginals* var. *cylindrica* (Hanley & Theobald).
**121. *L. lamellatus* (Lea)
*122. *Parreysia corrugata* (Müller)
*123. *P. corrugata* var. *nagpoorensis* (Lea)
*124. *P. favidens* (Benson)

**125. *P. favidens* var. *marcens* (Benson)
*126. *Parreysia rajahensis* (Lea)

Family CORBICULIDAE

*127. *Corbicula striatella* Deshayes
*128. *C. krishnaea* Ray
*129. *C. peninsularis* Prashad
*130. *C. regularis* Prime

KEY TO THE MOLLUSCS OF PUNE DISTRICT (UP TO FAMILIES)

a. *Land*

1. Animal slug-like, without a shell, tentacles contractile ...VERNONICELLIDAE
   Animal with either an internal or external shell, tentacles retractile. .2

2 Aperture of shell in life closed by a circular or horny operculum. .3
   Aperture of shell not closed by an operculum . 4

3. Shell larger in size, inner lip and outer lips of the aperture strongly thickened and reflected, foot broad and not grooved CYCLOPHORIDAE
   Shell smaller in size, lips comparatively thin, simple or expanded, foot with a median longitudinal groove POMATIASIDAE.

4. Shell turretted to cylindrical .. . 57
   Shell not cylindrical but either globose, trochiform to turbiniform or discoidal 6

5. Shell imporforate with many whorls—more than seven in an adult snail

   Shell perforate with less than seven whorls ENIDAE

6. Shell drab coloured, slender, body whorl narrow SUBULINIDAEE
   Shell smooth, glossy and thick, body whorl wide, distinct from the spire GLESSULIDAE

7. Shell trochiform, minute, lip thin, dilated at the columella obstructing the umbilical opening VALLONIIDAE
   Shell either globose or flatly depressed, lip thicknened 8

8. Shell either flatly compressed or depressed with less pronounced spire..9
   Shell globose with either slightly raised or prominent spire 10

9. Shell flatly compressed, thinly sculptured, body whorl keeled TROCHOMORPHIDAE
   Shell with a depressed spire, strong sculpture but without keel PLEURODONTIDAE

10. Shell widely umbilicate, spire slightly raised FRUTICICOLIDAE
    Shell with narrow umbilical pore, spire raised and prominent ARIOPHANTIDAE

b. ***Freshwater***

1.	**Shell univalve**	2
	Shell with two valves	9
2.	Occurs in fast flowing streams or hill streams, shell depressedly turbinate with a short spire	LITTORINIDAE
	Normally found in stagnant water pools, ponds or tanks, shell not depressed, spire prominent	3
3.	Shell with operculum	4
	Shell without operculum	7
4.	Shell moderately to considerably large in size, aperture broad	5
	Shell small in size, usually turreted, aperture small	6
5.	Shell considerably large in size, globose, body whorl very large, spire comparatively small	PILIDAE (AMPULLARIIDAE)
	Shell moderately large, top-shaped or turbinated, spire prominent, body whorl not very large when compared with the spire	VIVIPARIDAE
6.	Shell corneous, normally conical, spire not large than the body whorl	AMNICOLIDAE
	Shell thick, rounded but mostly turreted, spire may be very large or very small than the body whorl	THIARIDAE (MELANIIDAE)
7.	Shell thin, aperture large, body whorl generally large, spire short	8
	Shell thick, discoidal in shape, animal sinistral	PLANORBIDAE
8.	Columellar fold conspicuously twisted longitudinally, truly aquatic.	LYMNAEIDAE
	Columellar fold not twisted, found on land or even on trees	SUCCINEIDAE
9.	Shell transversely elongated, ligament internal, outer surface without concentric striae	UNIONIDAE
	Shell triangular or triangularly ovate, outer surface with concentric striae, ligament external	CORBICULIDAE

SYSTEMATIC ACCOUNT

In the following account nomenclature and the scheme of classification is based largely on Thiele (1931-1937) with a few exceptions here and there. Literature citations under every species have been limited to original description and important subsequent record.

A. LAND MOLLUSCS

Class GASTROPODA

Order MESOGASTROPODA

Family CYCLOPHORIDAE

Genus *Cyclophorus* Montfort, 1810.

Cyclophorus indicus (Deshayes)

1832. *Cyclostoma indicum*, Deshayes, in Belanger *Voy. Ind. Orient. Zool*: 415, pl. 1, figs. 4, 5.

1921. *Cyclophorus indicus* : Gude, *Fauna Brit. India* Mollusca-III : 63.

Total No. of exs. studied : 5. Largest shell H=30.47 mm./W = 35 mm.

Distribution : India—Elephanta Island; Western Ghats, Bombay, It is restricted to western India.

Family POMATIASIDAE

Genus **Cyclotopsis Blanford, 1864**

Cyclotopsis semistriata (Sowerby)

1843. *Cyclostoma semistriatum* Sowerby, *Thes, Conch.* 1 : 91, pl. 23, fig. 6.

1921. *Cyclotopsis semistriatum* : Gude *Fauna Brit. India,* Mollusca III : 353

Total no. of exs. studied : 100. Largest shell H = 10.31 mm./W = 10.5 mm.

Distribution : India—Pune, Maharashtra. It is restricted to hills near Pune city.

Order SYSTELLOMMATOPHORA

Family VERONICELLIDAE

Genus **Laevicaulis** Simroth, 1913.

Laevicaulis alte (Ferussac)

1821. *Vaginulus alte* Ferussac. *Tabl.Syst. Limaces,* p. 14 (Type locality : Pondicherry, India).

1961. *Laevicaulis alte* : Ray, *Treubia,* 25(3) : 275.

Total no. of exs. studied : 25. Average size, L = 35.5 mm./W = 15 mm.

Distribution : East Africa, Mauritius, Reunion, Madagascar, India, Ceylon, Hongkong, China, Formosa, Indonesia, New Caledonia, and Loyalty Islands.

It is a widely distributed tropical species. It is originally an African species from where it spread to other tropical countries through cultivated plants (Forcart, 1967).

Remarks : Its body is generally black on the dorsal surface and it is characterised by a long cylindrical penis, with a pointed tip.

It is nocturnal and during day it generally hides under foliage or debris avoiding direct sunlight. It frequents damp and wet places. It was recorded as a pest in vegetable gardens (Rao and Ramadoss, 1953).

Genus **Sarasinula** Grimpe & Hoffman, 1924

Sarasinula plebeja (Fischer)

1868. *Vaginula plebeja* Fischer, *J. Conch. Paris*, 6 : 145. (Type-locality : New Caledonia)

1961. *Vaginulus* (*Sarasinula*) *plebeja* : Ray, *Treubia*, **25** : 275.

Distribution : East Africa to Pacific islands. From India it was recorded from Chindamabaram, South Arcot District (Ray, 1961). The present one is a second record for India, but is the first report from Maharashtra.

Remarks : It differs from the preceeding species in generally having a pale grey to greyish-yellow dorsal body surface. Its penis is short, stout and asymmetrical.

Genus **Semperula** Grimpe & Hoffman, 1924.

Semperula birmanica (Tehobald)

1864. *Vaginulus birmanicus* Theoblad *J. Asiat. Soc. Beng.*, **33** : 243 (Type-locality : Rangoon, Burma).

1925. *Semperula birmanica* : Hoffmann, *Jenais Zeitschr. Naturw.*, **61** : 182, 254, Tab. 6. dig. 45, KI (Penis)

Total no. of exs. studied : 12. Average size. L = 37 mm. W = 14.7 mm.

Distribution : India-Calcutta, Moisraka; Burma-Rangoon, Pegu-Thayet-Mvo, Aracan, Tennasserim, Penang, Bhamo; Thailand, Zamboanga; Indonesia-Sumatra.

This species is recorded for the first time from Maharashtra. It is not as widely distributed as the other two species-*Laevicaulis alte* (Ferussac) & *Sarasinula plebeja* (Fischer).

Remarks : It is generally yellowish-brown and minutely marked with black dashes and spots. The penis is approximately oval shaped with a pointed tip in the centre. In juvenile forms it is long and almost cylindrical with a blunt tip.

Family ENIDAE

Subfamily NAPAEINAE

Genus **Rhachis** Albers, 1850.

Rhachis punctatus (Anton)

1839. *Bulimus punctatus* Anton, *Verzeich. Conch* : 42.

1961. *Rhachis punctatus* : Ray, *Treubia*, 25(3) : 276.

Total no. of exs. studied : 15. Largest shell, H=13.8 mm. W= 6.8 mm. H of aperture=6 mm.

Distribution : India-West Bengal, Orissa, Maharashtra, Tamil Nadu, Uttar Pradesh. Africa-Zanzibar, Mozambique.

Genus **Cerastus** von Martens, 1860

Cerastus densus (Pfeiffer)

1856. *Bulimus (Petraeus) densus*, Pfeiffer, *Malak. Blatt.*, **2** : 154.

1914. *Cerastus densus* : Gude, *Fauna Brit. India. Mollusca*, **2** : 269.

Total no. of exs. studied : 2. Largest shell, H=19.3 mm. W=11.2 mm. H. of aperture=8.4 mm.

Distribution : Kerala-Malabar, Maharashtra, Poona. Ahmadnager.

Family SUBULINIDAE

Genus **Opeas** Albers, 1850.

Opeas gracile (Hutton)

1834. No. 5, *Bulimus* ? Hutton, *J. Asiat. Soc. Beng.*, **3** : 84; No 5 *Bulimus ? (mihi) gracilis* ? p. 93 (Type-locality : Mirzapore, Uttar Pradesh).

1963. *Opeas gracile* : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc.*, **60(1)** : 113.

Total no. of exs. studied : 7. Largest shell H=14.8 mm. W=3.6 mm. H. of aperture = 3.5 mm.

Distribution : India—Tamil Nadu, Andhra Pradesh, Maharashtra Rajasthan, Punjab, Kashmir, Uttar Pradesh, Bihar, West Bengal, Assam, Andaman and Nicobar Islands. Pakistan, Ceylon, Bangladesh, Burma,, Malay Peninsula and Archipelago, Japan, China, Philippines, and Polynesia.

Remarks : It is commonly known as a garden snail and known to cause considerable damage to potted plants (Ray and Mukherjee, 1963).

Genus **Zootecus** Westerlund, 1887.

Zootecus insularis (Ehrenberg)

1831. *Pupa insularis* Ehrenberg, *Symb. Phys. Anim. Evert. Moll.*, **1** : 3.

1963. *Zootecus insularis* : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc.*, **60(1)** : 114.

Total no. of exs. studied : 66. Largest shell H=13.8 mm. W=5.mm. H. of aperture=3.1 mm.

Distribution : India—Andhra Pradesh, Maharashtra, Gujarat, Rajasthan, Punjab, Kashmir, Uttar Pradesh, Madhya Pradesh, Bihar. Elsewhere—Africa to Arabia, West Pakistan, Ceylon and Burma.

Family GLESSULIDAE

Genus **Glessula** von Martens, 1850.

Glessula illustris var. **tumida** Godwin-Austen

1920. *Glessula illustris* var. *tumida* Godwin-Austen, *Land & Freshwater Moll. India*, 3(1) : 39, pl. CLX, fig. 13 (Type-locality : Lukah Valley, Jaintia Hills)

Total no. of exs. studied : 3. Largest shell, H=12.1 mm. W=7.1 mm. H. of aperture=5.4mm.

Distribution : Lukah valley, Jaintia.

Remarks : While describing the typical *illustris*, Godwin-Austen (1875) made a reference to the variety, but without any description. At a later date (1920) he gave a complete description and figured the variety. It differs from the typical form in being more tumid. It is recorded for the first time from Maharashtra.

Glessula ceylanica (Pfeiffer)

1845. *Achatina ceylanica* Pfeiffer, *Zeitschr. Mal.*, p. 157.

1909. *Glessula ceylanica* : Pilsbry, *Man.* Conch., (2) 20 : 57. pl 6, figs. 7, 8

Total no. of exs. studied : 34, Largest shell H=12.9 mm. W=6.9. mm. H. of aperture = 5 mm.

Distribution : India—Maharashtra. Ceylon—Maturata, Bolapiti and Colombo.

Remarks : Shell is oblong-ovate, whorls, 7, spire obtuse, and almost smooth.

Glessula notigena (Benson)

1860. *Achatina notigena* Benson, *Ann. & Mag. nat. Hist.* (3) 5. 462. (Type-locality : Mahabaleswar ghats.

1914. *Glessula notigena* : Gude, *Fauna Brit. India*, Moll. II : 412.

Total no. of exs. studied : 20, Largest shell H=17.6 mm. W=7.3 mm. H. of aperture = 5.8 mm.

Distribution : Assam—Cherra Poonjee, West Bengal—Darjeeling, Sikkim, Maharashtra—Mahabaleshwar Hills, Pune, Khandala Bangladesh, Sylhet.

Remarks : The shell is elongately conical with a pointed spire, whorls 9-10, with fine longitudinal striae.

Glessula gemma (Reeve)

1850. *Achatina gemma* Reeve, *Conch. Iconica*, 5, *Achatina* pl. 22, Fig. 123 (Type-locality : West Bengal)

1920. *Glessula gemma*; Godwin-Austen. *Land & Freshwater, Moll India*, 3(1): 22.

Total no. of exs. studied : 1, H=12.1 mm. W=6.5mm H. of aperture=4.8 mm.

Distribution : Assam : Garo Hills; West Bengal—Barrackpore, Chandannagore; Bihar—Rajmahal; Maharashtra—Pune; Kerala-Malabar Plains, Beypore; Bangladesh—Jessore district, Chittagong; Burma—Araccan.

Remarks : Shell oblong-conical, whorls six, rounded and smooth.

Family ARIOPAHNTIDAE

Subfamily ARIOPHANTINAE

Genus **Ariophanta** Desmoulins, 1829

Ariophanta bajadara (Pfeiffer)

1850. *Helix bajadera Pfeiffer, Zeitschr. Mal.*, p. 69.

1963. *Ariophanta bajadera* : Tonapi & Mulherkar, *J. Bombay nat. Hist. Soc* 60(1) : 116.

Total no. of exs. studied: 15, Largest shell H=26 mm. W=30.6 mm. H. of aperture=3.1 mm.

Distribution : Bombay, South of the Narbudda, ranging east to Nagpur, Common on the Western Ghats near Bombay.

Genus **Cryptozona** Morch, 1872

Subgenus **Xestina** Pfeiffer 1878.

Cryptozona (Xestina) bistrialis (Beck)

1837. *Nanina bistrialis* Beck, *Index Moll.*, 1 : 2.

1961. *Cryptozona* (*Xestina*) *bistrialis* : Ray, *Treubia*, 25(3) : 278.

Total no. of exs. studied : 12. Largest shell H=20.5 mm. W=30·4 mm. H. of aperture=15.2 mm.

Distribution : It is common in South India. Andhra Pradesh Dumagudem; Tamilnadu : Tiruchirapalli, Balarangam, Shevroys, Madras; Karnataka : Bangaloıe; Kerala: Kottayam District; Maharashtra : Pune, Panchagani; Ceylon.

Remarks : Subba Rao (1975) mentioned its diagnostic characters ecology and economics.

Subgenus **Nilgiria** Godwin-Austen, 1888

Cryptozona (Nilgiria) semirugata (Beck)

1837. *Galaxis semirugata*, Beck, *Index Moll.*, 1 : 42.

1961. *Cryptozona* (*Xestina*) *semirugata* : Ray. *Treubia*, 25(3) : 228.

Total no. exs. studide : 23. Largest shell H=35.5 mm, W=37.2 mm. H. of aperture = 24.7 mm.

Distribution : It is an endemic form to Peninsular India. Its range extends to Gujarat in the West, Bengal in the north and Ceylon in the south.

Remarks : Subba Rao (1975) gave its diagnostic characters and mentioned its economic importance.

Subfamily MACROCHLAMYDINAE

Genus **Marochlamys** Gray, 1847

Subgenus **Macrochlamys** s. str

Macrochlamys (Macrochlamys) indica Godwin-Austen

1833. *Macrochlamys indica* Godwin-Austen. *Land and Freshwater Moll. India.*, 1 : 97, pl. xviii. figs. 1-8b. (Type-locality : Calcutta).

1975. *Macrochlamys* (*Macrochlamys*) *indica* : Subba Rao, *Dr. B.S. Chauhan Comm. Vol.* p. 168.

Total no. exs. studied : 7. Largest shell H=13mm. W=22.3 mm. H. of aperture = 9.6 mm.

Distribution : West Bengal—Siliguri; Assam : Cachaı; Orissa; Ganjam, Bihar : Bhagalpur.

It is recoıded for the first time from Maharashtra.

Remarks : In literature the author of the species *indica* is often given as Benson. Even Godwin-Austen (1893) attributes this species to Benson. As Benson had not named any such species we

recognise Godwin-Austen as its author. The latter was the first author to give a complete description accompanied by illustsrations.

Macrochlamys petasus (Benson)

1859. *Helix petasus* Benson, *Ann. Mag. nat. Hist.*, 3(3) : 388. (Type-locality-Phil Than, Tenasserim,) Burma)

1908. *Macrochlamys petasus* : Blanford & Godwin-Austen, *Fauna Brit. India.* Mollusca, p. 115.

Total no. of exs. studied : 4. Largest shell=5.5 mm. W=9.5 mm. H. of aperture=3.6 mm.

Distribution : India—Maharashtra; Burma.

Remarks : The identification is only provisional. It agrees with the figure given by Godwin-Austens.

Macrochlamys (Macrochlamys) tenuicla H. Adams

1868. *Macrochlamys tenuicula* H. Adams, *Proc. zool. Soc., Lond.*, p. 14, pl. 4, fig,9 (Type-locality : Satara, Maharashtra)

1908. *Macrochlamys tenuicula* : Blanford & Godwin-Austen, *Fauna Brit, India*, Moll. p. 130.

Total no. of exs. studied : 6. Largest shell H=5.7 mm. W=8 mm. H. of aperture=3.8 mm.

Distribution : Bombay and Western Ghats, Khandala, Satara and Surat, Rajpipla Hills at Dholgaum.

Remarks : The shell is easily recognised by its turbinate shape and longitudinal microscopic sculpture.

Subfamily HELICARIONINAE

Genus **Eurychlamys** Godwin-Austen 1899

Eurychlamys platychlamys Blanford

1880. *Macrochlamys platychlamys* Blanford, *J. asiat. Soc. Beng.*, 2 : 195, pl. 2, fig. 9.

1903. *Eurychlamys platychlamys* : Blanford and Godwin-Austen, *Fauna Britt. India*, Moll., p 188, fig 65 A-D

Total no. of exs. studied : 11. Largest shell H=7.5 mm. W=11 mm. H. of aperture = 4.5 mm.

Distribution : Bombay and its neighbourhood, Girnar hills, Pune

This species is probably restricted to Western India.

Remarks : Shell is openly perforate, thin, smooth and translucent generally resembling that of *Macrochlamys*. But it has remarkable mantle lobes and genitalia which prompted Godwin-Austen to erect a new subgenus with the present species as its type.

Subfamily DURGELLINAE

Genus **Sitala** H. Adams, 1856

Sitala denselirata Preston

1908. *Sitala denselirata* Preston, *Rec. Indian Mus.*, 2 : 187. (Type-locality : Andamans)

Total no. of exs. studied : 3. Largest shell H=5 mm. W=5.2 mm, H. of operlires=2.6 mm.

Distribution : India-Andamans; Maharashtra-Pune; Burma: Ceylon.

Remarks : The shells agree with the type specimen deposited in Zoological Survey of India. The shells are smaller in size with distinc carination at the periphery. Whorls with fine and distinct spiral striations, which are however, absent on the base of the shell.

Family PLEURODONTIDAE

Genus **Planispira** Beck, 1837

Subgenus **Trachia** Albers, 1860

Planispira (Trachia) crassicostata (Benson)

1848. *Helix crassicostata* Benson, *Ann. Mag. nat. Hist.*, (2)2 : 159 ("in dumetis Indiae meridionalis")

1914. *Planispira (Trachia) crassicostata*: Gude, *Fauna Brit India*, Moll., II :158.

Total no. of exs. studied : 37. Largest shell H=5.2 mm. W=10 mm. H. of aperture = 4.1 mm.

Distribution : South India, Maharashtra—Pune.

Family TROCHOMORPHIDAE

Genus **Trochomorpha** Albers, 1850

Subgenus **Sivela** Blanford, 1863

Trochomorpha (Sivela) billiana (Mörch)

1872. *Nanina (Videna) billiana* Mörch. *J. Conch. Paris*, p. 310.

1914. *Trochomorpha billiana* Gude, *Fauna Brit. India*, Moll. II : 4.

Total no. of exs. studied : 2. Largest shell H=3.6 mm. W=10.3 mm. H. of apertuie = 3.6 mm.

Distribution : Nicobar Islands, Nancowry, Camorta, Katchall; Maharashtra—Pune.

Hitherto it was known from the Nicobar Islands. It is recorded for the first time from (Maharashtra) the Indian mainland.

Family VALLONIIDAE

Genus **Pupisoma** Stoliczka, 1873

Pupisoma evezardi (Blanford)

1875. *Pupa evezardi* Blanford Mss., Hanley and Theobald, *Conch. Indica*, p. 41, pl. 101, figs. 5, 6.

1880. *Pupa (Pupisoma) evezardi* Blanford, *J. asiat. Soc. Bengal.*, 49 : 199, (Type-locality : Karkalla, near Khandala).

Total no. of exs. studied : 12. Largest shell H=3.5 mm. W=2 mm) H. of aperture = 1.6 mm.

Distribution : Maharashtra-Khandala.

Remarks : The species *evezardi* was described by Blanford (1880. a few year after Hanley and Theobald (1875) and Nevill (1878) who actually figured and listed the species respectively. According to Blanford (1880) Hanley and Theobald's figure was taken from one of the specimens collected by Col. Evezard at Karkalla, near Khandala, at the head of the Bor Ghot, which is the type locality of the species. No specimens were seen by us from Sinhagarh, near Pune, the locality mentioned by Hanley and Theobald.

Hora (1928) has remarked that it climbs trees tor purposes of aestivation. At Lonavla several specimens were collected in the crevices of trees along with snails of *Succinea raoi* Subba Rao & Mitra.

Family FRUITICICOLIDAE

Genus **Eulota** Hartmann, 1842

Eulota scalpturita (Benson)

1857. *Helix scalpturita* (Benson), Theobald, *J. asiat. Soc. Beng.*, 26 : 248.

1914. *Eulota scalpturita* Benson: Gude, *Fauna Brit. India*, Moll., II : 203.

Total no. of exs. studied : 11. Largest shell H=9.8 mm. W=14.6 mm. H. of ape ture = 7.4 mm.

Distribution : India—Maharashtra : Pune, Burma; Ava, Tsagin, Mandalay, Shan Hills. Thyet Myo.

Remarks : Shell globosely depressed with an obtuse apex, characterised by a brownish band.

b. FRESH WATER AND AMPHIBIOUS MOLLUSCS

Family VIVIPARIDAE

Genus Viviparus Montfort, 1810

Viviparus bengalensis f. typica (Lamarck)

1822. *Paludina bengalensis* Lamarck, *Hist. nat. Anim. sans. Vert.*, 6(2) : 174.

1921. *Vivipara bengalensis* race *bengalensis* : Annandale & Sewell, *Rec. Indian Mus.*, 22 : 270, pl. 1, figs. 1-3.

Total no. exs. studied : 22. Largest shell H=30.27 mm. W=20.37 mm.

Distribution : Common throughout India, Bangladesh, Burma and Ceylon.

Viviparus bengalensis (Lamarck) form doliaris (Gould)

1843. *Paludina doliaris* Gould, *Proc. Boston Soc. nat. Hist.* 1 : 144. (Type-locality : Burma)

1921. *Viviparus bengalensis* race *doliaris* : Annandale & Sewell, *Rec. Indian Mus.*, 22 : 273, pl. 1, fig. 9.

Total no. exs. studied : 131. Largest shell H=20.45 mm. W=20 mm.

Distribution : India—Maharashtra: Pune, Nasik; West Bengal—Howrah, Jalpaiguri, Sunderbans; Assam; Burma.

Viviparus bengalensis (Lamarck) form mandiensis Kobelt

1909. *Vivipara bengalensis* race *mandiensis* Kobelt in, Martini und Chemnitz's *Syst. Conch. Cab.*, 2 : 414, pl. 77, figs. 3, 10. (Type-locality : Mandi, Kangra Valley).

1963. *Viviparus bengalensis* race *mandiensis* : Ray und Mukherjee, *Rec. zool. Surv. India.*, 61 : 415.

Distribution : Bihar, Uttarpradesh, Punjab, Rajasthan & Maharashtra.

Remarks : Annandale (1921) expressed a doubt regarding the type-locality of this form. So far there is no record of *Viviparus bengalensis* from the Mandi district.

Viviparus bengalensis form incrassatus Annandale

1921. *Vivipara bengalensis* phase *incrassata*, Annandale, *Rec. Indian Mus.*, 22 : 277, pl. II, fig. 3.4, (Type-Locality : Tungabhadra, Kurnool Dist., Andhra Pradesh).

Total no. exs. studied : 89. Largest shell H=30.5 mm. W=20.5 mm.

Distribution : India—Andhra Pradesh, Masulipatam, Kurnool, Maharashtra—Pune, Mesopotamia.

Family PILIDAE (= AMPULLARIIDAE)

Genus **Turbinicola** Annandale & Prashad, 1921

Turbinicola saxea (Reeve)

1856. *Ampullaria saxea* and *Ampullaria nux*. Reeve, *Conch. Icon.* 10 : *Ampullaria*, pl. 22, fig. 108, pl. figs. 132a, b. (Type-locality : Unknown).

1925. *Turbinicola saxea* : Prashad, *Mem. Indian Mus.*, 8 : 87, pl. 16, figs. 10-12

Total no. of exs. studied : 67. Largest shell H=20.5 mm. W=20.2 mm. H. of aperture=17.2 mm.

Distribution : Small hill-streams round Khandala and Igatpuri in the Western Ghats. Bombay-Pune High Road, at altitudes between 2,500 and 3,000 feet (Prashad, 1925).

Remarks : The columellar callus of the shell is flattened and with the outer lip it forms a continuous margin, enabling the shell to come into much closer contact with the substratum.

It is a hill stream form occurring in the upper parts of the streams near Khandala. Some of the specimens in the collection were collected from the marshy fields to where they might have been carried with the flow of water.

Type-locality : According to Reeve the species *T. saxea* was collected from an unknown locality. Prashad (1925), however, remarked that the type in the British Museum (Natural History), London bears the locality label "Bombay". We now restrict the type-locality to "Streams near Khandala" from where most of the material of this species was collected.

Family HYDROBIIDAE

Genus **Alocinma** Annandale & Prashad, 1919.

Alocinma orcula (Frauenfeld)

1862. *Bithynia orcula* Frauenfeld, *Verhandl. zool. Bot. Geschaft.*, p. 1154.

1921. *Amnicola (Alocinma) orcula* : Annandale, *Rec. Indian Mus.*, **22** : 540.

Total no. exs. studied : 68.

Distribution : The typical form is known to occur in Assam, West Bengal, Bihar, Uttar Pradesh, Punjab and Rajasthan.

It is recorded, here for the first time from Maharashtra. The largest shell (4½ whorls) measures-length 6.45 mm., breadth 4.5 mm. height of the aperture 3.33 mm.

Alocinma orcula var. **producta** (Nevill)

1884. *Bithynia orcula* var. *producta* Nevill, *Hand List Moll. Indian Mus.*, **2** : 37.

1963. *Alocinma orcula* var. *producta* : Ray and Mukherjee, *Rec. zool. Surv. India*, **61** : 420, pl. 19, fig. 1, la.

Total no. exs studied : 119.

Distribution : Assam, West Bengal, Bihar, Uttar Pradesh, Punjab and Rajasthan.

Remarks : It often occurs in association with the form *typica*. The largest shell (4½ whorls) measures-length 6.5 mm., breadth 4.4 mm., hight of aperture 3.1 mm.

Genus **Digoniostoma** Annandale, 1920.

Digoniostoma pulchella (Benson)

1836. *Paludina puchella* Benson, *J. Asiat. Soc. Beng.*, **5** : 746. (Refers to No. 9 *Valvata*, Hutton, *J. Asiat Soc. Beng.*, **3** : 90. (Type-locality : Mirzapore),

1963. *Digoniostoma pulchella* : Ray and Mukherjee, *Rec. zool. Surv. India*, **61** : 418. pl. 18, figs. 8, 8a.

Total no. exs. studied : 25. Largest shell H=8.5 mm. W=6 mm.

Distribution : India—Common throughout India. Also Burma and Malay Peninsula.

Family THIARIDAE (=Melaniidae)

Subfamily THIARIINAE

Genus **Thiara** Röding

Thiara scabra (Müller)

1774. *Buccinum scabrum* Müller, *Verm. Terr. Fluv. Hist.* **2** : 136. (Type-locality : Tranquebar).

1963. *Melania (Plotia) scabra* : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc*, 60 : 109.

Total no. of exs. studied : 731. Largest shell H=20.3 mm. W=12.5 mm. H. of aperture = 10 mm.

Distribution : India—Kerala, Cochin; Pondicherry; Tamilnadu; Karnataka; Maharashtra, Pune. Madhya Pradesh; Uttar Pradesh; Bihar, West Bengal. Elsewhere Mauritius, Seychelles, Ceylon, Burma, Malay Peninsula, Malay Archipelago, Philippines, Indonesia, Madura, Java.

Thiara scabra var. **elegans** (Benson)

1836. *Melania elegans* Bensons, *J. asiat. Soc. Beng.*, **5** ; 782. (refers to sp., c., in, *Gleanings in science*, 2. p. 22, 1830) (Type-locality : River Gumti = Gomati, U. P.).

1963. *Melanoides* (*Plotia*) *scabra* var. *elegans*, Hutton : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc.*, **60** : 110,

Total no. exs. studied : 166. Largest shell H=20.7 mm. W=10.2 mm. H. of aperture=12.5 mm.

Distribution : Tamilnadu—Madras; West Bengal—Calcutta; Uttar Pradesh—Gomati river; Punjab—Ferozapur; Maharashtra-Pune. Persia.

Remarks : Hutton (1849) recorded this species from a stream in the Bolan Pass at Babu Nanee, which forms the western limit of its geographical range. The specimens were found deeply buried in the river bed during February, when it is extremely cold. Annandale and Prashad (1919) could not find any specimens from Baluchistan.

Genus **Melanoides** Olivier, 1807

Melanoides pyramis Hutton

1849. *Melanoides pyramis* Hutton, *J. asiat. Soc. Beng.*, **18**(2) : 658. (Refers to Benson, *Gleanings in Science* No. 13 for 1830, p. 22, species B.).

1919. *Melanoides pyramis* : Annandale and Prashad, *Rec. Indian Mus.*, **18** : 22, pl. 5, fig. 3.

Total no. of exs. studied : 51. Largest shell, H=28.5 mm. W=12, H. of aperture = 9.5 mm.

Distribution : Occurs throughout India, quite common in the Gangetic plains. Elsewhere : Pakistan, Iran, Iraq.

Melanoides pyramis var. **leopardina** Annandale & Prashad

1919. *Melanoides pyramis* var. *leopardina* Annandale and Prashad, *Rec. Indian Mus.*, **18** : 33, pl. iv. fig. 4 (Type-locality : Poona),

Total no. of exs. studied : 33. Largest shell, H=28.6 mm. W=10. mm. H. of aperture = 9 mm.

Distribution : It is not uncommon, though apparently sporadic in the Indo-Gangetic plain and Peninsular India.

Remarks : It differs from the typical form in having a slightly narrower body whorl, less produced anterior margin of the lip and indistinct granules on the surface.

Melanoides pyramis var. **puteicola**
Annandale & Prashad

1834. *Melania* (No. 14) Hutton, *J. asiat. Soc. Beng.*, 3 : 91.

1919. *Melanoides pyramis* var. *puteicola* Annandale and Prashad *Rec. Indian Mus.*, 18 : 33, pl. iv., figs. 7, 8. (Type-locality : Ferozpore, Punjab).

Total no. exs. studied : 35. Largest shell H=20.5 mm. W=10.5 mm. H. of aperture = 8 mm.

Distribution : Andhra Pradesh—Kurnool; Maharashtra—Pune Punjab—Ferozpore.

Remarks : It is characterised by smaller and thinner shells with more impressed suture and anteriorly slightly thickened lip.

As remarked by Annandale & Prashad (1919) the variety affords an easy transition to the sub-genus *Plotia*. It differs from the typical *pyramis* in its more conspicuous sculpture. The longitudinal ribs are distinctly seen as in *scabra* but differ from it in not being produced at the upper extremity.

The variety is recorded for the first time from Pune.

Melanoides tuberculatus (Müller)

1774. *Nerita tuberculata* Müller, *Verm. Terr. Fluv. Hist.*, 2 : 191. (Type-locality : Coromandel coast).

1963. *Melania* (*Striatella*) *tuberculata* : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc.*, 60 : 110.

Total no. exs. studied : 12. Largest shell, H=29.5 mm. W=12.5 mm. H. of aperture=9 mm.

Distribution : It is very widely distributed. Its range extends from North Africa to Pacific Islands, to Australia and China.

There is no evidence of its occurrence in Baluchistan or Southern Persia (Annandale & Prashad, 1919).

Remarks : The species is variable and often confused with *M.*

pyramis. Annandale & Prashad (1919) had clearly stated its distinguishing characters.

Subfamily PALUDOMINAE

Genus **Paludomus** Swainson, 1840.

Paludomus obesa (Philippi)

1842. *Melania obesa* Philippi, *Abbild. Beschr.*, 2 : 170, *Melania*, pl. 4, fig. 3.

1919. *Paludomus obesa* : Annandale, *Rec. Indian Mus.*, 16 : 147.

Total no. of exs. studied : 493. Largest shell H=14.5 mm. W= 11 mm. H. of aperture=7 mm.

Distribution : The range consists of the Western part of Indian Peninsula, Khandala and the Indo-Gangetic plain to the north.

Remarks : It is found in abundance in the streams near Khandala. It occurs only in a place where the mountain stream becomes broadened out and its currents become less strong as it crossed a small plain. It feeds on algae covering the rocks (Annandale, 1919).

Family LITTORINIDAE

Genus **Cremnoconchus** Blanford, 1869

Subgenus **Cremnoconchus** Blanford, 1869

Cremnoconchus syhadrensis (Blanford)

1863. *Cremnobates syhadrensis* Blanford, *Ann. Mag. nat. Hist.*, (3) 12 : 184, pl. iv. figs. 1-7., (Type-locality : Syhadri hills in Western Ghats).

1919. *Cremnoconchus syhadrensis* : Annandale. *Rec. Indian Mus.*, 16 : 149, pl. iv., figs. 2-4.

Total no. exs. studied : 130. Largest shell H=10 mm. W=9.6 mm. H. of aperture = 6 mm.

Distribution : Western Ghats—Khandala. Localised distribution (Hora, 1926).

Remarks : Hora (1928) recorded some interesting observations. It had been observed to hibernate on rocks projecting out of water at the edge of the pool below the falls at Khandala. The specimens were found firmly gripped in fairly deep pits well protected from the mid-day sun.

C. syhadrensis possesses both a gill and a branchial chamber with a small orifice that can be completely closed. The branchial chamber is however not transformed into a lung. A thin film of water is found

in the chamber and the absorption of oxygen takes place through thati film (Annandale, 1919).

Type-locality : Blanford (1863) did not specify the exact type-locality. We now designate "Khandala" as the type-locality.

Subgenus **Lissoconchus** Thiele, 1981

Cremnoconchus conicus Blanford

1871. *Cremnoconchus conicus* Blanford, *J. asiat. Soc. Beng.*, 39 (2) : 10, pl. 3, figs. 3, 3a. (Type-locality : Torna hills, near Pune).

1915. *Cremnoconchus conicus* : Preston, *Fauna of British India, Mollusca* (Freshwater Gastropoda and Pelecypoda), p. 65.

Total no. exs. studied : 28. Largest shell H=8.5 mm. W=7.5 mm. H. of aperture=5.3 mm.

Distribution : Not recorded outside Torna hills.

Remarks : It is characterised by a shell which is longer than broad making it ovately conical, sutures are very much impressed, the shell is olivaceous, smooth or with very fine longitudinal striae, body whorl with the distinct dark rufous-brown bands, the upper band is broader than the lower one.

All the specimens in the collection are decollated.

Cremnoconchus conicus var. **canaliculatus** Blanford

1870. *Cremnoconchus conicus* var. *canaliculatus* Blanford, *J. asiat. Soc. Beng.*, 39 (2) : 11, pl. 3, fig. 4. (Type-locality : Torna).

1915. *Cremnoconchus conicus* var. *canaliculatus* : Preston, *Fauna Brit. India*, Mollusca (Freshwater Gastropoda & Pelecypoda). p. 66.

Total no. of exs. studied : 8. Largest shell H=8 mm. W=6 mm. H. of aperture=4 mm.

Distribution : Not recorded beyond Torna.

Cremnoconchus conicus var. **edecollata** Nevill

1877. *Cremnoconchus conicus* var. *edecollata* Nevill, *Hand List Moll. Indian Mus.*, pt. II, p. 173. (Type-locality : Near Pune).

Total no. exs. studied : 12. Largest shell H =7 mm. W=5 mm. H. of aperture=3.5 mm.

Remarks : The material which was studied by Nevill is present in Zoological Survey of India. Evidently it constitutes the Syntype series.

It agrees completely with the preceeding species in its characters but differs from it in having complete spire without any decollation.

There is no recent material to ascertain whether it is a distinct variety. The exact type—locality was also not designated by Nevill.

Order BASOMMATOPHORA

Family LYMNAEIDAE

Lymnaea (Pseudosuccinea) acuminata form typica Lamarck

1822. *Limnaea acuminata* Lamarck, *Hist. Nat. Anim Sans. Vert.* 6(2) : 160.

1963. *Lymnaea acuminata* : Tonapi and Mulherkar, *J. Bombay nat. Hist. Soc.* 60(1) p. 111.

Total no. exs. studied : 70. Largest shell H=20.5 mm. W=15 mm. H. of aperture = 16.6 mm.

Distribution : India. Also Bangladesh, Pakistan and Burma.

Lymnaea (Pseudosuccinea) acuminata f. rufescens Gray

1820. *Limnaea rufescens* Gray, in Sowerby's *Genera of shells* London, 1, *Limnaea* fig. 2.

1925 *Limnaea (Pseudosuccinea) acuminata* f. *rufescens* : Annandale and Rao, *Rec. Indian Mus.*, 27 ; 181, fig. III.

Total no. exs. studied : 21. Largest shell H=32 mm. W=18.5 mm. H. of aperture=24.5 mm.

Distribution : India, also Bangladesh and Burma.

Lymnaea (Pseudosuccinea) acuminata (Lamarck) f. patula Troschel

1837. *Limnaeus patula* Troschel, Weigman's *Arch. f. Naturges,* 3 : 167.

1925. *Limnaea (Pseudosuccinea) acumicata* f. *patula* : Annandale and Rao *Rec. Indian Mus.*, 27 : 181, fig. III, no. 9.

Total no. exs. studied : 44. Largest shell H=24 mm. W=14.5 mm. H. of apeture = 17.5 mm.

Distribution : India, also Burma, Nepal and Pakistan

Lymnaea (Pseudosuccinea) acuminata

Sub. sp. **tonapii** Ray & Roychoudhury

1969. *Lymnaea (Pseudosuccinea) acuminata* sub. sp. *tonapii* Ray & Roychoudhuri, *Proc. zool. Soc., Calcutta* 22; 44-51, pl. 4, figs. 1-11. (Type-locality : Mula Mutha River, Pune).

Total no. exs. studied : 86. Largest shell H=12 mm. W=5 mm. H. of aperture = 7.5 mm.

Distribution : Maharashtra—Pune.

Lymnaea (Pseudosuccinea) acuminata f. **gracilior** Martens

1881. *Limnaea acuminata* var. *gracilior* Martens, *Conch, Mitheil*, 1 : 77.

1925. *Limnaea acuminata* f. *gracilior* : Annandale & Rao, *Rec. Indian Mus.*, 27: 181.

Total no. exs. studied : 4. Largest shell H=13.8 mm. W=7.5 mm. H. of aperture = 9.5 mm.

Distribution : India-Assam: West Bengal; Bihar; Raneegunge, Singhbhum, Orissa : Ganjam; Uttar Pradesh : Ghazipur, Mordabad, Kerala : Malabar, Burma : Moulmein : Mandalay.

Lymnaea (Pseudoscuccinea) luteola f. **succinea** Deshayes

1834. *Limnaea succinea* Deshayes, *Voy. dans. Ind. Belangar, Zool.* p. 418, pl. ii, figs. 13, 14.

1925. *Lymnaea luteola* f. *succinea* Annandale & Rao, *Rec. Indian Mus.*, 27 : 185.

Total no. exs. studied : 27. Largest shell H=14.9 mm. W=10 mm. H. of aperture = 10 mm.

Distribution : India—Assam: Barpeta; West Bengal; Uttar Pradesh: Benaras; Kashmir; Andhra Pradesh : Hyderabad, Kurnool, Godavari, Tamilnadu; Nilgiris and Pulney Hills.

Lymnaea (Pseudosuccinea) luteola f. **australis** Annandale & Rao

1925. *Limnaea* (*Pseudosuccinea*) *luteola* f. *australis* Annandale and Rao, *Rec., Indian Mus.*, 27 : 184., fig. IV no. 3.

1943. *Lymnaea* (*Pseudosuccinea*) *luteola* f. *australis* : Ray, *J. asiat. Soc. Beng.* 9 : 64.

Total no. exs. studied : 1. H=11.1 mm. W=7.2 mm. H. of aperture = 7.5 mm.

Distribution : India—Assam: Gauhati, Barpeta; Orissa : Puri; Chandbally; Bihar : Chakradharpur, Ranchi; Uttar Pradesh : Mizapore, Moradabad; Punjab : Ferozepur : Madhya Pradesh; Maharashtra : Nagpur, Pune, Satara : Karnataka : Bangalore; Kerala : Tranvancore; Tamilnadu : Coimbatore, Trichinopolly, Nilgiris : Elsewhere: Ceylon, Burma, Bangladesh and Pakistan.

Lymnaea (Pseudosuccinea) luteola f. impura Troschel

1837. *Limnaeus impurus*, Troschel, in Weigman's *Arch. f. Naturges*, Berlin, 3 : 172.

1925. *Limnaea (Pseudosuccinea) luteola* f. *impura*. Annandale & Rao, *Rec. Indian Mus.*, **27** : 185, fig. IV, no. 7.

Total no. exs. studied : 47. Largest shell H=19 mm. W=12 mm. H. of aperture = 13.2 mm.

Distribution : India, Burma and Ceylon.

Family PLANORBIDAE

Genus **Indoplanorbis** Annandale & Prashad 1921

Indoplanorbis exustus (Deshayes)

1834. *Planorbis exustus*, Deshayes, *Voy. Belang. Ind. Orient. Zool.* p. 417, pl. i, figs. 11-13.

1963. *Planorbis (Indoplanorbis) exustus* : Tonapi and Mulherkar *J. Bombay nat. Hist. Soc.*, **60**(1), pp. 112-113.

Total no. exs. studied : 1, 741. Largest shell H=7.8 mm. W=16.5 mm.

Distribution : A common species in India. It is widely distributed in Pakistan, Tibet, Bangladesh, Burma, Ceylon, Thailand, China, Iran, Malay Peninsula & Archipelago.

Genus **Gyraulus** Charpentier, 1837

Gyraulus convexiusculus (Hutton)

1849. *Planorbis convexiusculus* Hutton, *J. asiat. Soc. Beng.*, **18** (2) : 657, (Type-locality : Candahar, in tanks; Quetta and the Kojuck pass).

1963. *Planorbis (Gyraulus) convexiusculus* Germain, Tonapi Mulherkar, *J. Bombay nat. Hist. Soc.*, **60**(1) : p. 113.

Total no. exs. studied : 95. Average size, H=1.8 mm. W=5.7 mm. H. of aperture = 3 mm.

Distribution : A common species in India. It has got a wide range extending from Iran to the Philippines and Japan. It is recorded from Pakistan, Ceylon, Bangladesh, Burma, Malay Archipelago, Thailand, China.

Order STYLOMMATOPHORA

Family SUCCINEIDAE

Subfamily SUCCINEINAE

Genus **Succinea** Draparnaud, 1810

Succinea bensoni Pfeiffer

1849. *Succinea bensoni* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 133.

1924. *Succinea bensoni* : Rao, *Rec. Indian Mus.*, 26 : 394.

Total no. of exs. studied : 6. Average size, H=7.5 mm. W=5 mm. H. of aperture = 5.4 mm.

Distribution : Maharashtra : Bombay, Pune, Gujarat, Kutch; Uttar Pradesh : Mordabad; West Bengal : Calcuttta, Shibpore (Howrah).

Succinea collina Hanley & Theobald

1876. *Succinea collina*, Hanley & Theobald, *Conch. Indica*, p. 30. pl. 68, figs. 8, 9. (Type-locality : Mahableswar).

1924. *Succinea collina* : Rao, *Rec. Indian Mus.*, 26 : 384.

Total no. exs. studied : 1. =14 mm. W=10 mm. H. of aperture = 11.1 mm.

Distribution : It is probably restricted to Western Ghats.

Remarks : The single shell from Torna Hills is slightly more tumid and differs slightly from the typical shell.

Succinea raoi Subba Rao & Mitra

1927. *Succinea arboricola* Rao, *Rec. Indian Mus.*, 27 : 394, figs. 7-11. (Preoccupied by *Succinea arboricola* Connolly).

1976. *Succinea raoi* Subba Rao & Mitra, *Nautilus*, 90 (3) : 125.

Total no. of exs. studied : 116. Average size, H=6.3 mm. W=4.7 mm.

Distribution : Restricted to streams around Khandala.

Remarks : As the specific name *arboricola* Rao was preoccupied by *Succinea arboricola* Connolly we have proposed a new name (Subba Rao & Mitra, 1976).

Normally all the molluscs, especially land and amphibious forms are active during monsoon, but contrary to that *Succinea raoi* aestivates during that period. Hora (1928) attributes this habit as due to its incapacity to exercise properly its respiratory functions in the presence of water. It is remarkable to note that this is the only succineid which was found hibernating on bark of trees.

Rao (1925) described in detail the morphology and anatomy of this species.

Succinea tornadri Rao

1924. *Succinea tornadri* Rao, *Rec. Indian Mus.*, 26 : 384. (Type-locality : Torna hills, Pune).

Total no. exs. studied : 3. Largest shell, H=15.6 mm. W=11.5 mm. H. of aperture = 11.6 mm.

Distribution : Maharashtra : Pune.

Remarks : It is allied to *S. collina* but can be distinguished by its more tumid body whorl, straight and oblique outer lip of the aperture and less coarse sculpture.

Genus **Indosuccinea** Rao, 1924

Indosuccinea khandalla Rao

1924. *Indosuccinea semiserica* f. *khandalla* Rao, *Rec. Indian Mus.* **26** : 407 (Type-locality : Moist ground near Khandalla).

Total no. exs. studied : 5. Largest shell. H=9.5 mm. W=6.5 mm H. of aperture = 7.8 mm.

Distribution : Restricted to Khandala.

Remarks : *Indosuccinea semiserica* and *I. Khandalla* are found living on shrubs and trees in the rainy season. During unfavourable season they conceal themselves and hibernate. With the onset of monsoon they become active.

Genus **Lithotis** Blanford, 1863

Lithotis tumida Blanford

1870. *Succinea* (*Lithotis*) *tumida*, Blanford, *J. asiat. Soc. Beng.*, **39** : 23, pl. 3 fig. 24 (Type-locality : Singhur).

1924. *Lithotis tumida* : Rao, *Rec. Indian Mus.*, **24** : 372.

Total no. exs. studied : 14. Largest shell, H=8 mm., W=5.6 mm., H. of aperture = 5.7 mm.

Distribution : India—Maharashtra : Pune.

Remarks : In general form the shell approaches that of *Succinea* but can be easily distinguished by its short depressed spire, characteristic coarse sculpture, the broadly oval aperture, the well defined, relatively thick columellar fold.

It has not been found again since its discovery in 1870, and we know very little either about the structure of the animal or its habits (Hora 1926).

Lithotis rupicola Blanford

1863. *Succinea* (*Lithotis*) *rupicola*, Blanford, *Ann. Mag. nat. Hist.* (3) **12** : 186, pl. 4, figs. 8-10. (Type-locality : Syhadri.

1924. *Lithotis rupicola* : Rao, *Rec. Indian Mus.*, **26** : 372.

Total no. exs. studied : 74. Largest shell, H=10, W=7.1, H. of aperture = 8.8.

Distribution : Restricted to water falls at Khandala.

Remarks : It occurs in abundance on the wet rocks with algal encrustations at the sides of the waterfall at Khandala. *Cremnoconchus syhadrensis* is found in association with this species

Rao (1925) made a detailed study of the morphology and anatomy of the species.

Class BIVALVIA

Order EULAMELLIBRANCHIATA

Family UNIONIDAE

Genus **Indonaia** Prashad, 1918.

Indonaia caerulea (Lea)

1834. *Unio caeruleus* Lea, *Trans, Amer. Phil. Sco.*, 4 : 95, pl. xii fig. 28. (Type-locality : River Hooghly, Calcutta.)

1943. *Indonaia caerulea* : Ray, 1943, *J. asiat. Soc. Beng., Sci.*, 9 : 78.

Total no. exs. studied : 88. Largest shell, H=48.5 mm. W=26 mm., Thickness = 18.7 mm.

Distribution : It is a very common species in India. Also occurs in Bangladesh, Burma, Nepal, Pakistan.

Indonaia khadakvaslaensis Ray

1966. *Indonaia khadakvaslaensis* Ray, *J. Conch. Paris*, 105 (4) : 226-229. (Type-locality : Khadakvasla Dam, Pune.)

Total no. exs. studied : 2. Largei shell, L=47.8 mm., W=22.8 mm., Thickness = 21.1 mm.

Distribution : Maharashtra, Pune.

Remarks : No fresh collections could be made. The species is known by its types only.

Genus **Lamellidens**, Simpson, 1900

Lamellidens marginalis (Lamarck)

1819. *Unio marginalis* Lamarck, *Hist. Anim. sans, vert.* 6 : 79.

1960. *Lamellidens corrianus*, Satyamurti, *Bull. Madras Govt. Mus., N. S. nat. Hist. Soc.*, 6(4) : 148.

Total no. of exs. studied : 91. Largest shell L = 74.4 mm., W= 41.5 mm., Thickness : 22.2 mm.

Distribution : Assam : Sibsagar, Sylhet; Manipur Valley; West Bengal, Calcutta, Berhampur, Murshidabad; Bihar : Arrah, Santal Parganas; Uttar Pradesh : Lucknow : Maharashtra : Pune; Tamilnadu : Madras; Burma : Pegu.

Lamellidens lamellatus (Lea)

1838. *Unio lamellatus* Lea, *Trans. Amer. Phil. Soc.*, 6 : 19, pl. 6, fig. 16.

1928. *Lamellidens lamellatus* : Rao, *Rec. Indian Mus.*, 30 : 463.

Distribution : India—West Bengal, Calcutta. Burma—Mandalay, Bhamo, Pegu, Shan States; Ceylon.

It is recorded for the first time from Maharashtra.

Lamellidens consobrinus (Lea)

1859. *Unio consobrinus* Lea, *Proc. Acad. Natu. Sci. Philad*, 3 : 331.

1915. *Lamellidens marginalis* sub sp. *consobrina* : Preston *Fauna Brit. India, Mollusca*, (Freshwater Gastropoda & Pelecypoda) p. 180.

Total no. exs. studied : 1. L=90.0 mm., W=54.1 mm., Thickness= 33 mm.

Distribution : Widely distributed in India & Ceylon. Also occurs in Burma and China.

Genus **Parreysia** Conrad, 1853.

Subgenus **Parreysia** s. str.

Parreysia (Parreysia) corrugata (Müllec)

1915. *Parreysia (Parreysia) corrugata* : Preston, *Fauna Brit. India*, Moll. (Freshwater Gastropoda and Pelecypoda) p. 154.

Total no. exs. studied : 15. Largest L=45 mm., W=30.5 mm.,

Distribution : Throughout India, Burma and Ceylon.

Parreysia (Parreysia) corrugata (Müller) var. **nagpoorensis** (Lea)

1859. *Unio nagpoorensis* Lea, *Proc. Acad. Natu. Sci. Philad.*, 3 : 331.

1960. *Parreysia (Parreysia) corrugata* var. *nagpoorensis* : Satyamurti, *Bull. Madras Govt. Mus., N. S. Nat. Hist. Sec.* 6(4) : 144-145.

Total no. exs. studied : 5. Largest shell, L=50.2 mm., W=30.4 mm., Thickness = 26.8 mm.

Distribution : Maharashtra : Nagpur, Pune; Andhra Pradesh : Gudur, Godavari River; Tamilnadu : West Bengal.

Parreysia (Parreysia) favidens (Benson)

1862. *Unio favidens* Benson. *Ann. Mag. nat. Hist.*, 10 : 188. (Type-locality : "Ganges at Bhitoura between Cawnpore and Allahabad".,

1915. *Parreysia (Parreysia) favidens* : Preston, *Fauna Brit. India*, (Freshwater Gastropoda and Pelecypoda), p. 158.

Total no. exs. studied : 38. Largest shell, L=41.5 mm., W=32.7mm., Thickness = 21.1 mm.

Distribution : Assam : East Cachar, Silchar, Tejpore, West Bengal : Calcutta, Sunderbans; Orissa : Berhampur; Bihar : Arrah, Rajmahal, Hazrapur, Ranigunj; Uttar Pradesh : Mordabad; Rajasthan.

Parreysia (Parreysia) favidens (Benson) var. **marcens** (Benson)

1862. *Unio favidens* var. *marcens* Benson, *Ann. Mag. nat. Hist.*, 10 : 188. (Type-locality : Brahmaputra River, Assam.)

1915. *Parreysia (Parreysia) favidens* var. *marcens* : Preston *Fauna Brit. India*, Moll. (Freshwater Gastropoda and Pelecypoda, p. 159.)

Total no. exs. studied : 4. Largest shell, L=58.5 mm., W=37.1 mm., Thickness = 24.2 mm.

Distribution : Assam : Brahmaputra River; Maharashtra—Pune.

Parreysia (Parreysia) rajahensis (Lea)

1841. *Unio rajahensis* Lea, *Proc. Amer. Phil. Soc.*, II : 30.

1915. *Parreysia (Parreysia) rajahensis*. Preston, *Fauna Brit. India*, (Freshwater Gastropoda & Pelecypoda) p. 169.

Total no. exs. studied : 1. L=37.7 mm., W=31.5 mm., Thickness 20.5 mm.

Distribution : Bihar : West Bengal; Madhya Pradesh; Maharashtra.

Family CORBICULIDAE

Genus **Corbicula**, Mergerle von Muhlfeldt

Corbicula striatella Deshayes.

1854. *Corbicula striatella* Deshayes, *Proc. zool. Soc. London*, 22 : 344. (Type-locality : Pondicherry.)

1960. *Corbicula striatella* : Satyamurti, *Bull. Madras Govt. Mus. N.S. Nat. Hist. Sec.*, 6(4) : 153.

Total no. exs. studied : 243.

Distribution : It is fairly common all over India. It has a wide range of distribution in India as well as in Burma.

Remarks : Prashad (1928) had given a complete synonymy for the species and redescribed it. According to him Deshayes type-series consists of young shells only.

Corbicula peninsularis Prashad

1928. *Crobicula peninsularis* Prashad, *Mem. Indian Mus.*, Calcutta., 9 : 21, pl. iv, figs. 13-16. (Type-locality : Bombay.)

Total no. of exs. studied : 10. Largest shell, L=28 mm., W=16.8 mm., Thickness = 13.6 mm.

Distribution : Maharashtra : Pune, Bombay.

Remarks : Prashad (1928) described this species basing on a few specimens from Bombay. He had also examined a good series from the same place in the Museum d'Histoire Naturelle, Paris. After its first description no one has collected or described this species. The present collection is from Pune and it forms a new record extending its range beyond Bombay.

Corbicula krishnaea Ray

1967. *Corbicula krishnaea*, Ray, *Arch. Moll.* 96: (3-6) 191-193. (Type-locality: Krishna River, near Sangli, Pune.)

Total no. exs. studied : 1. L=6.5 mm., W=5.5 mm., Thickness = 3.4 mm.

Distribution : Pune.

Summary

The present account gives a comprehensive picture of the molluscan fauna of the Pune district. A total of 130 species and varieties of land and freshwater molluscs are reported from the district, based on records in literature and on examination of collections received in Zoological Survey of India. Of these, land molluscs are represented by 71 species and varieties, while freshwater molluscs are known by 60 species and varieties. The material studied by us includes only 81 species and varieties -48 freshwater and 33 land. This calls for more intensive surveys for a more comprehensive information about land molluscs. Freshwater molluscs were collected in fairly good number and among bivalves, except for *Corbicula regularis* Prime, all were present in the collections studied.

Ten species are recorded for the first time from Pune district and also Maharashtra (Subba Rao and Mitra, 1975). *Glessula ceylanica* (Pfeiffer) and *Eulota scalpturita* (Benson) reported from Sri Lanka and Burma respectively are recorded for the first time from India. *Sitala denselirata* Benson and *Trochomorpha billeana* (Mörch) known hitherto from Andaman & Nicobar Islands are recorded here from the Indian mainland.

It is interesting to note that type localities for 16 species reported here fall within the Pune district and majority of them are recorded from hill streams near Khandala. All these species are having restricted range of distribution in the Western Ghats, and are not known beyond it.

The type-localities of *Turbinicola saxea* (Reeve) and *Cremnoconchus syhadrensis* Blanford are designated as "Streams or falls near Khandala"

The molluscan fauna of Pune district is remarkable for two reasons; the presence of marine element and in showing wonderful adaptations to the changing weather conditions in the Western Ghats. *Cremnoconchus*, reported from Khandala belongs to the family *Littorinidae*, which is truly marine. Succinids and *Turbinicola* are known for their interesting adaptations. Hora (1926) has pointed out the necessity of studies on mollusca of Western Ghats. Our knowledge on the ecology of land molluscs, like slugs and amphibious molluscs like *Lithotis tumida* Blanford is still inadequate. It is hoped that the present study will lay the foundation for further research work on habits and life-histories of the interesting molluscs like *Cremnoconchus*, *Turbinicola* and succinids.

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