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RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

Endemic Land Molluscs of India

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ZOOLOGICAL SURVEY OF INDIA

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ENDEMIC LAND MOLLUSCS OF INDIA

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INTRODUCTION

The Indian subcontinent is very rich in terms of biological diversity for its unique biogeographic location with ten biogeographic zones, three biomes (Tropical humid forest, Tropical dry deciduous forest and warm desert/semi deserts), 26 biotic provinces with the faunal elements representing three biological realms viz. Indo-Malayan, Eurasian and Afro-tropical (Alfred *et.al.* 1998). The species diversity estimated to be around 89, 451 (out of 12,28,153 species of the world) with high degree of endemicity in various groups. The total number of animal species described so far from India is presented in Table :

Category	No. of species		India's share in Worlds percentage
	World	India	
Protista	65,000	2,577	3.96
Invertebrates (Excl. Arthropoda)	1,60,133	13,711	8.56
Arthropoda	10,68,893	68,377	6.40
Chordata	46,848	4,964	10.60

Invertebrates include an assemblage of different groups of animal kingdom from Protista to Echinodermata with 27 described phyla, of which 24 are distributed in different geographical areas of the subcontinent. The number so far described is not absolute, as the information on the parasitic forms, tropical unexplored rain forest representatives and the meiofaunal assemblages are very scanty. In addition, faunal diversity at microlevel cannot be comprehended as there is no authentic data on micro-organisms.

In contrast to the faunal diversity, the species diversity of various groups of plants is as below. The species richness is often accompanied by enormous genetic diversity within an individual species. This makes India one of the Vavolian centres of diversity and origin of 167 species of crop plants and the primary or secondary centres of domestication of a few animals (Pushpangadhan, *et.al.*, 1997). It is also estimated that India is tenth among plant rich countries of the world and sixth among diversity and origin of agrodiversity.

Taxon	No. of species	% of endemics
Bryophyta	2,700	29 %
Pterydophyta	1022	24.5 %
Gymnosperm	64	12.4 %
Angiosperm	17,000	33.5 %

(*Source* : Nayar, 1996)

RATIONALE

It is well known that sustainable development is the only strategy by which the resources of the biosphere can both be used and conserved for future. Preserving and protecting biosphere will enable us to utilise the biotic and abiotic resources judiciously on a sustainable basis. Man and Biosphere Programme (UNESCO's M A B Programme), as early as 1971 aimed to develop within the natural and social sciences a basis for rational use and conservation of resources of the biosphere for the improvement of the relationship between man and environment. Increased awareness during the last two decades for an un-precedented elimination of the earth's biological diversity has stimulated several new national and international conservation policies and programmes.

Setting priorities for conservation is the prime object of discussion, among planners, for implementing the Convention of Biological Diversity, at the global, regional and national level. The global priority includes "Hotspots" (Myers, 1988), Megadiversity approaches (Mitter - meier and Werner, 1990), Wilderness areas (Mc Clsoskey and Spalding, 1989) to regional and national efforts. The main thrust for this classification was species richness and **degree of endemism.**

ENDEMISM

Endemism of flora and fauna of a region are the exclusive biological capital of the region and being a native of that area throw light on the centres of speciation and biogeography of the region including adaptive radiation (Nayar, 1980). Most of the endemic species with small geographic range end up as rare species and subsequently threatened unless habitat is protected. The number and the generalised set of inter-relationship among different groups of fauna endemic to that area is difficult to predict. Tropical islands have high degree of endemism, and it is believed that the smaller the geographic area in these islands, they have high degree of endemism per unit area. Further to this, the ancient fauna are generally characterised by high number of endemic species.

ENDEMISM IN MOLLUSCA

The estimated number of Molluscs in the Indian subcontinent is around 5041 species out of the estimated 66,535 species of the world falling under 242 marine families 22 freshwater and 32 land forms. At the family level, about 62.8 % of the families known from the world are represented in India. The richness of the species is due to the diverse ecosystems and habitats. The table shows the species diversity at different levels.

Forms	Families	Genera	Species
Land forms	32	140	1487
Freshwater	22	53	183
Marine	242	591	3371

The land forms are exclusively confined to class Gastropoda falling under two sub-classes *viz*., Prosobranchia and Pulmonata. The table given below shows the distinctive features of the group as a whole.

Group	World		India	
	Genera	Species	Genera	Species
Prosobranchia	133	4000	34	527
Pulmonata	667	15,000	106	960

According to Subba Rao (1998), the land operculates of India include a number of zoogeographically significant genera such as *Cyclophorus, Diplommatina* and *Alycaeus*, which are typical to the oriental region and have a number of endemic species, majority of them are distributed in peninsular plains and Western Ghats. Pulmonate genera such as *Macrochlamys, Sitala, Kaliella, Ariophanta, Girasia, Austenia, Sesara, Sophina and Durgella* have a number of endemic species restricted to rainforest ecosystems of North eastern and Western Ghat. Further, *Boysia, Lithotis* and *Camptonyx* are endemic to India. Subba Rao (*op.cit*) also opines that a few genera such as *Mariella, Incillaria, Kasperia and Anadenus*, which occur in higher elevations are typical to oriental region with their distribution centres in India.

The distribution of endemic species (belonging to the number of genera mentioned in the next column) in various zoogeographic regions of the Indian subcontinent is as shown below (Sources: Blanford & Godwin – Austen, 1908; Gude, 1914 & 1921; Godwin – Austen, 1914–1918). : Classification followed is that of Vaught (1989).

Region	*No. of Species*	*No. of Genera*
Andaman & Nicobar	87	33
Western Ghat & Peninsular India	221	51
North Eastern India	237	38
Himalaya (Including Arunachal Pradesh & Darjeeling)	246	54
West & North West India	23	12
Gangetic Plains of Bihar, Orissa & West Bengal	24	10
Madhya Pradesh	4	3
Occuring in more than one region	65	35

ENDEMIC LAND MOLLUSCS OF ANDAMAN & NICOBAR ISLANDS

Phylum MOLLUSCA
Class GASTROPODA
Order ARCHAEOGASTROPODA
Family HELICINIDAE

1. *Sulfurina behniana* (Pfeiffer 1859) [N]

2. *Sulfurina zelebori* (Pfeiffer 1867) [N]
3. *Sulfurina bensoni* Wagner 1907 *[N]*
4. *Pleuropoma andamanica* (Benson 1860) [A]
5. *Pleuropoma dunkeri* (Zelbor 1867) [N]
6. *Pleuropoma rogersi* (Bourne 1911) [A]
7. *Pleuropoma nicobarica* (Pfeiffer 1847) [A & N]
8. *Aphanoconia scrupula* (Benson 1863) [A]

Order MESOGASTROPODA
Family CYCLOPHORIDAE

9. *Leptopoma roepstorffiana* Nevill 1878 [A]
10. *Lagochilus galatheae* (Moerch) 1872 [N]
11. *Lagochilus polynema* (Moerch 1876) [N]
12. *Lagochilus roepstorfi* (Moerch 1876) [N]
13. *Lagochilus warnefordi* Nevill 1876 [A]
14. *Lagochilus wuellerstorfiana* (Zelebor 1867) [N]
15. *Cyclophorus crocatus* (Born 1778) [N]
16. *Cyclophorus foliacious* (Pfeiffer) [N]
17. *Cyclophorus leai* (Tryon 1869) [A]
18. *Cyclophorus nicobaricus* Pfeiffer 1865 [N]
19. *Cyathopoma natalicum* G A 1895 [N]
20. *Alycaeus busbyi* Godwin – Austen 1893 [N]
21. *Alycaeus reinhardti* Moerch 1872 [A & N]
22. *Alycaeus andamaniae* Benson, 1861 [A & N]

Family DIPLOMMATINIDAE

23. *Palaina nicobarica* Godwin –Austen 1886 [N]
24. *Diplommatina battemalvensis* Godwin –Austen1886 [N]

Family PUPINIDAE

25. *Pupina nicobarica* Pfeiffer 1852 [N]

Family ASSIMINEIDAE

26. *Omphalotropis andersoni* Blanford 1880 [A]
27. *Omphalotropis sordida* (Frauenfeld 1863) [N]
28. *Omphalotropis distermina* Benson, 1863 [A]
29. *Omphalotropis brevis* Godwin-Austen 1895 [N]
30. *Omphalotropis decussata* Blanford 1880 [A]
31. *Omphalotropis pallida* Blanford 1880 [A]
32. *Acmella millilla* Godwin – Austen 1895 [A]
33. *Acmella roepstorffi* Nevill 1878 [N]
34. *Acmella moreleti* Nevill 1878 [N]

Order STYLOMMATOPHORA

Family VERTIGINIDAE

35. *Pupisoma constricta* Godwin-Austen ,1895 [A]

Family CLAUSILIIDAE

36. *Phaedusa corticina nicobarica* Gude 1914 [N]
37. *Phaedusa nevilliana* (Mollendorff 1882) [N]
38. *Oospira wuellerstorffi* (Zelebor 1867) [N]

Family SUBULINIDAE

39. *Prosopeas pealei* (Tryon 1864) [A]
40. *Prosopeas haughtoni* (Benson 1863) [A]
41. *Prosopeas achates* Moerch 1875 [N]
42. *Prosopeas roepstorffi* Moerch 1876 [N]

Family STREPTAXIDAE

43. *Haploptychius andamanicus* Benson 1860 [A]
44. *Haploptychius pfeifferi* Zelebor 1867 [A]
45. *Sinoennea moerchiana* Nevill 1881 [N]

Family ENDODONTIDAE

46. *Philalanka subbilirata* Godwin – Austen 1882 [A & N]

47. Philalanka homfreyi (Godwin – Austen 1895) [A]

Family SUCCINEIDAE

48. Hyalimax andamanica Godwin – Austen 1882 [A]

49. Hyalimax reinhardti Moerch 1872 [N]

Family HELIXARIONIDAE

50. Kaliella vagata (E.A.Smith, 1902) [Minicoy isl.]

51. Kaliella kjellerupi (Moerch, 1872) [N]

Family ARIOPHANTIDAE

52. Macrochlamys choinix (Benson 1861) [A]

53. Macrochlamys pseudochoinix Blanford 1904 [Cocos]

54. Macrochlamys exul (Theobald 1864) [A]

55. Macrochlamys stephus (Benson 1861) [A]

56. Macrochlamys woodmasoni Godwin – Austen 1888, [Cocos]

57. Macrochlamys aulopis (Benson 1861) [A & N]

58. Macrochlamys pseudaulopis Godwin – Austen 1888 [A]

59. Macrochlamys fordiana Godwin – Austen 1888 [A]

60. Macrochlamys perinconspicua Godwin – Austen 1888, [A]

61. Macrochlamys battimalvensis Godwin – Austen 1888 [N]

62. Durgella rogersi Godwin – Austen 1907 [A]

63. Sitala vulcania Blanford & Godwin – Austen 1908[Narkondom isl.]

64. Sitala haroldi Godwin – Austen 1882 [A & N]

65. Rhyssotopsis conferta (Pfeiffer) [A]

66. Microcystina rinki (Moerch 1872) [N]

67. Microcystina moerchiana Godwin – Austen 1882 [N]

68. Microcystina warnefordi Godwin – Austen 1882 [A]

69. Microcystina harrietensis Godwin – Austen 1882 [A]

70. Microcystina stewarti Blanford 1904 [A]

71. Microcystina brunii (Moerch, 1872) [N]

72. *Taphrospira bathycharax* (Godwin – Austen 1882) [A]

73. *Satiella christianae* (Theobald, 1864) [A]

Family TROCHOMORPHIDAE

74. *Videna frauenfeldi* (Zelebor, 1867) [N]

75. *Videna andamanica* Nevill, 1895 [A]

76. *Videna iopharynx* Moerch 1876 [N]

77. *Videna pseudosanis* Fulton 1897 [A]

78. *Videna sanis* Benson 1861 [A & N]

79. *Videna subnigritella* (Beddome 1891) [A]

80. *Videna sulcipes* Moerch 1872 [N]

81. *Videna trilineata* Moerch 1876 [N]

Family CAMAENIDAE

82. *Oreobba codonodes* (Pfeiffer 1846) [N]

83. *Planispira trochalia* (Benson 1861) [A]

84. *Chloritis helferi* (Benson, 1860) [A]

85. *Chloritis wimberleyi* (Godwin – Austen 1895) [N]

86. *Chloritis hemiopta* (Benson 1863) [A]

87. *Amphidromus andamanica* (Hanley & Theobald 1876) [A & N]

(**Note** : A – Andaman islands; N – Nicobar islands, also includes one species from the Minicoy island and two from the Cocos)

Table 1. Family-wise Endemic species found in Andaman & Nicobar group of islands.

No. Families	Andamans		Nicobars		Andaman & Nicobars	
	Total species	Total Endemic sp.	Total species	Total Endemic sp.	Total species	Total Restricted Endemic sp.
1 Helicinidae	3	1	5	4	8	8
2 Cyclophoridae	7	3	15	9	19	14
3 Diplommatinidae	—	—	2	2	2	2
4 Pupinidae	—	—	1	1	1	1
5 Assimineidae	5	5	4	4	9	9
6 Succineidae	3	1	2	1	5	2
7 Clausiliidae	—	—	3	3	3	3
8 Valloniidae	1	1	—	—	1	1
9 Subulinidae	4	2	4	2	6	4
10 Endodontidae	2	1	1	—	2	2
11 Trochomorphidae	4	3	7	5	11	8
12 Ariophantidae	17	13	5	5	21	22
13 Helixarionidae	—	—	1	1	1	1
14 Camaenidae	4	3	3	2	6	6
15 Streptaxidae	3	2	2	1	4	3
16 Veronicellidae	2	1	1	—	2	1
Total	55	36	56	40	101	87

DISCUSSION

Andaman and Nicobar are a young group of islands occupying a unique position, having its origin during the Tertiary period with close affinity with "Indo–Malayan Region" This group of islands located in the vast sprawling Bay of Bengal, comprises hundreds of islands (*i.e.*, > 325 islands occupying an area of 6408 sq.km. in Andamans and > 24 islands in Nicobar group occupying an area of 1841 sq.km.), covering a land mass of 8249 square km. This chain of islands constitutes the physiographic continuation of the mountain ranges of Naga and Lushai Hills and Arakan Yoma of Burmah through Cape Negaris to the Andaman and Nicobar islands and South -East to Sumatra. From this rich " Faunistic Centre " of Indo-Malayan region, the other subdivisions of the Indo – West Pacific Region recruited their fauna (Ekman, 1953). The islands also exhibit uniqueness in terms of vegetation having Andaman giant evergreen, Andaman semi evergreen, Andaman moist deciduous, Andaman hill top stunted evergreen, littoral forests, and Andaman tropical evergreen forest. Similarly the Nicobar group of islands also exhibit evergreen forests, littoral beach, sclerophyllus forests, Hill top stunted evergreen forests and semi evergreen forests. The degree of floral endemism in these group of islands are substantially high, 239 taxa are endemic out of 2200 estimated higher group of plants (Nayar, 1996).

A perusal on the endemic molluscan taxa presented above (Table *op.cit.*) indicates a fairly high degree of endemism (70 %). The land molluscs of these islands have resulted from the speciation within the area. This fact is supported by the absence of endemism at the supraspecific level and it is believed that the present species diversity is the result of autochthonous evolutions undergone by the initial group of colonising taxa (Subba Rao & Mitra, 1991). The displacement from the main land in the evolutionary history, resulted in the ecological isolation and as a result only closely related endemic species of few families dominate in the islands (viz. Families – Cyclophoridae, Trochomorphidae, Ariophantidae particularly under a few genera, e.g. *Videna and Macrochlamys*). Also included are the two monotypic endemic genera *Oreobba* and *Rhyssotopsis.*

It has been established for the terrestrial biota of islands that there is positive correlation between the size of the island and the number of the species occuring on it (Peake, 1969). Island size may also be considered an approximate measure of habitat diversity. An analysis of the land molluscs shows Andaman group of islands harbours nearly 21 sympatric species while the Nicobar and Car Nicobar islands account for 18 and 16 species respectively. Other smaller islands namely Trinket, Katchall, Nancowry account for 7–12 species. In all, Nicobar group, though smaller in its area has 40 endemic species (out of 56) and Andaman islands include 36 endemic (out of 55 species). Hence no positive correlation exists with the extent of the island and number of endemic taxa, however, it corroborates the hypothesis of Solem (1984) that increased area does not necessarily mean an increased species diversity and that the area of the land has little effect on its snail fauna.

ENDEMIC LAND MOLLUSCS OF WESTERN GHATS & PENINSULAR INDIA

Phylum	MOLLUSCA
Class	GASTROPODA
Order	MESOGASTROPODA
Family	CYCLOPHORIDAE

1. *Craspedotropis bilirata* (Beddome 1875)
2. *Craspedotropis salemensis* (Beddome 1875)
3. *Craspedotropis cuspidata* (Benson, 1851)
4. *Lagochilus malleata* (Blanford, 1861)
5. *Leptopomoides valvatus* Moellendorff 1897
6. *Micraulux scabra* Theobald 1876
7. *Ditropis convexa* Blanford 1869
8. *Ditropis planorbis* Blanford 1869
9. *Ditropis beddomei* Blanford 1869

10. *Theobaldius deplantus* (Pfeiffer 1854)
11. *Theobaldius tristis* Blanford 1869
12. *Theobaldius stenostoma* Sowerby 1843
13. *Theobaldius shiplayi* Pfeiffer 1856
14. *Theobaldius ravidus* Benson 1851
15. *Theobaldius maculosus* Sowerby 1843
16. *Cyclophorus altivagus* Benson 1854
17. *Cyclophorus indicus* Deshayes 1832
18. *Cyclophorus nilagirica* Benson 1852
19. *Cyclophorus jerdoni* (Benson 1851)
20. *Pterocyclus comatus* Moellendorff, 1897
21. *Pterocyclus nanus* Benson, 1851
22. *Pterocyclus pseudocumingi* Moellendorff, 1897
23. *Pterocyclus cyclophoroideus* Nevill 1881
24. *Pterocyclus bilabiatus* Sowerby 1843
25. *Pearsonia travancoica* (Blanford, 1880)
26. *Pearsonia fairbanki* (Blanford, 1869)
27. *Cyathopoma deccanense* Blanford 1868
28. *Cyathopoma coonoorense* Blanford 1868
29. *Cyathopoma filocinctum* Benson 1851
30. *Cyathopoma latilabre* Beddome 1875
31. *Cyathopoma travancoricum* Beddome 1875
32. *Cyathopoma procerum* Blanford 1868
33. *Cyathopoma kalryenense* Blanford 1861
34. *Cyathopoma kolamulliense* Blanford 1861
35. *Cyathopoma wyanaadense* Blanford 1868
36. *Cyathopoma beddomeanum* Nevill 1875
37. *Cyathopoma atrosetosum* Beddome 1875
38. *Cyathopoma vitreum* Beddome 1875
39. *Cyathopoma anamullayanum* Beddome 1875

40. *Cyathopoma elatum* Beddome 1875
41. *Cyathopoma imperforatum* Nevill 1881
42. *Cyathopoma nitidium* Beddome 1875
43. *Cyathopoma tignarium* (Benson 1851)
44. *Cyathopoma (trochlea)* Benson 1851
45. *Cyathopoma sivagherrianum* Beddome 1875
46. *Cyathopoma shevaroyanum* Beddome 1875
47. *Cyathopoma peilei* Preston 1903
48. *Cyathopoma ovatum* Beddome 1875
49. *Mychopoma hirsutum* Blanford 1869
50. *Mychopoma seticinctum* Beddome 1875
51. *Alycaeus expatriatus* Blanford 1860
52. *Alycaeus footei* Blanford 1861

Family DIPLOMMATINIDAE

53. *Nicida anamullayana* Beddome 1875
54. *Nicida fairbanki* Blanford 1868
55. *Nicida kingiana* Blanford 1861
56. *Nicida liricincta* Blanford 1868
57. *Nicida nilgirica* Blanford 1860
58. *Nicida nitidula* Blanford 1868
59. *Nicida pulneyana* Blanford 1868
60. *Nicida subovata* Beddome 1875
61. *Opisthostoma deccanense* Beddome 1875
62. *Opisthostoma distortum* Beddome 1875
63. *Opisthostoma fairbanki* Blanford 1866
64. *Opisthostoma macrostoma* Blanford 1869
65. *Opisthostoma nilgiricum* Blanford 1860
66. *Diplommatina minima* Beddome 1875
67. *Diplommatina gracilis* Beddome 1875

68. *Diplommatina canarica* Beddome 1875

Family PUPINIDAE

69. *Tortulosa albescens* Blanford 1880

70. *Tortulosa calcadensis* Blanford 1869

71. *Tortulosa costulata* (Blanford 1880)

72. *Tortulosa recurvata* Pfeiffer 1862

73. *Tortulosa tortuosa* (Chemnitz 1795)

Family POMATIASIDAE

74. *Cyclotopsis montana* Pfeiffer, 1854

75. *Cyclotopsis subdiscoidea* Sowerby 1850

76. *Cyclotopsis trailli* Pfeiffer 1862

Order SYSTELLOMMATOPHORA

Family VERONICELLIDAE

77. *Filicaulis (Eleutherocaulis) frauenfeldi* (Semper 1885)

Order STYLOMMATOPHORA

Family VALLONIIDAE

78. *Vallonia miserrina* Gude 1907

Family VERTIGINIDAE

79. *Pupisoma evezerdi* Blanford 1880

Family PUPILLIDAE

80. *Pupilla salemensis* (Blanford 1861)

Family BULIMINIDAE

81. *Mirus hanleyana* (Kobelt 1902)

Family CERASTUIDAE

82. *Rhachis trutta* Blanford 1866

83. *Cerastua malabaricus* Pfeiffer 1857

84. *Cerastua jerdoni* Reeve 1848

85. *Edouardia orbus* (Blanford 1861)

Family PYRAMIDULIDAE

86. *Pyramidula euomphalus* (Blanford 1861)

Family SUBULINIDAE

87. *Prosopeas hebes* Blanford 1861

88. *Glessula shiplayi* Pfeiffer 1855

89. *Glessula nilagirica* Reeve 1850

90. *Glessula fairbanki* Benson 1865

91. *Glessula tamulica* Blanford 1861

92. *Glessula perrotteti* Pfeiffer 1842

93. *Glessula chessoni* (Benson 1860)

94. *Glessula tornensis* Blanford 1870

95. *Glessula subtornensis* Gude 1914

96. *Glessula textilis* (Blanford 1846)

97. *Glessula subserena* Beddome 1906

98. *Glessula indica* Gude 1914

99. *Glessula senator* Hanley 1875

100. *Glessula isis* Hanley 1875

101. *Glessula subperotteti* Beddome 1906

102. *Glessula canarica* Beddome 1906

103. *Glessula anamullica* Blanford 1866

104. *Glessula subinornata* Beddome 1906

105. *Glessula beddomei* Blanford 1866

106. *Glessula bollampattiana* Hanley 1876

107. *Glessula leptospira* Benson 1865

108. *Glessula sisparica* Gude 1914

109. *Glessula tenuitesta* Gude 1914

110. *Glessula corrosula* (Pfeiffer 1856)

111. *Glessula blanda* Gude 1914
112. *Glessula bensoniana* (Pfeiffer 1851)
113. *Glessula tinnevellica* Gude 1914
114. *Glessula travancorica* Gude 1914
115. *Glessula singhurensis* Blabford 1870
116. *Glessula botellus* Benson 1870
117. *Glessula arthuri* (Benson 1868)
118. *Glessula oreas* (Reeve 1850)
119. *Glessula pseudoreas* Nevill 1853
120. *Glessula pulla* Blanford 1870
121. *Glessula malabarica* Gude 1914
122. *Glessula paupercula* (Blanford 1861)
123. *Glessula gracilis* Beddome 1906
124. *Glessula neglecta* Gude 1914
125. *Glessula mullorum* (Blanford 1861)
126. *Glessula courtallica* Gude 1914
127. *Glessula filosa* Blanford 1870
128. *Glessula subfilosa* Beddome 1906
129. *Glessula lyrata* Blanford 1870
130. *Glessula rugata* Blanford 1870

Family STREPTAXIDAE

131. *Streptaxis footei* W & H Blanford 1861
132. *Streptaxis watsoni* W & H Blanford 1860
133. *Streptaxis beddomei* Blanford 1899
134. *Streptaxis concinnus* Blanford 1860
135. *Streptaxis sculptus* Blanford Blanford 1899
136. *Streptaxis personatus* Blanford 1880
137. *Streptaxis pronus* Blanford 1880
138. *Streptaxis canaricus* Blanford 1869

139. *Streptaxis compressus* Blanford 1880

140. *Streptaxis subacutus* Blanford 1899

141. *Ennea macrodon* Blanford 1880

142. *Ennea subcostulata* Blanford 1880

143. *Ennea turricula* Blanford 1899

144. *Ennea exilis* Blanford 1880

145. *Ennea pirriei* (Pfeiffer 1854)

146. *Ennea sculpta* Blanford 1869

147. *Ennea beddomii* Blanford 1880

148. *Ennea canarica* Blanford 1880

Family PLECTOPYLIDIDAE

149. *Corilla anax* (Benson 1865)

Family CHAROPIDAE

150. *Thysanota tabida* (Pfeiffer 1855)

151. *Thysanota guerini* (Pfeiffer 1842)

152. *Thysanota flavida* Gude, 1914

153. *Thysanota crinigera* (Benson 1850)

154. *Ruthvenia retifera* (Pfeiffer 1845)

155. *Ruthvenia clathratuloides* (Gude 1897)

Family ENDODONTIDAE

156. *Philalanka bilirata* (Blanford 1861)

157. *Philalanka tricarinata* Blanford 1861

158. *Philalanka quinquelirata* Gude, 1914

159. *Philalanka daghoba* (Blanford 1861)

160. *Philalanka pirrieana* (Pfeiffer 1854)

161. *Philalanka bidenticulata* Benson 1852

162. *Philalanka febrilis* (Blanford 1861)

163. *Philalanka tertiana* (Blanford 1861)

Family SUCCINEIDAE

164. Succinea godivariana Gude 1914

165. Succinea collina Hanley & Theobald 1870

166. Camptonyx (Lithotis) rupicola Blanford 1863

167. Camptonyx (Lithotis) tumida Blanford 1870

Family HELIXARIONIDAE

168. Kaliella sigurensis Godwin – Austen 1882

169. Kaliella aspirans (Blanford 1861)

170. Pseudaustenia atra (Godwin – Austen, 1888)

171. Pseudaustenia auriformis (Blanford, 1866)

Family ARIOPHANTIDAE

172. Ariophanta kadapaensis Nevill 1878

173. Ariophanta bajadera (Pfeiffer, 1850)

174. Ariophanta laidlayana (Benson, 1856)

175. Ariophanta immerita Blanford 1870

176. Ariophanta intumescens Blanford 1866

177. Ariophanta canarica Blanford 1901

178. Ariophanta cysis (Benson 1852)

179. Ariophanta thyreus (Benson 1852)

180. Cryptozona albata (Blanford 1880)

181. Cryptozona sisparica (Blanford 1866)

182. Cryptozona basilessa (Benson 1865)

183. Cryptozona beddomii (Blanford 1874)

184. Cryptozona maderaspatana (Gray 1834)

185. Cryptozona gasii (Blanford 1901)

186. Cryptozona solata (Benson 1848)

187. Indrella ampulla (Benson 1850)

188. Euplecta acalles (Pfeiffer 1856)

189. Euplecta pulchella Blanford 1904

190. *Euplecta subcastor* (Meddome 1891)
191. *Euplecta fluctuosa* Blanford 1901
192. *Euplecta cacuminifera* (Benson 1850)
193. *Euplecta granulifera* Blanford
194. *Euplecta mucronifera* Blanford
195. *Euplecta apicata* (Blanford 1870)
196. *Euplecta orbiates* (Blanford 1901)
197. *Euplelcta mucosa* (W & H Blanford 1862)
198. *Hemiplecta basileus* (Benson 1861)
199. *Macrochlamys kurnulensis* Nevill
200. *Macrochlamys tenuicula* H. Adams 1868
201. *Macrochlamys rutila* Blanford 1904
202. *Macrochlamys todarum* (Blanford 1861)
203. *Macrochlamys perotteti* (Pfeiffer 1851)
204. *Macrochlamys peringundensis* Beddome 1891
205. *Macrochlamys neherensis* (Benson 1864)
206. *Macrochlamys atoma* (Blanford, 1904)
207. *Mariaella beddomei* (Godwin – Austen 1888)
208. *Satiella dekhanensis* (Godwin – Austen 1898)
209. *Satiella levidensis* (Godwin – Austen 1898)
210. *Satiella flexilis* (Blanford & Godwin – Austen 1908)
211. *Satiella compressa* Blanford & Godwin – Austen 1908
212. *Satiella pertenuis* Blanford & Godwin- Austen 1908
213. *Sitala palmaria* (Benson 1864)
214. *Sitala injussa* (Blanford 1861)
215. *Microcystina shevaroyana* Blanford 1904
216. *Microcystina cryptomphalus* Godwin – Austen 1882

Family CAMAENIDAE

217. *Planispira nilagirica* (Pfeiffer 1845)
218. *Planispira proxima* (Ferrusac 1832)

219. Amphidromus physalis (Benson 1857)

220. Amphidromus calcadensis (Blanford 1870)

221. Apatetes bourdilloni (Theobald 1876)

DISCUSSION

The Peninsular India, was geologically separated from the Gondwanaland in the late Jurrasic times. The faunal composition has undergone a series of changes during the later part of the Jurassic period, the fishes, dinosaurs and micro-mammals died out of the peninsula, several invertebrate groups of animals escaped from the hostile environment and retreated to the areas south of Deccan trap, interspersed with forests, lagoons, marshes, that are suitable for their survival (Menon, 1992).

The Deccan Peninsular biogeographic zone in India is one of the most extensive but relatively homogeneous zone covering nearly 43% of the total Indian land mass. Peninsular India includes several microcentres of endemism, a major part of it is included in the Western Ghat. The area according to Nayar (1996) includes :

1 Agasthyamalai Hills (South Travancore and Tirunelveli Hills)
2. Anaimalai and High Ranges
3. Palni Hills
4. Nilgiris Silent Valley – Wyanad- Kodagu
5. Mahabaleshwar – Khandala Ranges
6. Konkan Raighad
7. Marathwada – Satpura Ranges
8. Tirupati – Cudappah – Nallamalai Hills
9. Vizagapatnam – Ganjam – Jeypore Hills
10. Southern Deccan (Leeward side)

The Western Ghats is located on the west coast of the peninsula, running north-south direction from the mouth of river Tapti (Gujarat) to Kanyakumari (Tamilnadu) in the south, covering nearly 1600 km long mountain chains, except for a small gap of 30 km (Palakkad Gap). The hill ranges are located in the states of Gujarat, Maharashtra, Goa, Karnataka, Tamilnadu and Kerala, with a steep slope on the western side (Windward) running up to the Arabian sea and with sloping hills on the leeward side. The altitude in this area varies from 300–1,500 m , excluding isolated peaks with conical and flat topped hills interspersed with valleys and spurs. The climate of the area is influenced by the south-west monsoon, the rainfall varying from 2,350 mm to 7,450 mm in the southern part. The mean annual temperature is about 24 degree Celcius. The area is marked by the origin of three major rivers of the south viz. Krishna, Godavari and Cauveri and a chain of small rivers directly entering the

sea. The windward side of the Western Ghat receives heavy south-west monsoon and the leeward side in the east has a major part depicting the rain shadow area. According to Nayar (1996), presence of mosaic of soil types, soil nutrients have resulted in mosaic of ecological islands, niches, and refugia which favour a high degree of endemism, vicariants and relict species.

The vegetation of Western Ghat is unique in having variety *viz.*, tropical evergreen forests, moist deciduous forests, dry deciduous forests, scrub jungles, sholas, savannas, peat bogs and *Myristica* swamps. Besides a thick canopy layer in the evergreen belt, the copious growth of the feeder roots in the soil surface occupying the interface of the decaying litter and the mineral matrix of the soil is yet another characteristic of the forest (Nair & Daniel, 1986). This undergrowth is probably responsible for the species diversity of several land molluscs in the area.

Isolation of the Western Ghats being protected by the sea along the western side, the Vindhyas and Satpura ranges on the northern side, semi-arid plateau on the eastern side and the Indian ocean in the south, is the reason for the high degree of endemicity. Habitat destruction by the way of shrinkage in the forest cover in the states of Karnataka, Kerala and Tamilnadu, by conversion of a large chunk of area in to agricultural fields due to hydro-electric projects, increase in the area of commercial crops (coffee, tea, rubber, eucalyptus, cardamom, teak), besides introduction of alien species have threatened the existence of endemic fauna and flora.

The species diversity of the Western Ghats is very high with 4000 species of flowering plants, of which 57 genera and 1600 species are endemic to the region (43 are monotypic) [Pushpangadhan *et.al.*1997]. The occurrence of 57 species of endemic genera in Western Ghat as compared to 84 from rest of the country (Nayar 1980), might indicate that it is an ancient flora (Nair and Daniel, 1986), and most of the endemic species are Paleoendemic in Western Ghat. The expiorative survey on the Nilgiri Biosphere (only a part of the Western Ghat) carried out by the scientists of the Zoological Survey of India [Cherian, 1999, per. Comn.] includes 2028 species of which 1423 species are various groups of invertebrates and 605 species of vertebrates. Among 188 species of fishes, 108 are endemic to the area; 55 species of amphibians (38 are endemic) and 5 are exclusively restricted to Nilgiri Biosphere Reserve. 21 species of reptiles are recorded, 7 of which are restricted to Western Ghat in their range of distribution. 313 species of birds of which 59 are exclusively found in Western Ghat. The mammalian diversity is very high with nearly 100 species (representing 26.8% of the Indian species) of which 30 species belonging to threatened or endangered IUCN Categories (20 of these are Indian endemics).

Land mollusca constitute a small percentage of terrestrial invertebrates, the habitat preference is predominantly the litter formed by the scenescent vegetation. Associated with the litter other edaphic factors play an important role in their survival and distribution. In the Peninsular India, the endemic land molluscs are represented by 221 species under 51 genera and 20 families. Notable among them are *Indrella*, the large monotypic genus and

Hemiplecta basileus (Imperial shell), the largest land snail of India. *Lithotis* , the unique succineid genus occupying a specialised habitat adjacent to the water falls at Khandala also deserves a mention.

Table 2. Endemic Land Molluscs in Peninsular India

No.	Family	No. of Genera	No. of Species
1	Cyclophoridae	12	52
2	Pupinidae	1	5
3	Diplommatinidae	3	16
4	Pomatiasidae	1	3
5	Valloniidae	1	1
6	Vertiginidae	1	1
7	Pupillidae	1	1
8	Buliminidae	1	1
9	Cerastuidae	3	4
10	Pyramidulidae	1	1
11	Subulinidae	2	44
12	Streptaxidae	2	18
13	Charopidae	2	6
14	Endodontidae	1	8
15	Succineidae	2	4
16	Helixarionidae	2	4
17	Ariophantidae	10	45
18	Plectopylididae	1	1
19	Camaenidae	3	5
20	Veronicellidae	1	1
	Total	**51**	**221**

ENDEMIC LAND MOLLUSCS OF NORTH EAST INDIA

Phylum MOLLUSCA
Class GASTROPODA
Order MESOGASTROPODA
Family CYCLOPHORIDAE

1. *Craspedotropis fimbriata* Godwin-Austen 1875 [N L]
2. *Scabrina pinnulifera* (Benson, 1857) [Meghalaya & NL]
3. *Cyclophorus muspratti* Godwin-Austen & Beddome [NL]
4. *Cyclophorus nagaensis* Godwin-Austen & Beddome [NL]

5. *Cyclophorus poeciloneuras* Godwin-Austen &Bedome[NL]
6. *Cyclophorus cybeus* (Benson, 1857) [Assam]
7. *Cyclophorus austenianus* Preston 1914 [Naga hills]
8. *Cyclophorus beddomeanus* Preston 1914 [Naga hills]
9. *Cyclophorus fultoni Godwin* – Austen & Beddome, 1894[Meghalaya]
10. *Cyclophorus khasiensis* Nevill,1878 [Meghalaya]
11. *Cyclophorus pealianus* Nevill 1878 [Nagaland]
12. *Pterocyclus marionae* Preston 1914 [N L]
13. *Pterocyclus miriensis* Godwin-Austen 1915 [Miri Hills]
14. *Pterocyclus parvus* Pearson 1833 [Meghalaya & N L]
15. *Pterocyclus brahmakundensis* Godwin-Austen 1915 [Assam]
16. *Pterocyclus cyclophoroideus* Nevill 1881 Assam
17. *Pearsonia assamensis* Fulton 1900 [Meghalaya]
18. *Pearsonia hispida* (Pearson, 1833) [Meghalaya]
19. *Pearsonia mastersi* (Hanley & Theobald,1876) [Naga hills]
20. *Pearsonia simplex* (Nevill, 1878) [Naga hills]
21. *Cyathopoma garoense* Godwin-Austen 1876 [Meghlaya]
22. *Cyathopoma jawaiense* Godwin-Austen 1876 [Naga hills]
23. *Cyathopoma nevilli* (Beddome, 1875) [Meghalaya & Naga hills]
24. *Dioryx globulosus* Godwin-Austen 1914 [Assam]
25. *Dioryx varius* Godwin-Austen 1914 [Naga hills]
26. *Alycaeus barowliensis* Godwin-Austen 1914 [Assam]
27. *Alycaeus beddomei* Godwin – Austen1914 [Naga hills]
28. *Alycaeus chanjukensis* Godwin – Austen1914 [Assam]
29. *Alycaeus conicus* Godwin – Austen 1871 [Assam]
30. *Alycaeus kamakiaensis* Godwin – Austen 1914 [Assam]
31. *Alycaeus levis* Godwin – Austen 1914 [Manipur]
32. *Alycaeus logtakensis* Godwin – Austen 1914 [Manipur]
33. *Alycaeus magnus* Godwin – Austen 1914 [Naga hills]
34. *Alycaeus nowgongensis* Godwin – Austen 1914 [Assam]

35. *Alycaeus oglei* Godwin – Austen 1914 [Assam]
36. *Alycaeus perplexus* Godwin – Austen 1914 [Meghalaya]
37. *Alycaeus pusillus* Godwin – Austen 1871 [Meghalaya]
38. *Alycaeus sculpturus* Godwin-Austen 1875 [Nagaland & Manipur]
39. *Alycaeus serratus* Godwin – Austen 1874 [Manipur]
40. *Alycaeus brahma* Godwin – Austen 1886 [Assam]
41. *Alycaeus canaliculus* Godwin – Austen 1914 [Meghalaya]
42. *Alycaeus distinctus* Godwin – Austen 1871 [Nagaland]
43. *Alycaeus edei* Godwin – Austen 1871 [Assam]
44. *Alycaeus inflatus* Godwin-Austen 1874 [Nagaland]
45. *Alycaeus nagaensis* Godwin – Austen 1871 [Naga hills]
46. *Alycaeus stoliczkai* Godwin – Austen 1874 [Nagaland]
47. *Alycaeus strigatus* Godwin – Austen 1874 [Assam]
48. Alyc*aeus asaluensis* Godwin – Austen 1871 [Assam]
49. Alyc*aeus bicrenatus* Godwin – Austen 1871 [Naga hills]
50. *Alycaeus birugosus* Godwin – Austen 1893 [Meghalaya]
51. *Alycaeus chennelli* Godwin – Austen 1886 [Naga hills]
52. *Alycaeus crenatus* Godwin – Austen 1871 [Assam, Manipur & N L]
53. *Alycaeus diagonius* Godwin – Austen1871 [Assam & N L]
54. *Alycaeus globulus* Godwin – Austen 1874 [Nagaland]
55. *Alycaeus habiangensis* Godwin–Austen 1914 [Meghalaya]
56. *Alycaeus hebes* Benson 1857 [Meghalaya]
57. *Alycaeus jaintiacus* Godwin – Austen 1871 [Meghalaya]
58. *Alycaeus khasiacus* Godwin – Austen 1871 [Meghalaya]
59. *Alycaeus kezamaensis* Godwin – Austen 1914 [Nagaland]
60. *Alycaeus multirugosus* Godwin – Austen 1874 [Naga hills]
61. *Alycaeus nongtunensis* Godwin–Austen 1914 [Meghalaya]
62. *Alycaeus obscurus* Godwin – Austen 1914 [Meghalaya]
63. *Alycaeus peilei* Preston 1914 [Naga hills]
64. *Alycaeus prosectus* Benson 1857 [Meghalaya]

65. *Alycaeus subculmen* Godwin – Austen 1893 [Naga hills]
66. *Alycaeus teriaensis* Godwin – Austen 1914 [Meghalaya]
67. *Alycaeus theobaldi* Blanford 1862 [Meghalaya]
68. *Alycaeus burrailensis* Godwin – Austen1914 [Nagaland]
69. *Alycaeus generosus* Godwin – Austen 1914 [Meghalaya]
70. *Alycaeus granum* Godwin – Austen 1893 [Naga hills]
71. *Alycaeus khunhoensis* Godwin – Austen 1874 [Naga hills]
72. *Alycaeus mangutensis* Godwin – Austen 1871 [Meghalaya]
73. *Alycaeus multicostatus* Godwin – Austen 1914 [Naga hills]
74. *Alycaeus thompsoni* Godwin – Austen1914 [Manipur]
75. *Alycaeus akhaensis* Godwin – Austen1914 [Assam]
76. *Alycaeus duoculmen* Godwin – Austen1914 [Assam]
77. *Alycaeus musprati* Godwin – Austen 1914 [Naga hills]
78. *Alycaeus lahupaensis* Godwin – Austen 1914 [Manipur]

Family DIPLOMMATINIDAE

79. *Diplommatina ambigua* Godwin – Austen 1892 [Manipur]
80. *Diplommatina decorosa* Godwin – Austen 1892 [Naga hills]
81 *Diplommatina burti* Godwin – Austen 1875 [Assam]
82. *Diplommatina butleri* Godwin – Austen 1892 [Manipur]
83. *Diplommatina chenneli* Godwin – Austen 1892 [Manipur]
84. *Diplommatina commutatus* Godwin – Austen 1892 [Manipur]
85. *Diplommatina convoluta* Godwin – Austen 1875 [Assam]
86. *Diplommatina depressa* Godwin – Austen 1870 [Meghalaya]
87. *Diplommatina diplochilus* Benson 1857 [Meghalaya]
88. *Diplommatina demoncula* Godwin–Austen 1892 [Naga hills]
89. *Diplommatina elongata* Godwin – Austen 1875 [Naga hills]
90. *Diplommatina fallax* Preston 1914 [Naga hills]
91. *Diplommatina frumentum* Preston 1914 [Naga hills]

92. *Diplommatina garoensis* Godwin – Austen 1892 [Meghalaya]
93. *Diplommatina gibberosa* Godwin – Austen 1892 [Assam]
94. *Diplommatina gibbosa* Blanford 1868 [Meghalaya]
95. *Diplommatina godwini* Mollendorff 1898 [Naga hills]
96. *Diplommatina jaintiaca* Godwin – Austen 1868 [Meghalaya]
97. *Diplommatina jatingana* Godwin – Austen 1870 [Assam]
98. *Diplommatina labiosa* Blanford 1868 [Meghalaya]
99. *Diplommatina oligopleuris* Blanford 1868 [Meghalaya]
100. *Diplommatina parvula* Godwin – Austen 1870 [Meghalaya]
101. *Diplommatina salutensis* Godwin – Austen 1886 [Assam]
102. *Diplommatina scalaria* Blanford 1868 [Meghalaya]
103. *Diplommatina sherfaiensis* Godwin – Austen 1886 [Assam]
104. *Diplommatina silvicola* Godwin – Austen 1892 [Assam]
105. *Diplommatina compacta* Godwin – Austen 1892 [Manipur]
106. *Diplommatina khunhoensis* Godwin – Austen 1892 [Naga hills]
107. *Diplommatina animula* Godwin – Austen 1892 [Manipur]
108. *Diplommatina succinea* Godwin – Austen 1886 [Assam]
109. *Diplommatina tumida* Godwin – Austen 1870 [Assam]
110. *Diplommatina venustula* Godwin – Austen 1892 [Nagaland]
111. *Diplommatina distincta* Godwin – Austen 1892 [Nagaland]
112. *Diplommatina dohartyi* Godwin – Austen 1897 [Assam]
113. *Diplommatina japvoensis* Godwin – Austen 1875 [Nagaland]
114. *Diplommatina nengloensis* Godwin – Austen 1892 [Assam]
115. *Diplommatina delicata* Godwin – Austen 1892 [Nagaland]
116. *Diplommatina subrubella* Godwin – Austen 1892 [Nagaland]
117. *Diplommatina subtilis* Godwin – Austen 1892 [Nagaland]
118. *Diplommatina unicrenata* Godwin – Austen 1892 [Nagaland]

Family PUPINIDAE

119. *Pseudopomatias pleurophorus* (Benson, 1857) [Meghalaya]

Family ASSIMINEIDAE

120. Acmella milium (Benson 1853) [Meghalaya]

121. Acmella tersa (Benson 1853) [Meghalaya]

Order SYSTELLOMMATOPHORA
Family RATHOUISIIDAE

122. *Atopos (Padangia) kempii* Ghosh. 1916 [Assam]

Order STYLOMMATOPHORA
Family VERTIGINIDAE

123. Pupisoma cacharicum Godwin-Austen 1910 [Assam]

Family CLAUSILIIDAE

124. Phaedusa monticola Blanford 1872 [Assam]

125. Phaedusa ferruginea Blanford 1872 [Nagaland]

126. Phaedusa asaluensis Blnford 1872 [Assam & Meghalya]

Family SUBULINIDAE

127. Bacillum muspratti Gude, 1914 [Nagaland]

128. Curvella munipurensis Godwin – Austen 1872 [Manipur]

129. Glessula burrailensis Godwin-Austen 1875 [Manipur]

130. Glessula butleri Godwin-Austen 1895 [Assam]

131. Glessula illustris Godwin-Austen 1875 [Assam & Meghalaya]

132. Glessula naja Pilsbry 1909 [Assam, Manipur & Tripura]

Family STREPTAXIDAE

133. Ennea vara (Benson 1859) [Meghalaya & Assam]

134. Ennea blanfordiana Godwin-Austen 1872 [Assam]

135. Ennea nagaensis Blanford 1880 [Naga hills]

Family PLECTOPYLIDIDAE

136. Plectopylis blanda Gude 1898 [Assam & Nagaland]

137. Plectopylis sowerbyi Gude 1899 [Assam & Meghalaya]

138. *Plectopylis affinis* Gude1897 [Meghalaya]

139. *Plectopylis fultoni* Godwin – Austen 1892 [Assam &Meghalaya]

140. *Plectopylis muspratti* Gude 1897 [Assam & Meghalaya]

141. *Plectopylis austeni* Gude 1898 [Assam]

142. *Plectopylis oglei* Godwin – Austen 1879 [Assam]

143. *Plectopylis serica* Godwin – Austen 1874 [Assam & Nagaland]

144. *Plectopylis munipurensis* Godwin – Austen 1874 [Manipur]

145. *Plectopylis nagaensis* Godwin – Austen 1874 [Nagaland]

146. *Plectopylis shiroiensis* Godwin – Austen 1874 [Manipur]

147. *Plectopylis brahma* Godwin-Austen 1879 [Assam]

Family SUCCINEIDAE

148. *Succinea rutilans* Blanford 1870 [N E India]

Family HELIXARIONIDAE

149. *Kaliella jaintiaca* Godwin-Austen 1882 [Meghalaya]

150. *Kaliella manipurensis* Godwin-Austen 1882 [Manipur& Nagaland]

151. *Kaliella khasiaca* Godwin-Austen 1882 [Meghalaya]

152. *Kaliella subcostulata* Godwin-Austen 1882 [Meghalaya]

153. *Kaliella elongata* Godwin-Austen 1882 [Meghalaya]

154. *Kaliella gratiosa* Godwin-Austen 1882 [Manipur]

155. *Kaliella animula* Godwin-Austen 1882 [Meghlaya]

156. *Kaliella teriaensis* Godwin–Austen1882 [Meghlaya]

157. *Kaliella resinula* Godwin-Austen 1882 [Meghlaya]

158. *Kaliella flatura* Godwin-Austen 1882 [Manipur]

159. *Kaliella lhotaensis* Godwin-Austen 1882 [Naga hills]

160. *Kaliellla ruga* Godwin-Austen 1883 [Manipur]

161. *Kaliella shillongensis* Godwin-Austen 1907 [Meghalaya]

162. *Kaliella nongsteinensis* Godwin-Austen 1883 [Meghalaya]

163. *Kaliella chenneli* Godwin-Austen 1883 [Naga hills]

164. *Kaliella kezamahensis* Godwin-Austen 1883 [Meghalaya]

165. Kaliella lailangkotensis Godwin-Austen 1883 [Meghalaya]

166. Pseudokaliella sadiyaeniss Godwin–Austen 1892 [Assam]

167. Sesara harmeri Gude 1900 [Meghalaya]

168. Sesara galea (Benson, 1859) [Meghlaya]

169. Sesara episema Ponsonby 1894 [Naga hills]

170. Rahula bascauda (Benson, 1859) [Meghalaya & Nagaland]

171. Rahula burrailensis Godwin–Austen 1916 [Manipur]

172. Rahula dihingensis Godwin–Austen 1916 [Assam]

173. Rahula koboensis Godwin–Austen 1916 [Assam]

174. Rahula daflaensis Godwin-Austen 1907 [Meghalaya & Nagaland]

175. Rahula lhotaensis Godwin-Austen 1907 [Naga hills]

176. Rahula munipurensis Godwin-Austen 1907 [Manipur]

177. Tadunia muspratti Godwin–Austen 1916 [Naga hills]

Family ARIOPHANTIDAE

178. Macrochlamys castaneo-labiata Godwin–Austen 1883 [Assam, Manipur & Nagaland]

179. Macrochlamys lata Godwin – Austen 1888 [Meghalaya]

180. Macrochlamys decussata (Benson 1836) [Meghalaya]

181. Macrochlamys lhotaensis Godwin – Austen 1883 [Naga hills]

182. Macrochlamys burkilli Godwin – Austen 1916 [Assam]

183. Macrochlamys rubellocincta (Blanford 1870) [Meghalaya]

184. Macrochlamys cacharica Godwin – Austen 1883 [Manipur]

185. Macrochlamys salmonea (Ancey 1882) [Assam]

186. Macrochlamys godwini Tryon 1886 [Assam]

187. Macrochlamys terminus Godwin – Austen 1899 [Assam & Nagaland]

188. Macrochlamys munipurensis Godwin – Austen 1899 [Manipur]

189. Macrochlamys hengdanensis Godwin – Austen1899 [Assam]

190. Macrochlamys nengloensis Godwin–Austen 1883 [Naga hills & Manipur]

191. Macrochlamys koliaensis Godwin – Austen 1883 [Assam]

192. Macrochlamys roberti Godwin – Austen 1883 [Nagaland]

193. *Macrochlamys longicauda* Godwin – Austen 1883 [Meghlaya]
194. *Macrochlamys dorani* Godwin – Austen 1883 [Meghalaya]
195. *Macrochlamys umbraticola* Godwin – Austen 1883 [Assam]
196. *Macrochlamys pacata* Godwin – Austen 1883 [Naga hills]
197. *Macrochlamys rusticula* Godwin – Austen 1883 [Meghalaya]
198. *Khasiella austeni* (Blanford 1870) [Meghalaya]
199. *Khasiella serrula* (Benson 1836) [Meghalaya]
200. *Oxytesta oxytes* (Benson 1836) [Assam]
201. *Oxytesta castor* (Theobald 1858) [Meghalya]
202. *Oxytesta oglei* Godwin–Austen 1916 [Assam]
203. *Oxytesta pollux* (Theobald 1858) [Meghalaya]
204. *Oxytesta sylvicola* Blanford 1880 [Assam & Nagaland]
205. *Cryptaustenia verrucosa* (Godwin-Austen 1876) [Assam]
206. *Cryptaustenia durrangensis* (Godwin-Austen 1907) [Assam]
207. *Cryptaustenia bicolor* Godwin–Austen 1916 [Assam]
208. *Cryptaustenia silcharensis* (Godwin-Austen 1907) [Assam]
209. *Austenia butleri* (Godwin-Austen 1880) [Naga hills]
210. *Austenia nagaensis* Godwin–Austen 1875
211. *Austenia cacharica* (Godwin-Austen 1888) [Assam & Nagahills]
212. *Austenia solida* (Godwin–Austen 1872) [Assam]
213. *Girasia radha* (Godwin-Austen 1876) [Assam]
214. *Girasia crocea* (Godwin-Austen 1872) [Meghalaya]
215. *Girasia burtii* (Godwin-Austen 1876) [Assam]
216. *Girasia maculosa* Godwin – Austen 1916 [Assam]
217. *Girasia gladstoni* Godwin – Austen 1916 [Assam]
218. *Cryptogirasia rubra* (Godwin-Austen 1875) [Naga hills]
219. *Durgella assamica* Godwin-Austen 1881 [Meghalaya]
220. *Durgella mairangensis* Godwin-Austen 1898 [Meghalaya]
221. *Durgella khasiana* Godwin – Austen 1883 [Meghalaya]
222. *Sitala gromatica* Godwin-Austen 1882 [Assam, Manipur & Meghalaya]

223. *Sitala phulongensis* Godwin-Austen 1882 [Meghalaya]

224. *Sitala crenicincta* Godwin-Austen 1883 [Meghalaya & Nagaland]

225. *Sitala srimani* Godwin-Austen1882 [Manipur]

226. *Sitala placita* Godwin-Austen 1883 [Manipur & Meghalaya]

227. *Sitala intonsa* Godwin-Austen 1883 [Meghalaya]

228. *Sitala recondita* Godwin-Austen 1883 [Meghalaya]

229. *Sitala uvida* Godwin – Austen 1883 [Meghalaya]

230. *Taphrospira excavata* Blanford 1904 [Assam & Meghalaya]

Family CAMAENIDAE

231. *Chloritis cyclostrema* (Benson 1863) [Assam]

232. *Amphidromus masoni* (Godwin-Austen 1876) [Assam]

233. *Ganesella galea* (Benson 1859) [Meghlaya & Nagaland]

234. *Landouria hengdanensis* Godwin-Austen 1916 [Manipur]

Family BRADYBAENIDAE

235. *Aegista nutans* Gude 1914 [Meghalaya]

236. *Aegista coeni* Preston 1914 [Nagaland]

237. *Aegista congenor* Preston 1914 [Nagaland]

Table. Endemic Land Molluscs of North-East India

Family	Assam	Manipur	Meghalaya	Nagaland
Cyclophoridae	17	6	23	36
Diplommatinidae	11	6	9	14
Pupinidae	—	—	3	—
Assiminedae	—	—	2	—
Rathouisiidae	1	—	—	—
Vertiginidae	1	—	—	—
Clausiliidae	2	—	1	1
Subulinidae	3	3	1	1
Streptaxidae	2	—	1	1
Helixarionidae	3	6	15	9
Ariophantidae	22	7	23	11
Plectopylididae	8	2	4	3
Camaenidae	2	1	1	1
Bradybaenidae	—	—	1	1

DISCUSSION

North–East represents the transition zone between Indian, Indo-Malayan, and Indo-Chinese bio-geographical regions as well as meeting place of the Himalayan mountains and Peninsular India. It was in the north-east that the north ward migrating "Deccan Peninsula" first touched the Asian land mass after the break up of Gondwanaland in the early tertiary period. The north-east is thus a biogeographical "Gateway" for much of India's fauna and flora and, as a consequence, is one of the richest biological value (Rodgers & Panwar, 1988). Nayar (1986) includes Sikkim, Darjeeling Himalaya, Arunachal Pradesh and also the eastern border of Patkkoi, Naga hills along with Assam, Meghalaya, Mizoram, Tripura, Nagaland, as the *Megadiversity centre* and forms the "*Cradle of flowering plants*". A wide range of physiography and eco-climatic condition have already expressed themselves in giving rise to rich gene pool of wild and cultivated plant species (Chauhan, 1996). Several factors having affinity to near by Sino–Himalyan, Bhutan, Myanmar, Malaysia and to a lesser extent Peninsular India could be collected from this region, as they biogeographically belong to a single land, Indo–Chinese sub Chinese sub region (Mani, 1974). In recent years, factors such as demographic pressure, unplanned utilisation of resources, agricultural practices (slash and burn), introduction of alien species and application of chemicals affected the ecosystem balance thereby decreasing the genetic diversity (Nayar and Sastry, 1990).

The region is characterised by high rainfall (above 2,000 mm), humidity (80% during morning hours), besides altitudinal variation. The soil is rich in organic matter, iron content, however, sometimes, deficient in boron, calcium and zinc. The pH of the soil being acidic, ranges from 4.5–5.5 [Rao, 1974; Joseph, 1982].

ENDEMIC LAND MOLLUSCS OF THE HIMALAYA

Phylum	MOLLUSCA
Class	GASTROPODA
Order	MESOGASTROPODA
Family	CYCLOPHORIDAE

1. *Lagochilus sikhimensis* Godwin – Austen 1918 (Sikkim)
2. *Logochilus daflaensis* Godwin-Austen1918 [A P]
3. *Logochilus oakesi* Godwin-Austen 1918 [Abor hills]
4. *Theobaldius orites* Nevill 1881 [Sikkim]
5. *Theobaldius phaenotopicus* Benson 1851 [Sikkim & Darjeeling]
6. *Theobaldius nivicola* (Godwin-Austen, 1876) [A P]
7. *Theobaldius oakesi* Godwin – Austen 1915 [Abor hills]
8. *Cyclophorus exul* Benson 1854 [Sikkim & Darjeeling]

9. *Cyclophorus himalayanus* Pfeiffer 1851 [Darjeeling]
10. *Cyclophorus tryblium* Benson 1854 [Sikkim & Darjeeling]
11. *Cyclophorus bapuensis* Godwin-Austen 1915 [Abor hills]
12. *Cyclophorus fuscicolor* Godwin-Austen 1876 [A P]
13. *Cyclophorus koboensis* Godwin-Austen 1915 [Abor hills]
14. *Cyclophorus sidiensis* Godwin-Austen 1915 [Abor hills]
15. *Cyclophorus aborensis* Godwin – Austen 1915 [Abor hills]
16. *Alycaeus montanus* Nevill 1884 [Sikkim]
17. *Alycaeus physis* Benson 1859 [Darjeeling]
18. *Alycaeus gemmula* Benson 1859 [Sikkim & Darjeeling]
19. *Alycaeus lectus* Godwin-Austen 1914 [Darjeeling]
20. *Alycaeus strangulatus* (Pfeiffer 1846) [Western Himalaya]
21. *Alycaeus subhumilis* Mollencroft 1897 [Darjeeling]
22. *Alycaeus constrictus* Benson 1851 [Sikkim & Darjelling]
23. *Alycaeus otiphorus* Benson 1859 [Darjeeling]
24. *Alycaeus rotundatus* Godwin – Austen 1914 [A P]
25. *Alycaeus sibbumensis* Godwin – Austen 1914 [Abor hills]
26. *Alycaeus yamneyensis* Godwin –Austen 1914 [Abor hills]
27. *Alycaeus aborensis* Godwin – Austen 1914 [Abor hillls]
28. *Alycaeus burroiensis* Godwin – Austen 1914 [A P]
29. *Alycaeus rotundatus* Godwin – Austen 1914 [A P]
30. *Alycaeus mundulus* Godwin – Austen 1914 [A P]
31. *Alycaeus luyorensis* Godwin – Austen 1914 [Abor hills]
32. Alycaeus *magnificus* Godwin – Austen 1914 [Abor hills]
33. *Alycaeus vesica* Godwin – Austen 1914 [Abor hills]
34. *Alycaeus rotundatus* Godwin – Austen 1914 [A P]
35. *Alycaeus daflaensis* Godwin – Austen 1976 [A P]
36. *Alycaeus gemma* Godwin – Austen 1914 [A P]
37. *Alycaeus neglectus* Godwin – Austen 1914 [A P]
38. *Alycaeus mutatus* Godwin – Austen 1876 [N E India]

39. Alycaeus *pachitaensis* Godwin – Austen 1986 [A P]
40. *Alycaeus rugosus* Godwin – Austen 1986 [A P]
41. *Alycaeus gemma* Godwin – Austen 1914 [A P]
42. *Alycaeus panggianus* Godwin – Austen 1914 [Abor hills]
43. Alycaeus *costatus* Godwin – Austen 1876 [A P]
44. *Alycaeus toruputuensis* Godwin – Austen 1916 [A P]
45. *Alycaeus oakesi* Godwin – Austen 1914 [Abor hills]
46. *Alycaeus paucicostatus* Godwin – Austen 1876 [A P]
47. *Alycaeus elegans* Godwin – Austen 1914 [A P]
48. *Alycaeus edei* Godwin – Austen 1914 [Assam]
49. *Alycaeus macgregori* Godwin – Austen 1878 [AP]
50. *Pterocyclus spiramentum* Godwin-Austen 1915 [Abor hills]
51. *Pearsonia kempi* (Godwin-Austen 1915) [Abor hills]
52. *Pearsonia luyorensis* (Godwin-Austen 1915) [Abor hills]
53. *Pearsonia minima* (Godwin-Austen 1915) [Abor hills]
54. *Pearsonia nevilli* Godwin-Austen, 1876 [Abor hills]
55. *Pearsonia oakesi* Godwin –Austen 1915 [Abor hills]
56. *Pearsonia plana* Godwin-Austen, 1915 [Abor hills]
57. *Dioryx urceolus* Godwin-Austen 1914 [Abor hills]

Family DIPLOMMATINIDAE

58. *Diplommatina costulata* Benson 1849 [W. Himalaya]
59. *Diplommatina folliculus* Pfeiffer 1846 [Western Himalaya]
60. *Diplommatina huttoni* Pfeiffer 1851 [Western Himalaya]
61. *Diplommatina oviformis* Fulton 1801 [Darjeeling]
62. *Diplommatina pachychilus* Benson 1857 [Darjeeling]
63. *Diplommatina pullula* Benson 1859 [Darjeeling]
64. *Diplommatina acutulus* Godwin – Austen 1918 [Miri hills]
65. *Diplommatina regularis* Fulton 1901 [Darjeeling]
66. *Diplommatina semisculpta* Blanford 1858 [Darjeeling]

67. *Diplommatina theobaldi* Godwin-Austen 1886 [Darjeeling]
68. *Diplommatina ungulata* Blanford 1871 [Darjeeling]
69. *Diplommatina mucronata* Godwin – Austen 1917 [Sikkim]
70. *Diplommatina acutulus* Godwin – Austen 1918 [Miri hills]
71. *Diplommatina burti* Godwin – Austen 1875 [A P]
72. *Diplommatina chennelli* Godwin – Austen 1892 [A P]
73. *Diplommatina convoluta* Godwin – Austen 1875 [A P]
74. *Diplommatina daflaensis* Godwin – Austen 1876 [A P]
75. *Diplommatina levigata* Godwin – Austen 1876 [A P]
76. *Diplommatina miriensis* Godwin – Austen 1917 [Mirihills]
77. *Diplommatina khunhoensis* Godwin – Austen 1892 [Nagaland]
78. *Diplommatina perobesa* Preston 1915 [Abor hills]
79. *Diplommatina homei* Godwin – Austen 1876 [A P]

Family PUPINIDAE

80. *Raphaulus assamicus* (Godwin – Austen, 1917) [Miri hills]
81. *Raphaulus luyorensis* (Godwin-Austen, 1917) [Abor hills]
82. *Raphaulus miriensis* (Godwin-Austen, 1917) [Miri hills]
83. *Raphaulus oakesi* Godwin-Austen, 1917 [Abor hills]
84. *Raphaulus shimangensis* Godwin-Austen, 1897 [Abor hills]
85. *Raphaulus yamneynsis* Godwin –Austen, 1917 [Abor hills]
86. *Raphaulus blanfordi* (Benson, 1857) [E. Himlaya]
87. *Raphaulus aborensis* Godwin – Austen, 1917 [E. Himalaya]
88. *Schistoloma tanychilum* (Godwin-Austen, 1876) [A P]
89. *Nodopomatias sibbumensis* (Godwin-Austen,1917) [Abor hills]
90. *Pseudopomatias himalayae* (Benson, 1859) [E. Himalaya]

Order SYSTELLOMMATOPHORA

Family RATHOUISIIDAE

91. *Atopos (Prisma) aborense* Ghosh, 1916 [Abor hills]

Order STYLOMMATOPHORA

Family STREPTAXIDAE

92. *Ennea milium* Godwin-Austen 1876 [A P]

Family PUPILLIDAE

93. *Pupilla gutta* Benson 1864 [Western Himalaya]

Family ORCULIDAE

94. *Orcula (Sphyradium) himalayanum* (Benson,1869) [N-W Himalaya]

Family BULIMINIDAE

95. *Subzebrinus arcuata* (Kuester, 1845) [W. Himalaya]

96. *Subzebrinus salsicola* (Benson,1857) [W. Himalaya]

97. *Subzebrinus boysiana* (Reeve, 1850) [W. Himalaya]

98. *Subzebrinus nivicola* Reeve 1849 [E Himalaya]

99. *Subzebrinus mainwaringiana* (Nevill,1878) [W. Himalaya]

100. *Subzebrinus pretiosa* (Reeve, 1849) [W Himalaya]

101. *Subzebrinus rufistrigata* (Reeve, 1849) [W. Himalaya]

102. *Subzebrinus kuluensis* (Kolbet, 1902) [W. Himalaya]

103. *Subzebrinus domina* (Benson, 1857) [W. Himalaya]

104. *Subzebrinus linterae* (Kobelt, 1899) [W. Himlaya]

105. *Subzebrinus vibex* (Kaester, 1845) W. Himlaya

106. *Serina hazarica* Gude, 1914 [W. Himalaya]

107. *Serina nevilliana* (Theobald, 1881) [W. Himalaya]

108. *Serina beddomeana* (Nevill, 1878) [W. Himalaya]

109. *Serina kuluensis* (Kobelt, 1902) [W. Himalaya]

110. *Serina tandianiensis* (Kobelt, 1902) [W. Himalaya]

111. *Mirus ceratina* (Reeve, 1849) [W. Himalaya]

112. *Mirus smithei* (Benson, 1865) [W. Himalaya]

Family CLAUSILIIDAE

113. *Phaedusa waageni* (Stolitzka, 1872) [W. Himalaya]

114. ***Phaedusa annandalei*** Preston, 1916 [Abor hills]

115. ***Phaedusa aborensis*** Godwin- Austen 1916 [Abor hills]

116. ***Phaedusa shimangensis*** Godwin–Austen 1916 [Abor hills]

117. *Oospira turritella* (Sowerby, 1870), [W.& E Himalaya]

Family PYRAMIDULIDAE

118. *Pyramidula humilis* (Benson, 1838) [W. Himalaya]

Family SUBULINIDAE

119. *Opeas latebricola* (Reeve, 1849) [W. Himalaya]

120. *Glessula hugeli* (Pfeiffer, 1842) [Kashmir]

121. *Glessula oakesi* Godwin – Austen 1916 [Abor hills]

122. *Glessula aborensis* Godwin – Austen 1916 [Abor hills]

123. *Bacillum erosum* (Blanford, 1871) [Sikkim & Darjeeling]

124. *Bacillum daflaensis* Godwin – Austen, 1916 [A.P.]

125. *Curvella sikkimensis* (Reeve 1850) [Sikkim & Darjeeling]

126. *Curvella blanfordi* Gude 1914 [Sikkim & Darjeeling]

Family SUCCINEIDAE

127. *Succinea indica* (Pfeiffer, 1849), [W. Himalaya]

Family HELIXARIONIDAE

128. *Kaliella fastigiata* (Hutton, 1838) [W. & E Himalaya]

129. *Kaliella nana* (Hutton, 1838) [W. Himalaya]

130. *Kaliella bullula* (Hutton, 1838) [W. Himalaya]

131. *Kaliella sikkimensis* Godwin – Austen 1888 [Sikkim]

132. *Kaliella nevilli* Godwin – Austen 1883 [Darjeeling]

130. *Kaliella paucistriata* Godwin-Austen 1907 [A P]

131. *Kaliella dikrangensis* Godwin-Austen 1883 [A P]

132. *Pseudokaliella annandalei* Godwin–Austen, 1916 [Abor hills]

133. *Rahula daflaensis* Godwin – Austen, 1907 [A P]

134. *Rahula aborensis* Godwin – Austen, 1916 [Abor hills]

135. Tadunia oakesi Godwin – Austen , 1916 [Abor hills]

136. Sesara globosa Godwin – Austen, 1916 [Abor hills]

Family ARIOPHANTIDAE

137. Bapuia rengingensis Godwin – Austen, 1918 [Abor hills]

138. Macrochlamys glauca (Pfeiffer, 1846) [W. Himalaya]

139. Macrochlamys nuda (Pfeiffer, 1852) [W. Himalaya]

140. Macrochlamys kuluensis (Blanford, 1904) [W. Himalaya]

141. Macrochlamys tugurium Benson 1852 [Sikkim & Darjeling]

142. Macrochlamys mainwaringi Godwin-Austen 1882 [Sikkm & Darjeeling]

143. Macrochlamys opipara Godwin-Austen 1883 [E Himalaya]

144. Macrochlamys hodgsoni Benson 1859 [Sikkim]

145. Machrochlamys sequax (Benson, 1859) [Darjeeling]

146. Machrochlamys lubrica Benson, 1852 [Sikkim&Darjeeling]

147. Macrochlamys patane (Benson 1859) [Darjeeling]

148. Machrochlamys perfragilis Godwin-Austen 1907 [Sikkim]

149. Macrochlamys zemoensis Godwin-Austen 1907 [Sikkim]

150. Macrochlamys rorida (Benson 1859) [Darjeeling]

151. Macrochlamys darjilingensis Godwin-Austen 1883 [Darjeeling]

152. Macrochlamys bapuensis Godwin – Austen, 1916 [Abor hills]

163. Macrochlamys shimangensis Godwin-Austen, 1916 [Abor hills]

164. Macrochlamys austeniana (Nevill, 1878) [W. Himalaya]

165. Macrochlamys planiscula (Hutton, 1838) [W. Himalaya]

166. Macrochlamys tanirensis Godwin – Austen 1883 [Dafla (A P)]

167. Macrochlamys kempi Godwin-Austen 1883 [Abor hills]

168. Macrochlamys hippocastaneum Godwin –Austen 1916 [Abor hills]

169. Macrochlamys psittacinus Godwin – Austen, 1916 [Abor hills]

170. Macrochlamys rotungensis Godwin – Austen, 1916 [Abor hills]

171. Macrochlamys albus Godwin – Austen, 1916 [Abor hills]

172. Macrochlamys murdochi Godwin – Austen, 1916 [Abor hills]

173. Macrochlamys luyorensis Godwin–Austen,1916 [Abor hills]

174. Macrochlamys superflua Blanford, 1904 [E. Himalaya]

175. Macrahlamys beata Godwin- Austen 1899 [A P]

176. Macrochlamys fragosus Godwin – Austen 1899 [A P]

177. Macrochlamys mahadeoensis Godwin – Austen 1899 [A P]

178. Macrochlamys bilineata Godwin – Austen 1876 [A P]

179. Macrochlamys shengorensis Godwin – Austen 1883 [A P]

180. Macrochlamys originaria Godwin – Austen 1883 [A P]

181. Macrochlamys (Parvatella) flemingi (Pfeiffer, 1850) [W. Himalaya]

182. Macrochlamys (Parvatella) magnifica (Reeve, 1862) [W. Himalaya]

183. Macrochlamys (Parvatella) austeniana (Nevill, 1878) [W. Himalaya]

184. Macrochlamys (Parvatella) altivaga (Godwin – Austen, 1818) [W. Himalaya]

185. Euaustenia monticola (Pfeiffer, 1856) [W. Himalaya]

186. Euaustenia gurhwalensis (Godwin-Austen,1899) [W. Himalaya]

187. Euaustenia theobaldi (Godwin Austen, 888) [W. Himalaya]

188. Euaustenia paurhiensis (Godwin-Austen, 1899) [W. Himalaya]

189. Syama prona (Nevill, 1878) [W. Himalaya]

190. Syama theobaldi (Godwin – Austen, 1888) [W. Himalaya]

191. Syama splendens (Hutton 1838) [W Himalaya]

192. Syama promiscua (Godwin-Austen, 1883) [W. Himalaya]

193. Syama masuriensis Godwin – Austen 1883 [W. Himalaya]

194. Syama annandalei Godwin – Austen 1883 [W. Himalaya]

195. Khasiella hyba (Benson, 1861) [W. Himalaya]

196. Khasiella chloroplax (Benson, 1865) [W. Himalaya]

197. Khasiella kashmirenis (Neville, 1878) [W. Himalaya]

198. Khasiella sonamargensis (Neville, 1878) [W. Himalaya]

199. Khasiella tandianensis (Theobald, 1878) [W. Himalaya]

200. Khasiella dinonoensis Godwin – Austen, 1916 [Abor hills]

201. Oxytesta cycloplax (Benson 1836) [Sikkim]

202. Oxytesta blanfordi (Theobald, 1859) [Sikkim]

203. *Oxytesta orobia* (Benson, 1848) [Sikkim & Darjeeling]

204. *Oxytesta aborensis* Godwin – Austenm, 1916 [Abor hills]

205. *Oxytesta siyomensis* Godwin – Austen 1916 [Abor hills]

206. *Bensonies angelica* (Pfeiffer, 1856) [W. Himalaya]

207. *Bensonies monticola* (Hutton, 1838) [W. Himalaya]

208. *Bensonies jamuensis* (Theobald, 1878) [W. Himalaya]

209. *Bensonies theobaldiana* Godwin – Austen, 1886 [W. Himalaya]

210. *Bensonies convexa* (Reeve, 1852) [W. Himalaya]

211. *Bensonies camura* (Benson 1859) [Sikkim]

212. *Bensonies aborensis* Godwin – Austen, 1916 [Abor hills]

213. *Bensonies jacquemonti* (Martens, 1869) [W. Himalaya]

214. *Cryptaustenia ovata* (Blanford 1871) [Darjeeling]

215. *Cryptaustenia heteroconcha* (Blanford 1871) [Darjeeling]

216. *Girasia dalhousiae* Godwin – Austen 1888 [W. Himalaya]

217. *Girasia pankabariensis* Godwin-Austen 1888 [Sikkim]

218. *Girasia cinera* (Godwin-Austen 1876) [A P]

219. *Austenia sikkimensis* (Godwin – Austen 1888) [Sikkim]

220. *Durgella seposita* (Benson, 1859) [Darjeeling]

221. *Durgella aborensis* Godwin – Austen, 1916 [Abor hills]

222. *Ibycus fissidens* Heynemann 1862 [Sikkim]

223. *Staffordia daflaensis* Godwin-Austen 1876 [A P]

224. *Staffordia toruputuensis* Godwin – Austen 1907 [A P]

225. *Staffordia staffordi* Godwin-Austen [A P]

226. *Rotungia williamsoni* Godwin – Austen, 1916 [Abor hills]

227. *Minyongia kempi* Godwin – Austen, 1916 [Abor hills]

Family LIMACIDAE

229. *Limax (Kasperia) mayae* Godwin–Austen,1914 [W. Himalaya]

Family CAMAENIDAE

230. *Landouria damsangensis* Godwin – Austen, 1916 [Sikkim]

Family PLECTOPYLIDIDAE

231. Plectopylis hanleyi Godwin – Austen 1879 [Sikkim]

132. Plectopylis pinacis (Benson, 1859) [Sikkim]

233. Plectopylis aborensis Gude 1916 [Abor hills]

234. Plectopylis babbagei Gude 1916 [Abor hills]

235. Plectopylis bedfordi Gude 1916 [Abor hills]

236. Plectopylis gregorsoni Gude 1916 [Abor hills]

237. Plectopylis miriensis Gude 1916 [Abor hills]

238. Plectopylis oakesi Gude 1916 [Abor hills]

239. Plectopylis williamsoni Gude 1916 [Abor hills]

Family BRADYBAENIDAE

240. Bradybaena radicicola (Benson 1848) [Sikkim & W. Himalaya]

241. Cathaica mataianensis (Nevill 1878) [Kashmir]

Family ARIONIDAE

242. Anadenus altivagus (Theobald, 1862) (N-W Himalaya)

243. Anadenus giganteus Heynemann 1862 (N-W Himalaya)

244. Anadenus beebei Cockerell 1913 (N-W Himalaya)

245. Anadenus modestus Theobald 1862, (W. Himalaya)

246. Anadenus schlagintweiti Heynemann 1863 (W. Himalaya)

247. Anadenus blanfordi Pfeiffer 1882 [E Himalaya]

Family PHILOMYCIDAE

248. Philomycus (Meghimattium) campestris Godwin-Austen 1876 [E. Himalaya]

DISCUSSION

Rodgers and Panwar (1988) classify the Himalayas into four geographic provinces *viz.*, (1). The North-west Himalaya comprising provinces from Kashmir to the Sutlej in Himachal Pradesh (2). The West Himalaya including the areas of Sutlej to Gandak in Nepal (3). The Central Himalaya, areas including Gandak in Nepal through West Bengal and Sikkim to Central Bhutan and (4). The Eastern Himalaya including areas from Central Bhutan and all Arunachal Pradesh. Rao (1986) considers the Eastern Himalaya as a distinct phyto-geographical region

based on the work of Clarke (1898), Hooker (1906), Chatterjee (1940). It includes Sikkim, Darjeeling district of West Bengal, and Arunachal Pradesh and floristically separated from the sub Himalayan ranges of Assam. Nayar (1996), classifies the Himalayan range into Sikkim Himalayas, Garhwal – Kumaon Himalaya, Lahul–Himachal Pradesh Himalaya, Kashmir Himalaya, and Nepal Himalaya.

The western Himalaya consists of (a). Kumaon Himalaya comprising the states of Garhwal and Kumaon and (b). Comprising the states of Himachal Pradesh and and North-west part of Jammu and Kashmir state. Though differs slightly in their floristic pattern (Rao, 1998), both the regions show more or less drier climate. The western Himalaya includes several altitudinal zones with varied vegetational types such as tropical (below 1,000 m), subtropical (1,000–2,000 m), temperate (1,800–3,500 m), sub alpine (3,500–4,000 m) and alpine (4,000–5,500 m). Rao and Hazra (1982). Rodgers and Panwar (1988), include East Himalaya as a complete Biogeographic zone. Here the Himalaya rises rather abruptly from the plain and hence the sub Himalyan zone is not distinct, compared to Western Himalya, being more mesic. The altitude ranges from 1,500 m to the lofty ranges of 8,598 m (Kanchenjunga), with a high degree of precipitation, due to its horse shoe shaped arrangement of chain of mountains. The Eastern Himalaya includes Arunachal Pradesh, Sikkim and Darjeeling of West Bengal, however, a few authors treat Sikkim and Darjeeling as Central Himalya. In the present context, the eastern Himalaya includes Arunalchal Pradesh, Sikkim and Darjeeling.

The vegetation in the Eastern Himalaya is very rich and the area is considered to be the sanctuaries of Ancient flora. Takhtajan (1969) considers this region as the "Cradle of flowering Plants" Similarly, the faunistic composition has not left far behind in the area, and the area is rich in all groups of animals with the percentage of endemic elements higher than any other biogeographic zones of the country. The altitudinal variation together with deep river valleys of some of the major rivers of north-east India; south-west and north-east monsoon forms a mosaic of ecological islands, with enormous species diversity. This together with plant diversity centres, centres of projenitors of cultivated plants and centres of endemic species forms the basis for considering the area as "Hot Spot"

ENDEMIC LAND MOLLUSCS OF WESTERN & NORTH WESTERN INDIA

Family POMATIASIDAE

1. *Otopoma hinduorum* Blanford 1864
2. *Cyclotopsis semistriata* (Pfeiffer, 1843)
3. *Cyclotopsis spurca* (Grateloup, 1839)

Family CERASTUIDAE

4. *Cerastua fairbanki* (Pfeiffer, 1857)
5. *Cerastua moussonianus* (Petit, 1851)

6. *Cerastua densus* (Pfeiffer, 1856)

Family PUPILLIDAE

7. *Pupoides lardeus* (Pfeiffer, 1852)
8. *Pupoides tutulus* (Reeve, 1849)

Family SUBULINIDAE

9. *Zootecus estellus* (Benson, 1857)
10. *Zootecus agraenis* Kurr 1856
11. *Glessula notigena* (Benson, 1860)
12. *Glessula rugata* Blanford 1870

Family SUCCINEIDAE

13. *Succinea girnarica* Theobald 1859
14. *Succinea bensoni* Pfeiffer 1849

Family ARIOPHANTIDE

15. *Ariophanta laevipes* (Mueller, 1774)
16. *Euplecta subdecussata* (Pfeiffer, 1857)

Family EUCONULIDAE

17. *Eurychlamys platychlamys* Blanford 1880

Family CAMAENIDAE

18. *Planispira albicostis* (Pfeiffer, 1846)
19. *Planispira asperella* (Pfeiffer, 1846)
20. *Planispira footei* (Stoliczka, 1873)
21. *Planispira nagpoorensis* (Pfeiffer, 1860)
22. *Planispira contracta* Benson, 1864
23. *Chloritis leithi* (Gude, 1914)

DISCUSSION

A major portion of the Western and North western part of the subcontinent includes the Thar or the Great Indian Desert. This region includes Western Punjab, a part of Haryana, and a major part of Rajasthan west of Aravalli mountain range and a part of Gujarat including

Kutchh, Jamnagar, Junagadh, Banaskantha, Mehsana, Rajkot, Ahmedabad and Surendranagar districts. According to Krishnan (1968), the area is mainly arid (62%) in Rajasthan, Punjab (5%), Haryana (4%), Gujarat (20%), geographically marked by the Aravalli ranges tending in north easterly direction from Champaner in Gujarat to near Delhi in north east.

Historically, many parts of Rajasthan were under the sea during Jurassic, Cretaceous and Eocene period. And it must have been uplifted into dry land some times during Upper Tertiary period (Krishnan, 1952). Further to this, the Aravallis appear to have undergone several changes both in height and extent during the Himalayan movements (Hora, 1952). According to him, these changes have affected the physiography, climatology faunal distribution of the area. Several factors are responsible for the poor representation of the fauna, among them, one of the major reasons being the exploitation of the vegetation for anthropogenic use. In addition, the gregarious attitude of the locust insect (*Schistocera gregaria* Foerskall), large rodent population (*Meriones hurrianae* Jerdon), and other herbivorous mammals like Chinkara (*Gazella gazella* Pallas) and Nilgai (*Boselaphus tragocamelus* Pallas) have also caused considerable damage to the vegetation, thus affecting the distribution of several molluscs in the area.

ENDEMIC LAND MOLLUSCA FROM ORISSA, BIHAR & WEST BENGAL PLAIN (EXCLUDING DARJEELING)

Phylum MOLLUSCA
Class GASTROPODA
Order MEOSOGASTROPODA
Family CYCLOPHORIDAE

1. *Cyclophorus polynema* Pfeiffer 1854 [Orissa & Bihar]
2. *Pterocyclus rupestris* Benson 1832 [West Bengal & Bihar]

Family PUPILLIDAE

3. *Pupilla seriola* Benson 1863 [Orissa]
4. *Pupilla brevicostis* (Benson 1864) [West Bengal]

Family SUBULINIDAE

5. *Glessula jeypurensis* Beddome1906 [Orissa]
6. *Glessula amentum* Reeve 1849 [West Bengal & Orissa]
7. *Glessula ganjamensis* Gude 1914 [Orissa]
8. *Glessula scrutillus* Benson 1868 [Orissa]
9. *Glessula praelustris* (Benson, 1860) [West Bengal & Orissa]

Family SUCCINEIDAE

10. *Succinea baconi* Pfeiffer 1854 [West Bengal]
11. *Succinea hanleyi* Gude 1914 [West Bengal]
12. *Succinea subgranulosa* Pfeiffer 1849 [West Bengal]
13. *Succinea daucina* Pfeiffer 1854 [West Bengal]

Family HELIXARIONIDAE

14. *Kaliella peliosanthi* (Moerch, 1872) [West Bengal]

Family ARIOPHANTIDAE

15. *Macrochlamys petrosa* (Hutton, 1834) [Gangetic plain]
16. *Macrochlamys subjecta* (Benson, 1852) [Bihar, Rajamahal Range]
17. *Macrochlamys lecythis* (Benson, 1852) [Bihar, Rajamahal Range]
18. *Macrochlamys perplana* Godwin –Austen 1883 [W. Bengal, Orissa & Bihar]
19. *Macrochlamys lixa* Blanford 1866 [Orissa]
20. *Macrochlamys anonae* Godwin-Austen 1883 [West Bengal]
21. *Macrochlamys ganjamensis* Godwin-Austen 1914 [Orissa]
22. *Cryptozona infausta* (Blanford 1866) [Orissa, Barkuda islands]
23. *Cryptaustenia panchetensis* (Godwin-Austen,1883) [Bihar, Rajamahal Range]
24. *Sitala balliana* Godwin – Austen 1882 [Ganjam, Orissa]

The plains of Bihar and West Bengal (Gangetic delta), as well as some parts of Orissa up to the Chilka lake (deltaic regions of Mahanadi river), characterised by the hot and humid climate, influence of south-west monsoon, deciduous as well as scrub forests, alluvial, sandy or clayey loam soil have a limited extent of distribution of endemic species.

ENDEMIC LAND MOLLUSCA FROM MADHYA PRADESH

Family VERTIGINIDAE

1. *Gastrocopta bathyodon* (Benson, 1863)
2. *Gastrocopta serrula* (Benson, 1863)

Family PUPILLIDAE

3. *Pupilla diopsis* (Benson, 1863)

Family ARIOPHANTIDAE

4. *Macrochlamys fragilis* (Hutton, 1838)

The Central India comprises the state of Madhya Pradesh located between the Gangetic Plain in the north and Deccan Peninsula in the south, bordered by two hill ranges of moderate elevation *viz.*, the Vindhyas and the Satpuras. The innumerable rivulets formed during monsoon, the rugged ravines, harsh and varied climate, Precambrian Archaean rocks, volcanic eruption leading to the formation of Deccan Trap, rich reserves of metallic ores, hard black cotton soil are some of the important land marks of this area.

A complete picture of the faunal distribution is not yet available from the area. However, from the available literature, the Central India is the meeting point of diverse Indian flora and also a place where migrants from different regions have ended their journey. The record shows a very few species are endemic to Central India (Verma, 1996). This appears to be true also in case of molluscs of this region, as the area is represented by only four species, known to be endemic to the region.

Table 4. Summary of Endemic Land Mollusca species of India (Region wise)

Region	Species
Peninsular India	221
Andaman & Nicobar Islands	87
North Eastern India	237
Himalaya	246
North-Western & Western India	23
Orissa, Bihar & West Bengal (Excl. Darjeeling)	24
Madhya Pradesh	4
Occurring in more than one region	65

LIST OF SPECIES OCCURRING IN MORE THAN ONE REGION (VAGRANT ENDEMIC SPECIES)

Order MESOGASTROPODA
Family CYCLOPHORIDAE

1. *Lagochilus tomotrema* (Benson) [N E & E. Himalaya]
2. *Alycaeus dikrangensis* Godwin – Austen [N E & E. Himalaya]
3. *Alycaeus crispatus* Godwin – Austen [N E & E. Himalaya]

4. *Alycaeus lohitensis* Godwin – Austen [N E & E. Himalaya]
5. *Alycaeus notatus* Godwin – Austen [N E & E. Himalaya]
6. *Pearsonia beddomei* (Blanford) [Orissa & A P]
7. *Pearsonia nagaensis* (Godwin – Austen & Bedome) [N E & E. Himalaya]
8. *Pterocyclus aborensis* Godwin – Austen [N E & E. Himalaya]
9. *Pterocyclus magnus* Godwin – Austen [N E & E. Himalaya]

Family DIPLOMMATINIDAE

10. *Diplommatina austeni* Blanford [N E & E. Himalaya]
11. *Gastroptychia insignis* Godwin – Austen [N E & E. Himalaya]

Family PUPINIDAE

12. *Pseudopomatias grandis* Godwin – Austen [N E & E. Himalaya]
13. *Schistoloma funiculatum* (Sowerby) [N E & E. Himalaya]

Order STYLOMMATOPHORA
Family CLAUSILIIDAE

14. *Phaedusa cylindrica* (Pfeiffer) [N E & W. Himalaya]

Family SUBULINIDAE

15. *Bacillum casiacum* Reeve [N E & W. Himalaya]
16. *Bacillum orthoceros* Godwin – Austen [N E & E. Himalaya]
17. *Curvella khasiana* (Godwin – Austen) [N E & E. Himalaya]
18. *Opeas nevilli* (Godwin – Austen) [N E & E. Himalaya]
19. *Glessula baculina* Blanford [N E & E. Himalaya]
20. *Glessula brevis* Pfeiffer [Peninsular India & Orissa]
21. *Glessula crassula* (Reeve) [N E & E. Himalaya]
22. *Glessula dikrangense* Godwin – Austen [N E & E. Himalaya]
23. *Glessula facula* Benson [Peninsular India & Orissa]
24. *Glessula gracilis* Beddome [Peninsular India & Orissa]
25. *Glessula jerdoni* Reeve [Peninsular India & N E]
26. *Glessula orobia* Benson [N E & E. Himalaya]

27. *Glessula subjerdoni Benson* (E. Himalaya, Orissa & Peninsular India)

Family FERUSSACIIDAE

28. *Cecilioides balanus* Reeve [W. India, N W India & W. Himalaya]
29. *Coilostele scalaris* Benson [N W India & W. Himalaya]

Family STREPTAXIDAE

30. *Ennea planguncula* (Benson) [Peninsular India & Orissa]
31. *Ennea stenopylis* Benson [N E & E. Himalaya]

Family PLECTOPYLIDIDAE

32. *Plectopylis macromphalus* Blanford [N E & E. Himalaya]
33. *Plectopylis minor* Godwin – Austen [N E & E. Himalaya]

Family SUCCINEIDAE

34. *Succinea baconi* Pfeifer [West Bengal & Karnataka]
35. *Succinea subgranosa* Pfeiffer [W B, W. India & Peninsular India]
36. *Succinea vitrea* Pfeiffer [W B, W. India & Andaman islands]

Family HELIXARIONIDAE

37. *Kaliella cherraensis* Godwin – Austen [N E & E. Himalaya]
38. *Kaliella costulata* Godwin – Austen [N E & E. Himalaya]
39. *Kaliella nagaensis* Godwin – Austen [N E & E. Himalaya]
40. *Kaliella burrailensis* Godwin – Austen [N E & E. Himalaya]

Family ARIOPHANTIDAE

41. *Ariophanta laidlayana* Benson [W B., Orissa & Peninsular India]
42. *Cryptaustenia globosa* (Godwin – Austen) [N E & E. Himalaya]
43. *Cryptaustenia ligulata* (Ferrusac) [Bihar, W.B., Orissa & Peninsular India]
44. *Durgella salius* (Benson) [N E & E. Himalaya]
45. *Ibycus minutus* Godwin – Austen [N E & E. Himalaya]
46. *Macrochlamys hebescens* Blanford [Orissa & Peninsular India]
47. *Macrochlamys hepatizon* Godwin – Austen [N E & E. Himalaya]

48. *Macrochlamys pedina* (Benson) [Peninsular India & W. India]
49. *Macrochlamys sata* Godwin – Austen [N E & E. Himalaya]
50. *Macrochlamys shisha* (Godwin – Austen) [N E & E. Himalaya]
51. *Macrochlamys uda* Godwin – Austen [N E & E. Himalaya]
52. *Oxytesta (Oxytesta) oxytes* (Benson) [N E & E. Himalaya]
53. *Sitala rimicola* (Benson) [N E., W. Himalya & E. Himalaya]

Family TROCHOMORPHIDAE

54. *Videna billeana* (Moerch) [W. India & Nicobar islands]

Family CAMAENIDAE

55. *Amphidromus sylheticus* (Reeve) [N E & E. Himalaya]
56. *Chloritis propinqua* (Pfeiffer) [Orissa & Peninsular India]
57. *Ganesella acris* (Benson) [W.B., N E & E. Himalaya]
58. *Planispira crassicostata* (Benson) [Peninsular India & W. India]
59. *Planispira ruginosa* (Ferrussac) [W B., & Peninsular India]

Family PHILOMYCIDAE

60. *Incillaria monticola* Godwin – Austen [W. B., N E & E. Himalaya]

Family VERTIGINIDAE

61. *Gastrocopa huttoniana* (Benson) [W. India & W. Himalaya]
62. *Boysia boysii* (Pfeiffer) [W. India., N-W India & M. P]
63. *Boysia plicidens* (Benson) [N E & W. Himalaya]

Family CERASTUIDAE

64. *Rhachis bengalensis* (Lamarck) [W.B., Orissa & N E]
65. *Rhachis praetermissus* (Blanford) [W.B., Orissa & P. India]

GENERAL DISCUSSION

The overall endemicity in Indian land molluscs is above 50%. The region wise level ranges between 20% in the west and plains of north west to above 80% in the Himalaya

and the Andaman & Nicobar islands. The variation follows an interesting pattern. The plains of west and the north west India which include the desert and semi arid zones have the lowest level. This is because the land molluscan fauna of the dry zone of north west Indian plains mostly comprise of the usual arid zone dwellers. The plains of the western India have only a few endemic species under a few genera like *Cerastua, Coilostele*, belonging to a small group of taxa with Ethiopean link.

The plains of Orissa, Bihar, and West Bengal also have a low level of endemicity in land mollusca. The list does not include any significant taxa, qualitatively or quantitatively. It includes only a few species under widely distributed genera of *Macrochlamys, Glessula* or *Succinea*. These are the two regions which do not contain any endemic elements at generic level and the representation of land operculates is very poor in both the regions.

North east India, Peninsular India, the Western Ghat, the Himalaya and the Andaman & Nicobar group of islands are the regions with well over 50% of endemicity level.

North east India together with the Eastern Himalaya (because of the climatic affinity, these two are taken together) with its lush green tropical rain forests, high rainfall, and less vigorous extremes of temperature, represent above one third of the total Indian land molluscan fauna. The level of endemicity is also very high, around 70%. At the generic level, there are a number of endemic forms (mostly monotypic) viz., *Bapuia, Cryptogirasia, Rotungia, Tadunia, Dihangia, Galongia* and also a few others. The Indo-Malayan land operculates which show a great degree of radiation are very largely represented in the region and also in the Peninsular India. Out of around 600 species of Indo-Malayan land operucates approximately 300 are endemic to these regions. The major genera are *Diplommatina, Alycaeus, Cyclophorus*, and *Pterocyclus*. Pulmonates are represented approximately by 250 endemic species, largely represented genera are *Plectopylis, Macrochlamys, Kaliella, Oxytesta, Sitala*, etc. Alluvial soil which by virtue of its water holding capacity supports rich growth of vegetation is definitely the factor in regulising occurrence of a number of endemic species (around 25) of slugs and semi slugs, including a few monotypic endemic genera (*Dihangia, Galongia, Minyongia*). But whether this is an indication of poor calcium content in the soil, is definitely not known. However, one factor which cannot be overlooked is that the lists of endemic species of North east India and also Peninsular India contain a large number of species under a few genera (*Dipommatina, Alycaeus, Macrochlamys, Glessula*) known by their types and have had no subsequent reports after they were first described. Though all such species are taken as endemic, there exists some reservations as regards the validity of these species. Moreover, some of the little known endemic genera (*Dihangia, Galongia, Minyongia, Cryptogirasia, Bapuia, Tadunia*) are perhaps likely to merge into one another.

The peninsular India with the series of hill ranges (the Western Ghats) offer specialised habitat to a number of interesting taxa and has an endemicity level of above 60%. Besides two monotypic genera *Indrella* and *Apatates*, the small amphibious genus *Lithotis* also is endemic to the splash zones of the Western Ghats stream. Representations of the operculates is

comparatively less being around 80 species, the major genera being *Cyathopoma, Nicida,* and *Theobaldius*. *Opisthostoma*, the tiny operculate genus with a tubed body and curiously upturned aperture is represented by two endemic species. The dry natured red soil of the peninsular plate could be the factor behind this little change. Pulmonates are represented by nearly 150 species, the major genera are *Glessula, Ariophanta, Macrochlamys, Cryptozona, Euplecta, Philalanka, Thysanota* and also the *streptaxids.*

In the Himalayan region, the striking climatic dissimilarities between the east and west-north west is amply reflected in the faunal structure. Against 80 odd species of endemic land operculates in the east, the west and north west harbour 3 species. This clearly indicates the general atmospheric aridity of the region. Pulmonates are represented by around 60 endemic species. The major genera are *Macrochlamys, Bensonies, Subzebrinus, Serina* and *Mirus*. The three last mentioned genera as also *Sphyradium* and *Cathaica* are palaearctic immigrants represented by at least 20 endemic species here. Level of endemicity in the Himalayan region as a whole is above 70% but in the west–north west it is around 50%. In Kashmir, the endemicity level is even less being 30%. The genera *Parvatella* and *Rhadella* are endemic to the region.

Islands have always been important centres for diversity and endemicity in the land molluscs for isolation. Andaman and Nicobar islands, though comparatively of recent origin show an endemicity level of around 80%. As mentioned earlier, endemicity at generic level is negligible being restricted to the lone monotypic genus *Rhysotopsis*. Operculates are represented by 34 species. Among the endemic operculates, besides cyclophorids (*Cyclophorus, Lagochilus, Leptopoma, Alycaeus*) and the terrestrial assimineids (*Omphalotropis, Realia, Acmella*), the archaeogastropod family Helicinidae is represented by two genera and eight species. Among the pulmonates, *Macrochlamys and Videna* are the largely represented genera. *Hyalimax*, the succineid slug genus is represented by two endemic species.

The number of 'vagrant' endemic species of Indian land molluscs which occur in more than one region is appended in table above with 65 species. Most of such species are shared between North east and eastern Himalaya. This is because of the climatic similarities of these two regions. Six species are shared between the Peninsular India and the plains of Orissa, West Bengal and Bihar. This is because Orissa happens to be the transitional zone between northern India and southern India. Number of species shared between western Himalaya and west- north west plains is 6, obviously this is because of some overlappings or spilling over of few species from the western Himalaya to the plains of north west. Number of species shared between other regions is negligible.

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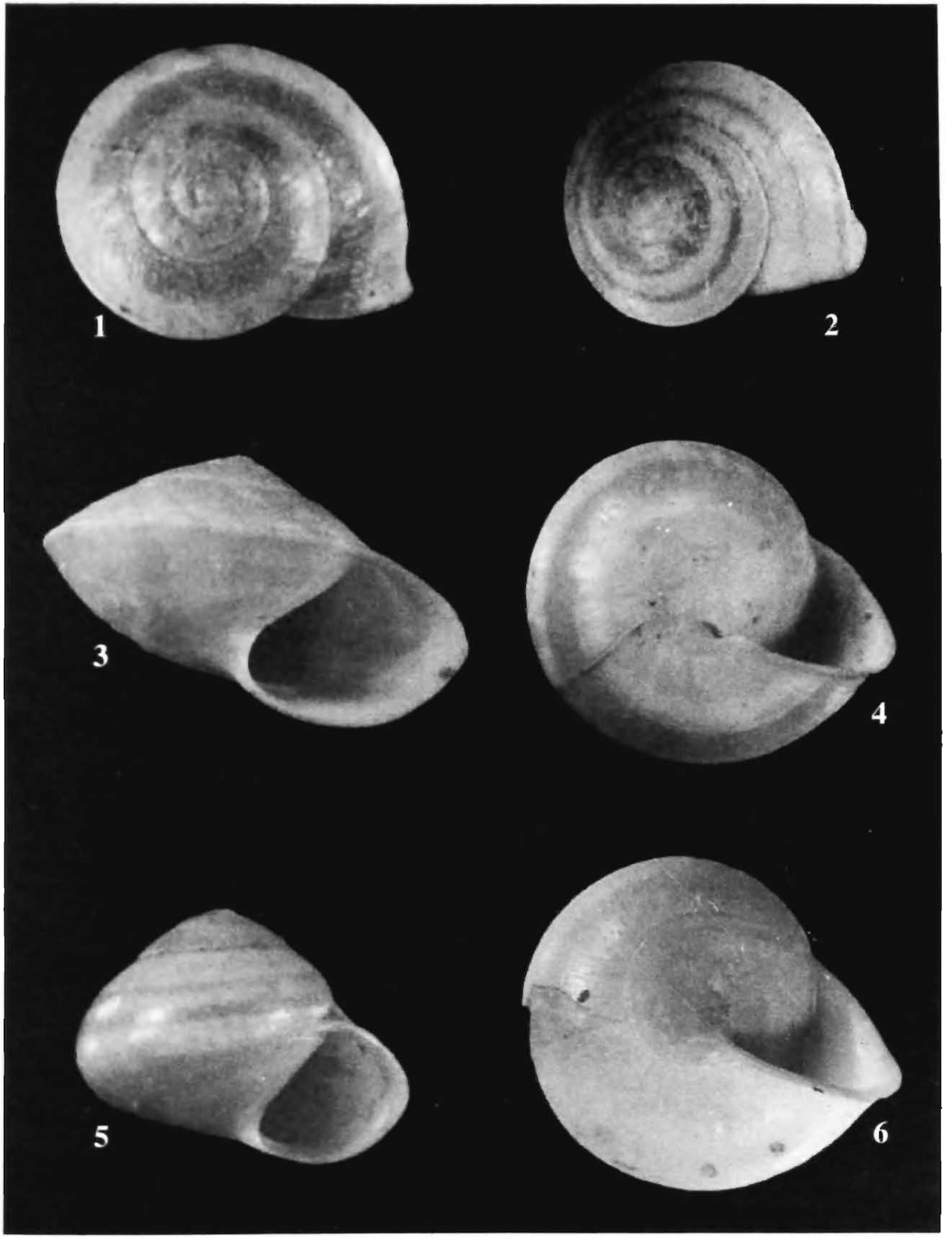
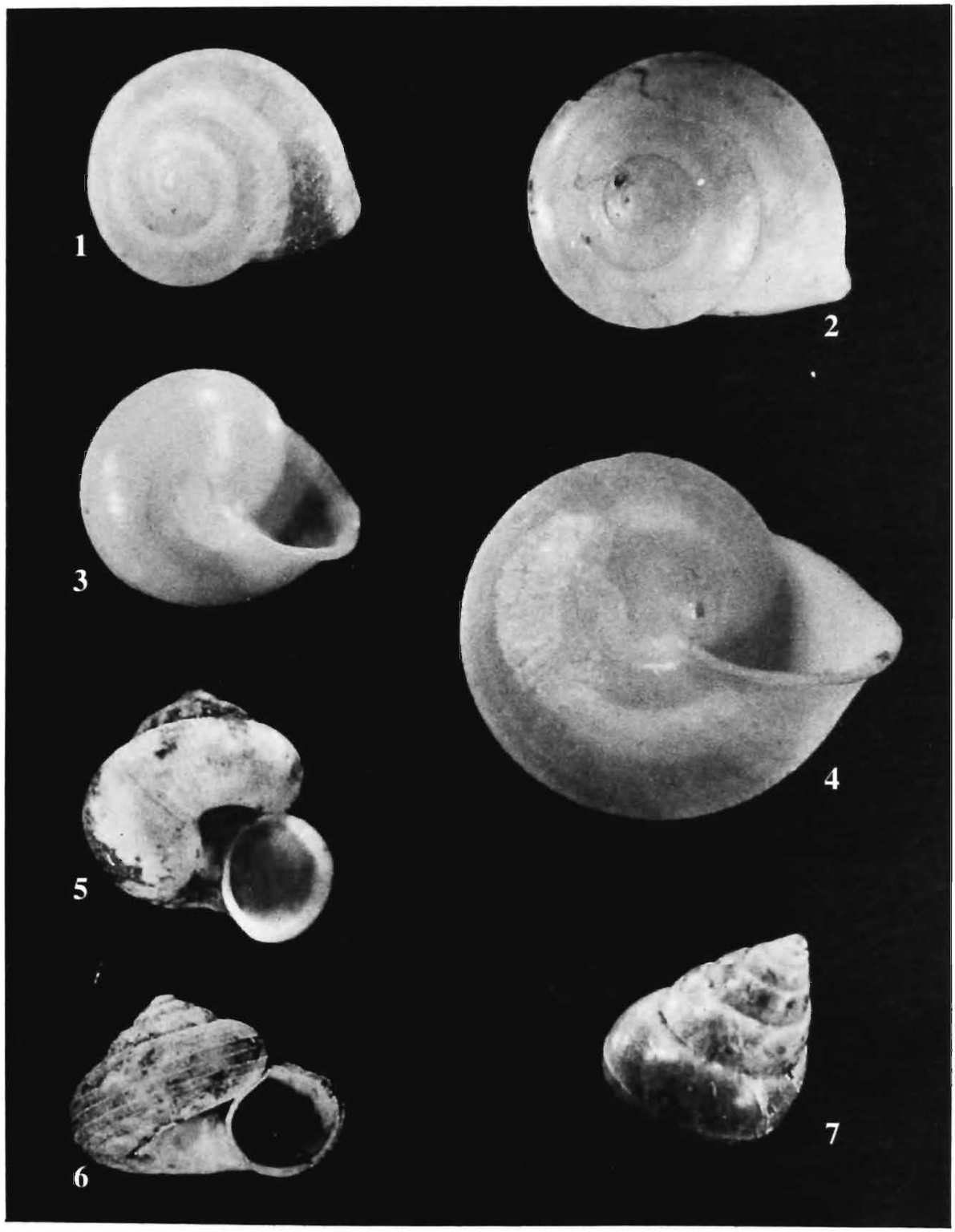
PLATE 1



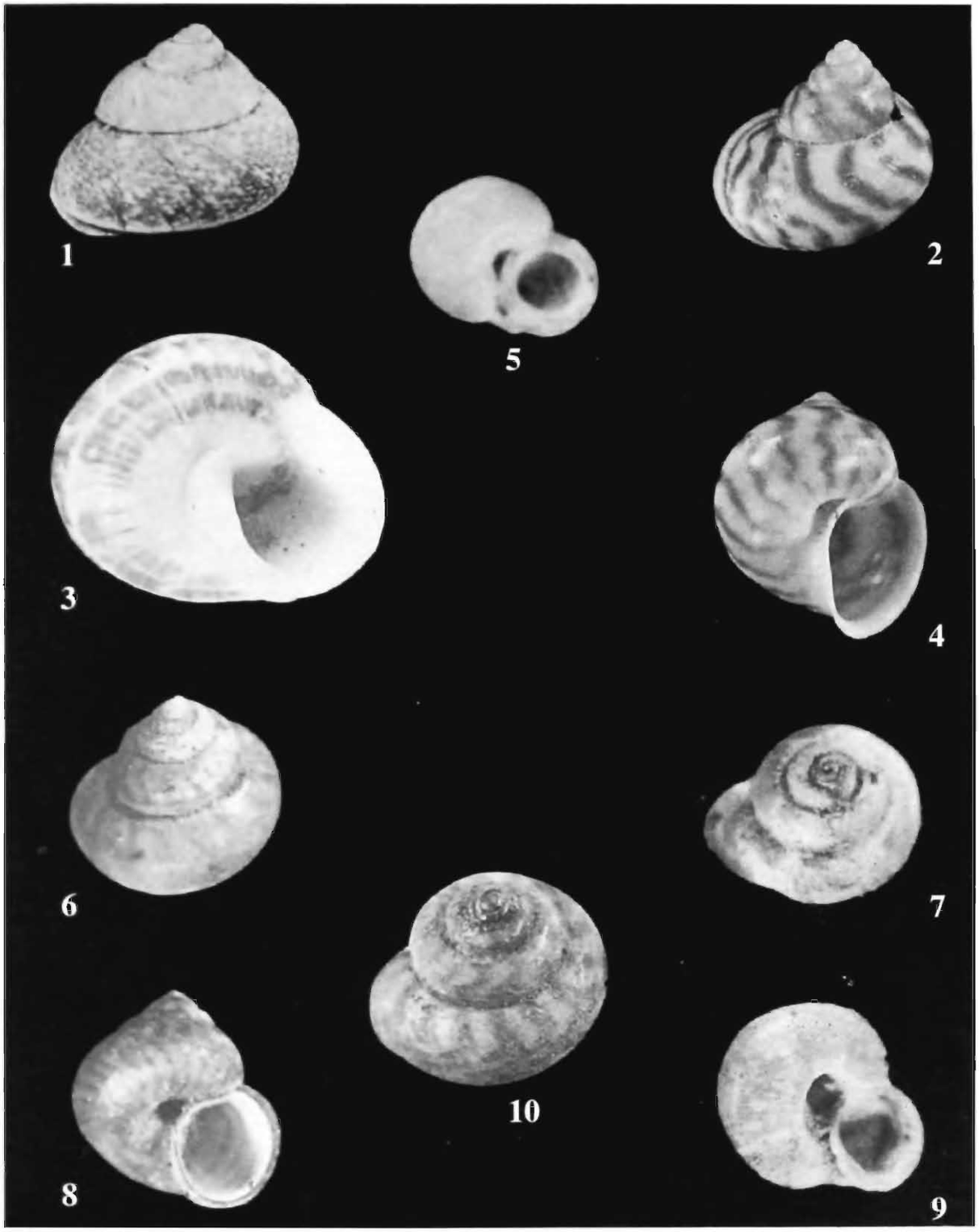
Figs. 1 & 3. *Pleuropoma andamanica* (Benson) 5.80×9.60 (Andaman and Nicobar)
2 & 4. *P. nicobarica* (Pfeiffer) 4.10×7.15 (A. & N.)
5. *Aphanoconia scrupula* (Benson) 4.45×5.15 "
6. *Pleuropoma dunkeri* (Zelebor) 5.15×9.25 "

PLATE 2



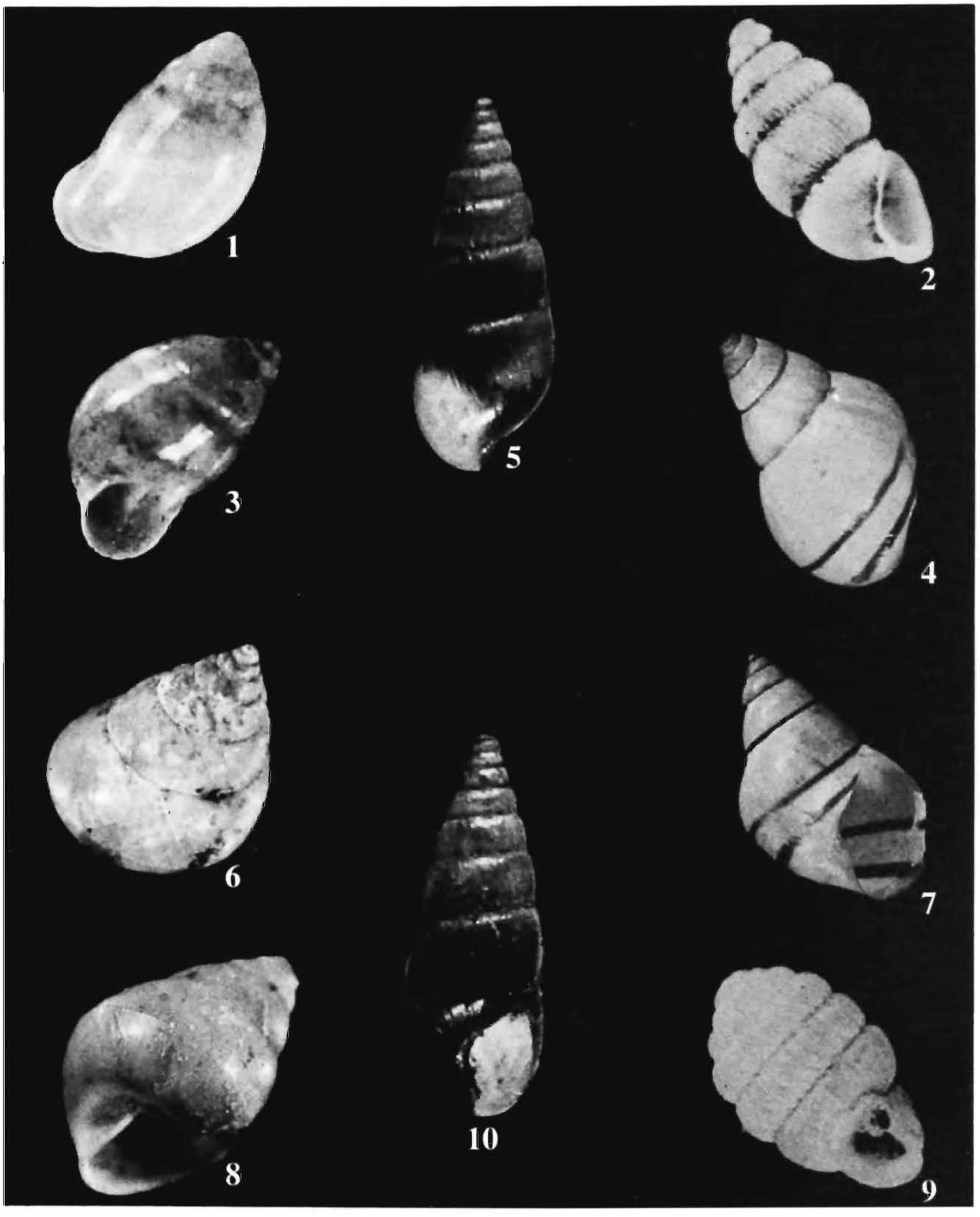
Figs. 1 & 3. *Sulfurina zelebori* (Pfeiffer) 4.85×5.10 (Andaman and Nicobar)
2 & 4. *S. behniana* (Pfeiffer) 5.20×7.40 (A. & N.)
5. *Alycaeus busbyi* Godwin-Austen 6.50×11.55 "
6. *Lagochilus roepstorfi* (Moerch) 5.15×5.40 "
7. *Omphalotropis andersoni* Blanford 5.0×4.15 "

PLATE 3



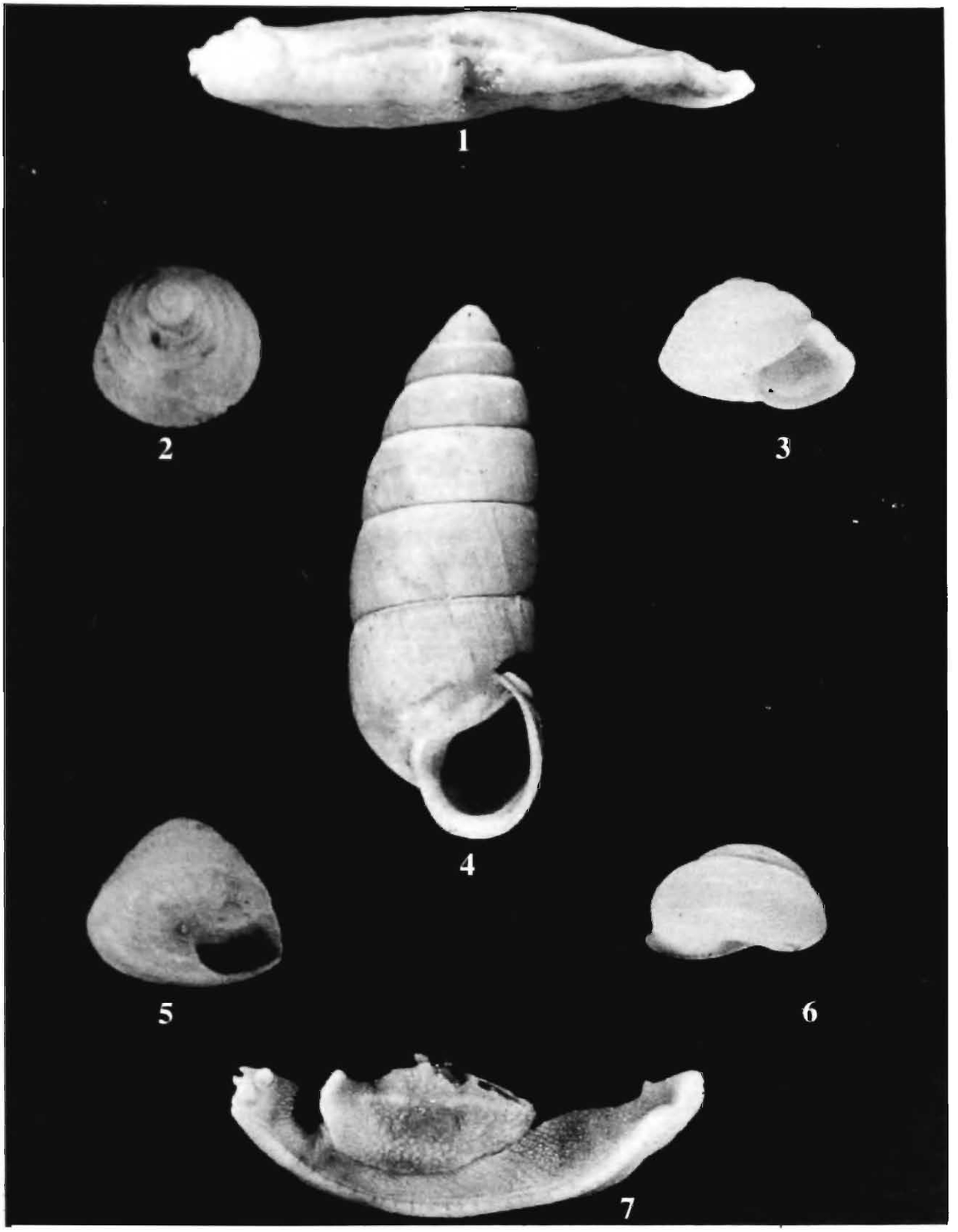
Figs. 1 & 3. *Cyclophorus crocatus* (Born) 22.0×23.9 (A. & N.)
2 & 4. *Leptopoma roepstorffiana* Nevill 12.60×11.50 "
5. *Alycaeus jaintiacus* Godwin-Austen 3.25×2.18 "
6 & 8. *Lagochilus polynema* (Moerch) 4.50×5.50 "
7 & 9. *Alycaeus khasiacus* Godwin-Austen 3.30×2.15 (Manipur)
10. *Lagochilus galathiae* Moerch 5.50×5.25 (A. & N.)

PLATE 4



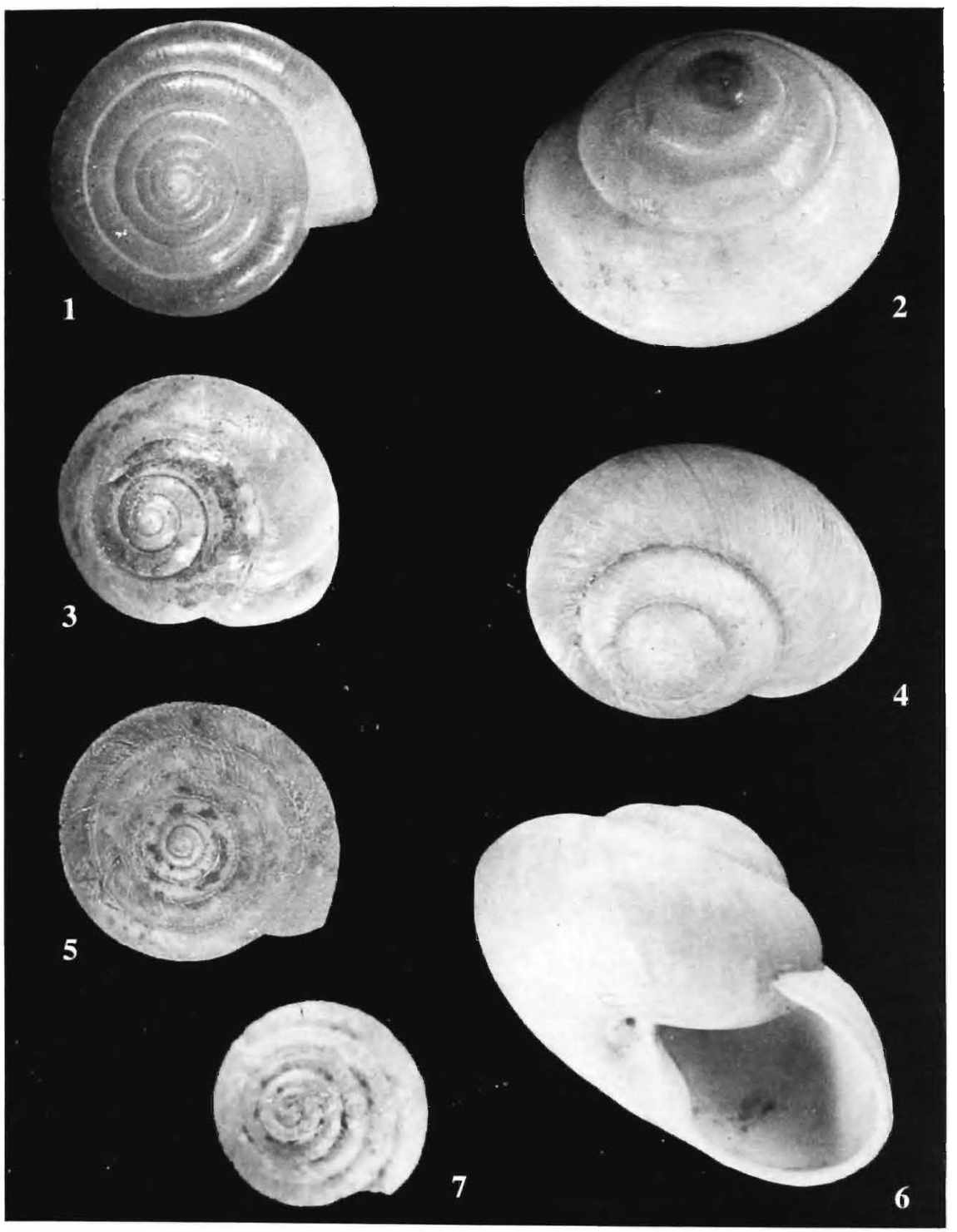
Figs. 1 & 3. *Pupina nicobarica* Pfeiffer 6.10×4.0 (Andaman and Nicobar)
2. *Palaina nicobarica* Godwin-Austen 2.80×1.10 "
4 & 7. *Rachis bengalensis* (Lamarck) 12.55×7.75 Tripura
6 & 8. *Omphalotropis distermina* Benson 6.50×4.55 A & N.
9. *Sinoennea moerchiana* Nevill 4.50×2.80 A. & N.
5 & 10. *Glessula naja* Pilsbry 14.0×5.10 Tripura

PLATE 5



Figs. **1.** *Incillaria campestris* Godwin-Austen 35.40×5.90 Manipur
2 & 5. *Sitala haroldi* Godwin-Austen 2.25×2.0 A. & N.
3 & 6. *Chloritis hemiopta* (Benson) 13.50×18.45 A. & N.
4. *Zootecus estellus* (Benson) 13.0×5.0 Rajasthan
7. *Girasia hookeri* Gray 29.20×6.70 Manipur

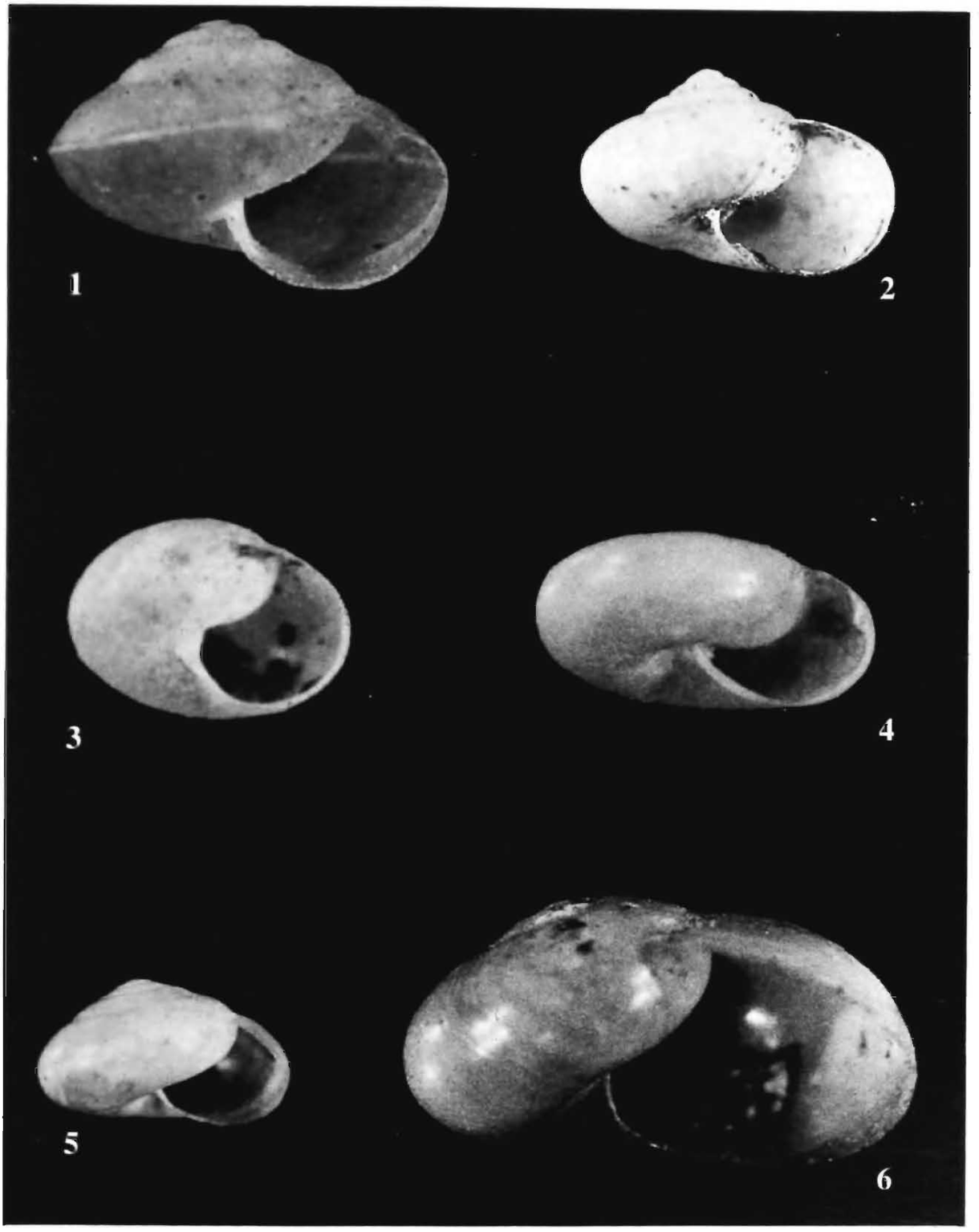
PLATE 6



Figs.

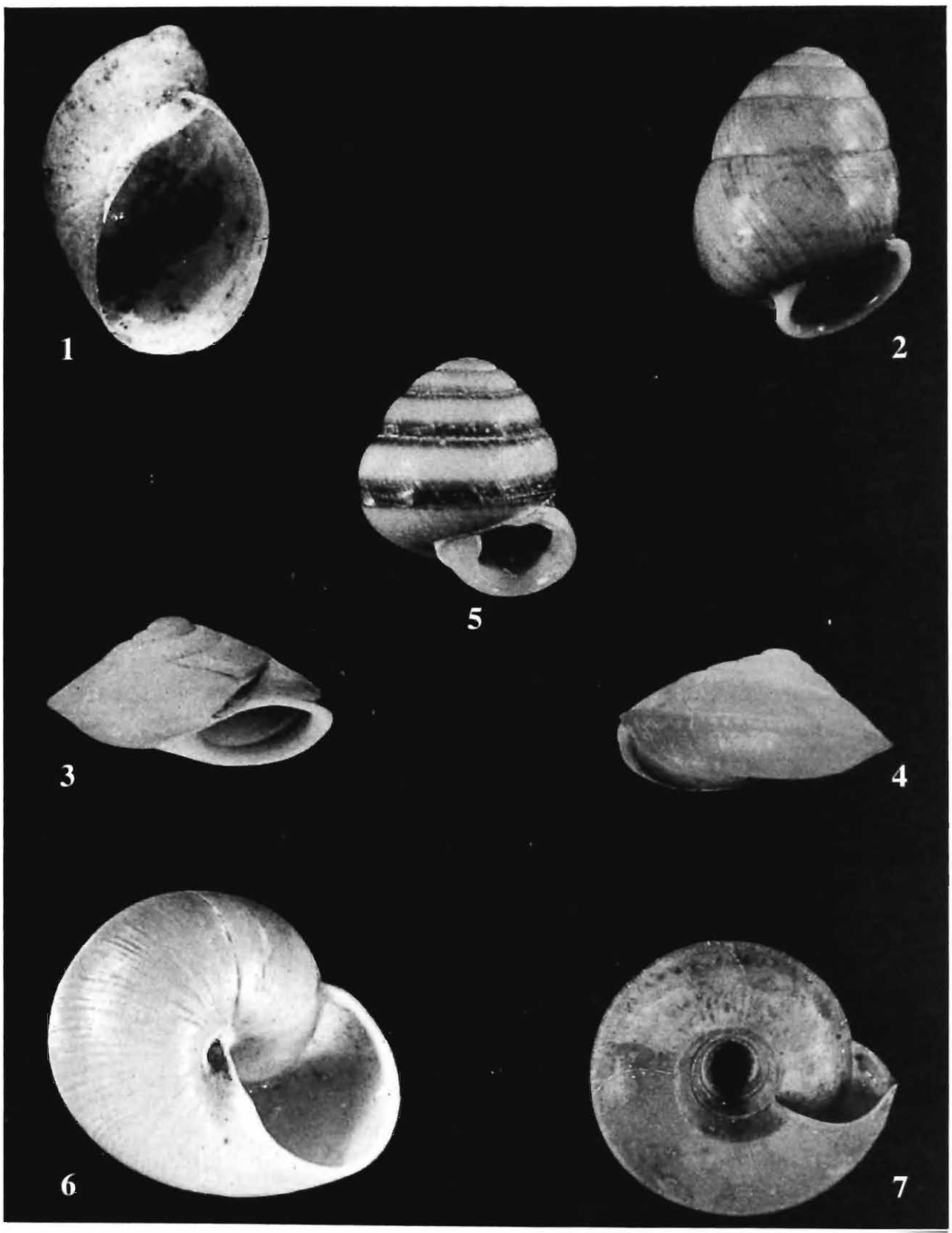
1. *Macrochlamys stephus* (Benson) 8.0×4.0 A. & N.
2. *M. fordiana* Godwin-Austen 18.50×11.20 "
3. *M. pseudaulopis* Godwin-Austen 6.90×10.25 "
4 & 6. *Rhyssotopsis conferta* (Pfeiffer) 21.15×30.0 "
5. *Videna andamanica* Nevill 4.70×12.80
7. *Philalanka subbilirata* Godwin-Austen 2.90×2.0 "

PLATE 7



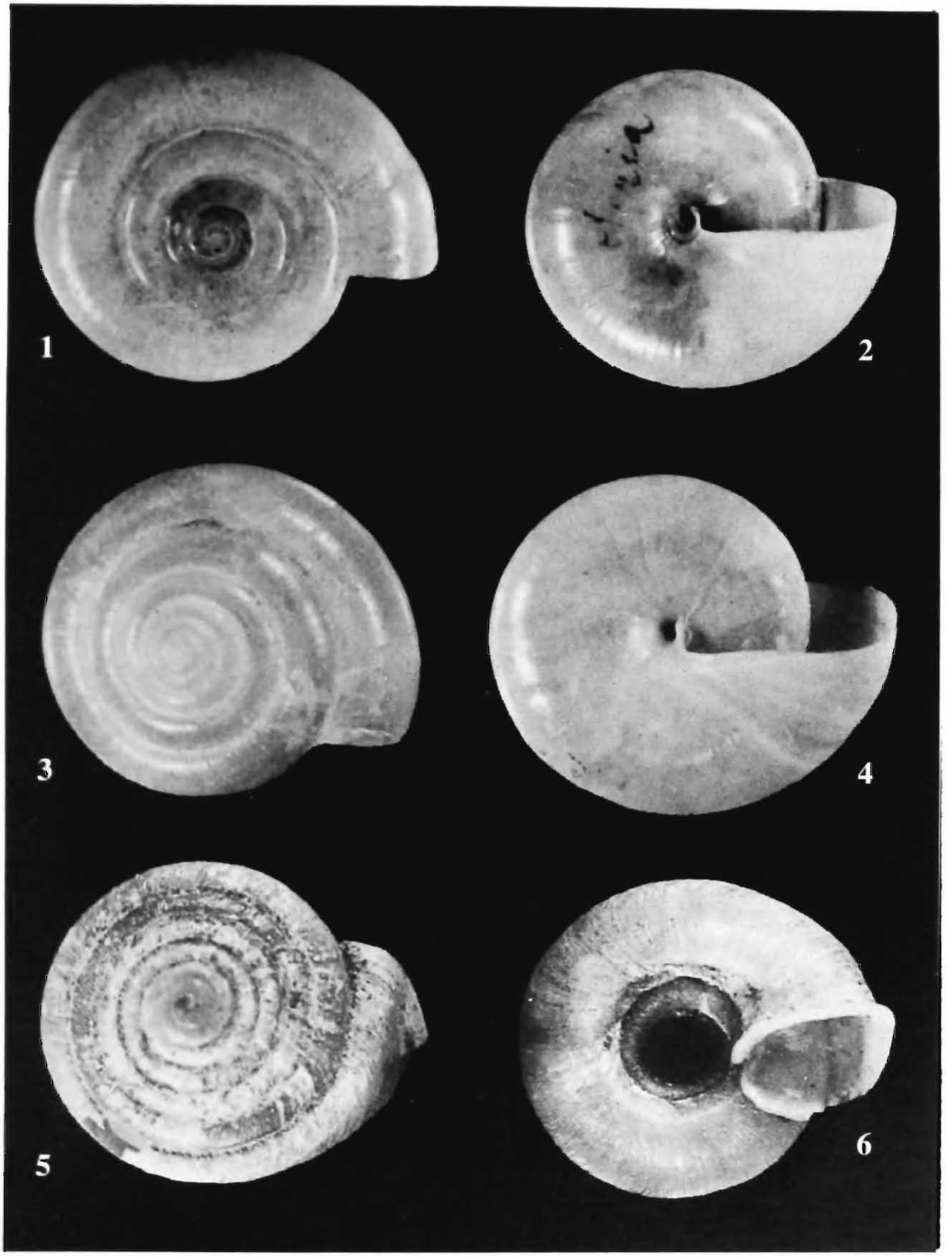
Figs.
1. *Macrochlamys tugurium* (Benson) 5.80×7.90 Manipur
2. *M. lahupaensis* Godwin-Austen 7.70×11.95 "
3. *Durgella salius* (Benson) 3.30×5.25 "
4. *Macrochlamys uda* Godwin-Austen 3.75×6.85 "
5. *M. Sufflava* Godwin-Austen 5.50×8.65 "
6. *Cryptaustenia durrangensis* (Godwin-Austen) 9.80×11.9 "

PLATE 8



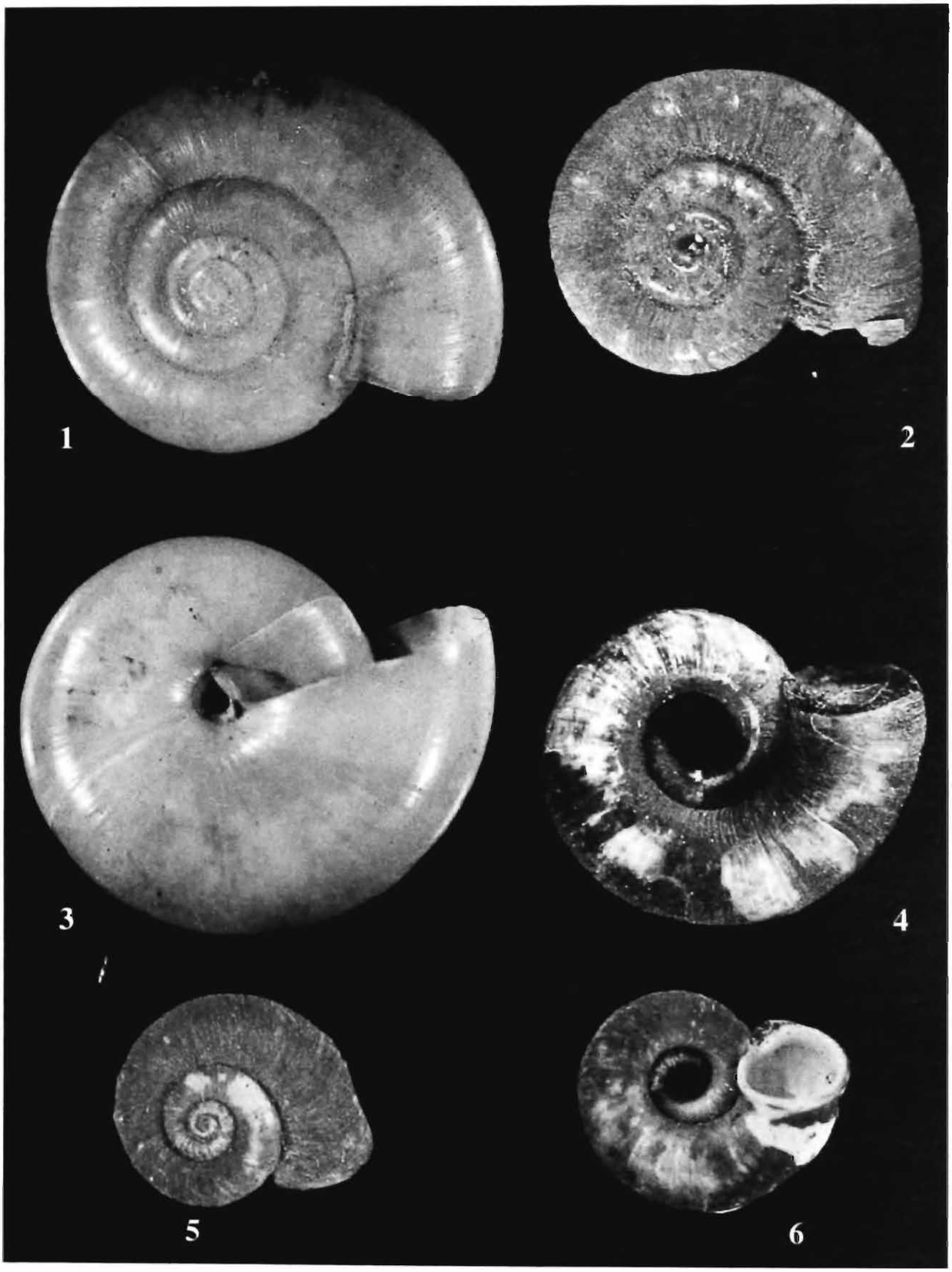
Figs. **1.** *Succinea rutilans* Blanford 6.60×4.0 Manipur
2 & 5. *Oreobba codonodes* (Pfeiffer) 18.50×17.65, 19.15×21.20 A. & N.
3 & 4. *Planispira trochalia* (Benson) 14.75×22.15 "
6. *Rhyssotopsis conferta* (Pfeiffer) 21.15×30.0 "
7. *Videna andamanica* Nevill 4.70×12.80 "

PLATE 9



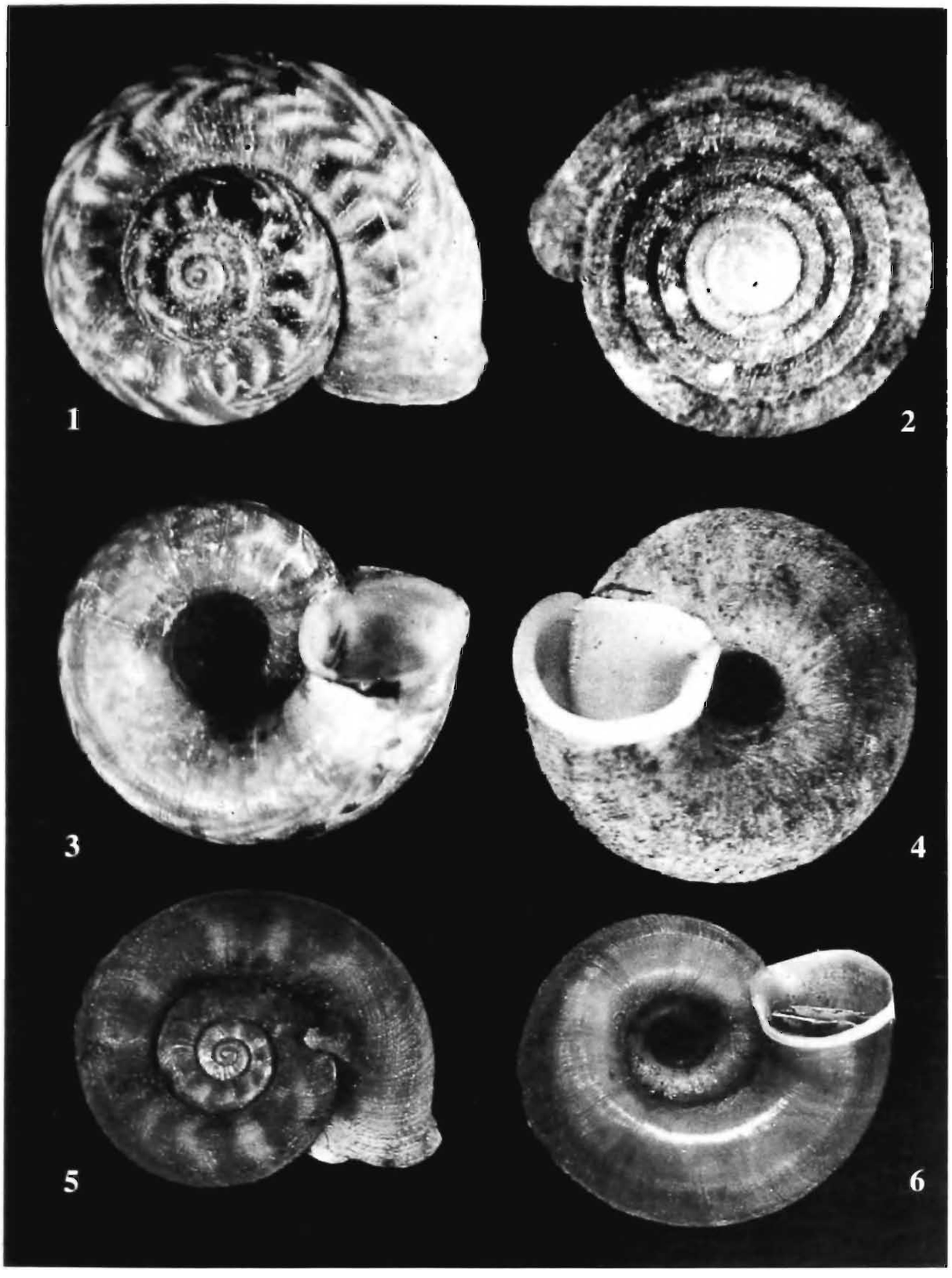
Figs. 1 & 2. *Macrochlamys decussata* (Benson) 15.10×26.65 Meghalaya
3 & 4. *M. lata* Godwin-Austen 5.20×12.80 Meghalaya
5 & 6. *Plectopylis brahma* Godwin-Austen 4.60×8.10 Meghalaya

PLATE 10



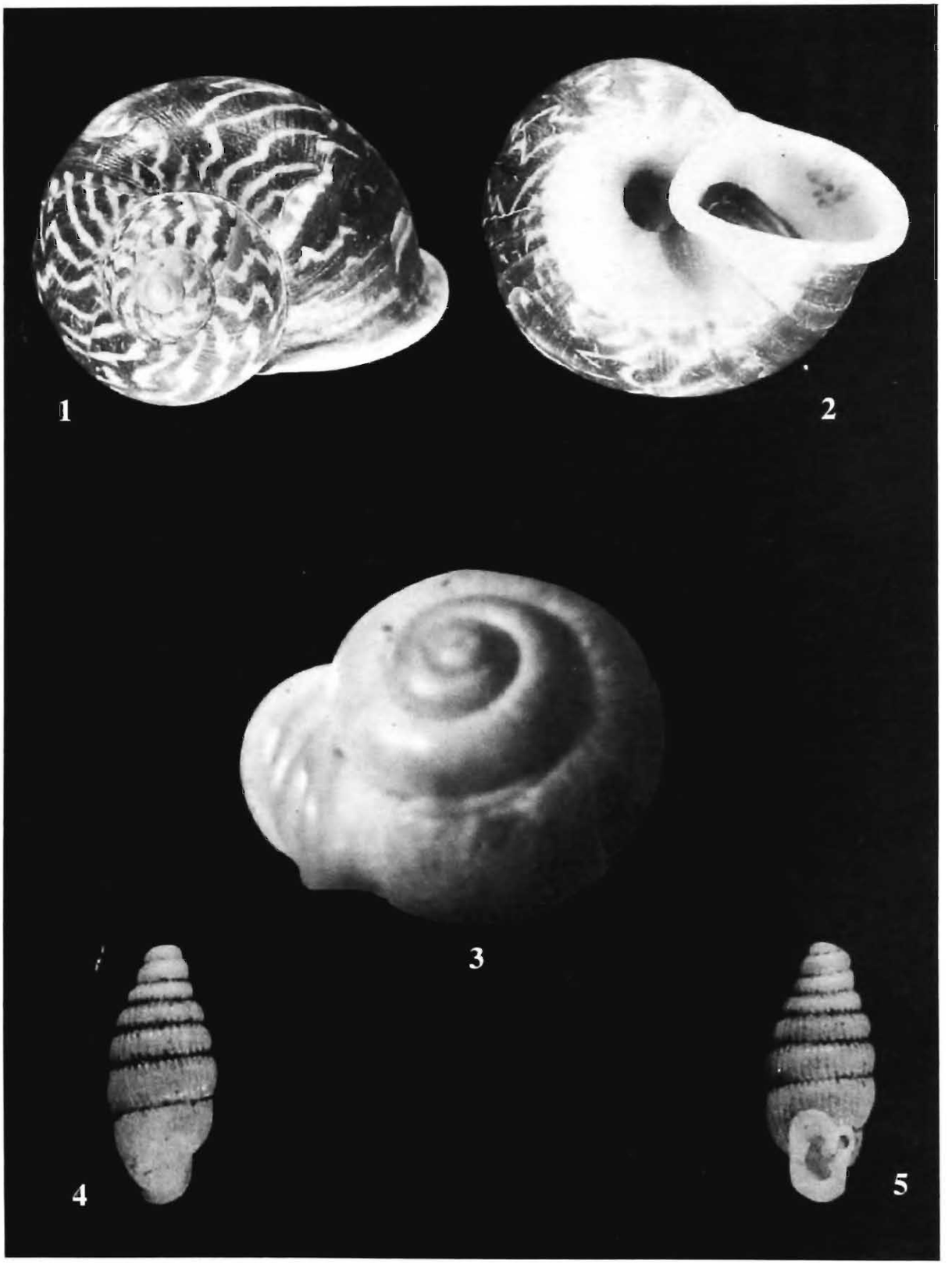
Figs. 1 & 3. *Macrochlamys lubrica* (Benson) 12.60×23.25 Meghalaya
2 & 4. *Theobaldius orites* Nevill 4.95×13.10 Meghalaya
5 & 6. *Scabrina pinnulifera* (Benson) 6.10×11.60 Meghalaya

PLATE 11



Figs. 1 & 3. *Theobaldius phaenotopicus* (Benson) 5.65×13.15 Meghalaya
2 & 4. *Plectopylis affinis* Gude 6.60×8.85 "
5 & 6. *Pearsonia hispida* Pearson 6.35×7.25 "

PLATE 12



Figs. 1 & 2. *Cyclophorus khasiacus* Nevill 37.95×49.76 Meghalaya
3. *Alycaeus hebes* Benson 4.0×3.25 "
4 & 5. *Ennea vara* Benson 5.20×2.20 "

PLATE 13

Figs. 1 & 2. *Gastroptychia insignis* Godwin-Austen 7.60×3.60 Meghalaya
3. *Macrochlamys terminus* Godwin-Austen 7.10×12.15 Meghalaya
4 & 5. *Curvella khasiaca* Godwin-Austen 12.90×6.25 Meghalaya