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SOME LAND MOLLUSCS OF KASHMIR, INDIA

By

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(With 2 Text-figures and 1 Plate)

I—INTRODUCTION

The present paper is a taxonomic study of some land molluscs of Kashmir, based primarily on material collected during two faunistic surveys of Jammu and Kashmir Valley during the years 1954 and 1955 by the Zoological Survey of India. Opportunity was also taken to re-examine the identified collections of land molluscs preserved in the Zoological Survey of India, including the types of Nevill and incorporate the results in the present study. An account of the fresh-water and amphibious molluscs of Kashmir Valley is given by the authors in an earlier paper. (Rajagopal and Subba Rao, 1968).

References dealing exclusively with molluscan fauna of Kashmir are few and scattered. The earliest work appears to be a short paper by Woodward (1856) in which he reported two species of *Ena* Turton (=*Bulimus* Scopoli). Theobald (1878) recorded, besides other molluscs, 14 genera and 27 species of land shells from Kashmir and adjacent areas. Nevill (1878 b) while reporting on the collections made by the second Yarkand Mission, dealt with 3 genera and 10 species, and Godwin-Austen (1899) listed 12 genera and 19 species of land molluscs from this area. Blanford and Godwin-Austen (1908) in the *Fauna of British India*, have listed 6 genera and 9 species, all belonging to family Zonitidae, from Kashmir, and Gude (1914) accounted for 11 genera and 22 species, spread in six families, while dealing with non-operculate land molluscs in the *Fauna of British India.*

II—ABBREVIATIONS USED

coll. — Collector ; ex(s). — example(s) ; Reg. No. — Registered Number ; Sta. — Station ; ZSI. — Zoological Survey of India.

III—CONSOLIDATED LIST OF LAND MOLLUSCS KNOWN FROM KASHMIR AND ITS VICINITY

Class GASTROPODA
Order STYLOMMATOPHORA
Family VERTIGINIDAE

1. *Orcula himalayana* (Benson)
2. *Pupoides coenopictus* Hutton

3. *Pupilla muscorum* Linnaeus
4. *Pupilla muscorum* var. *asiatica* Möllendorf
5. *Pupilla eurina* Benson
6. *Gastrocopta huttoniana* (Benson)

Family VALLONIIDAE

*7. *Vallonia pulchella* (Müller)
8. *Vallonia costata* (Müller)
*9. *Vallonia ladacensis* (Nevill)

Family ENIDAE

10. *Ena arcuata* (Küster)
*11. *Ena candelaris* (Pfeiffer)
12. *Ena coelebs* (Pfeiffer)
13. *Ena domina* (Benson)
*14. *Ena mainwaringiana* (Nevill)
15. *Ena pretiosa* (Reeve)
16. *Ena sindica* (Reeve)
17. *Ena smithei* (Benson)
*18. *Ena stoliczkanus* (Nevill)
*19. *Ena rufistrigata* (Reeve)
*20. *Ena rufistrigata* var. *gracilis* (Hanley & Theobald)
21. *Cerastus segregatus* (Reeve)

Family CLAUSILIIDAE

22. *Clausilia waageni* Stoliczka

Family FERUSSACIDAE

23. *Glessula hügeli* Pfeiffer

Family ZONITIDAE

24. *Oxychilus lucida* Draparnaud
25. *Oxychilus fulva* Draparnaud

Family VITRINIDAE

26. *Vitrina pellucida* (Müller)

Family ARIONIDAE

*27. *Anadenus altivagus* (Theobald)
28. *Anadenus jerdoni* Godwin-Austen

Family ARIOPHANTIDAE

29. *Bensonia angelica* Pfeiffer
30. *Bensonia monticola* (Hutton)

*31. *Euaustenia cassida* (Hutton)
*32. *Euaustenia monticola* Pfeiffer
*33. *Euaustenia theobaldi* (Godwin-Austen)
34. *Kaliella barrackporensis* Pfeiffer
*35. *Khasiella hyba* (Benson)
36. *Macrochlamys glauca* Benson
37. *Macrochlamys* (*Rhadella*) *kashmirensis* Benson
38. *Macrochlamys* (*Microcystis ?*) *sonamurgensis* (Nevill)
39. *Macrochlamys patane* Benson
40. *Parvatella austeniana* (Nevill)
41. *Parvatella altivaga* Godwin-Austen
42. *Parvatella flemingi* Pfeiffer
*43. *Syama splendens* (Hutton)
44. *Syama ? theobaldi* Godwin-Austen

Family FRUTICICOLIDAE

45. *Aegista huttoni* (Pfeiffer)
(= *Plectotropis huttoni* (Pfeiffer)
46. *Cathaica matainensis* Nevill
47. *Cathaica phaeozoma* von Martens

Family HELICIDAE

48. *Trichia hispida* (Linnaeus)

IV—KEY TO THE IDENTIFICATION OF THE LAND MOLLUSCS OF KASHMIR UPTO FAMILIES (BASED ON SHELL CHARACTERS ONLY).

1. Shell external .. 2
Shell internal i.e. enclosed by mantle Arionidae.

2. Shell minute not larger than 4 mm. in major diameter and 2 mm. in height, widely umbilicate . Valloniidae.
Shell always larger and never widely umbilicate but may be perforate 3

3. Shell fusiform-cylindrical, spire turreted .. Enidae.
Shell heliciform, spire depressed or conoidly turbinate Ariophantidae.

V—SYSTEMATIC ACCOUNT

Class GASTROPODA
Order STYLOMMATOPHORA

Family VALLONIIDAE

Genus **Vallonia** Risso, 1826

Type-species : *Vallonia rosalia* Risso, 1826. (=*Helix pulchella* Müller, 1774). by monotypy.

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*Species studied by us.

1826. *Vallonia* Risso, *Hist. nat. Europe merid.*, **4** : 101.
1893. *Vallonia* : Sterki, *Proc. Acad. nat. Sci. Philad.* : 234-246.

Sterki (1893) gave an excellent account of this genus, which is represented in the collection by two species.

1. **Vallonia pulchella** (Müller, 1774)

1774. *Helix pulchella* Müller, *Verm. Terr. Fluv. Hist.*, **2** : 30 (sp. no. 232), (Type-locality : not mentioned).
1893. *Vallonia pulchella* : Sterki, *Proc. Acad. nat. Sci. Philad.*, Philadelphia : 246-251.
1894. *Vallonia pulchella* : Pilsbry, *Man. Conch.*, **9** : 283.
1914. *Vallonia pulchella* : Gude, *Fauna Brit. India, Mollusca* II (Trochomorphidae—Janellidae), London, : 223.
1935. *Vallonia pulchella* : Mozley, *Trans. Roy Soc. Edin.*, Edinburgh, **58** (3), No. 24 : 645.

Material.—Coll. *A. S. Rajagopalaiengar* : 1 ex., Sta. 44-Stagnant water in the lowest terraced tank in Shalimar Garden, 31.vii. 1955 (washed material).

Distribution.—Throughout Nearctic and Palaearctic regions and in Asia as far south as Kashmir, in the latter ; Bermuda, Northern Africa ; Azores ; Madeira etc. It has been introduced (probably with plants) into Australia, Mauritius etc.

Remarks.—The single dry shell (which was evidently washed into the tank whence it was collected) representing this species in the collection, agrees well with the description given by Sterki (1893). The shell is finely and regularly striated ; umbilicus is broad and deep. The outerlip is considerably thickened. Whorls : $3\frac{3}{4}$.

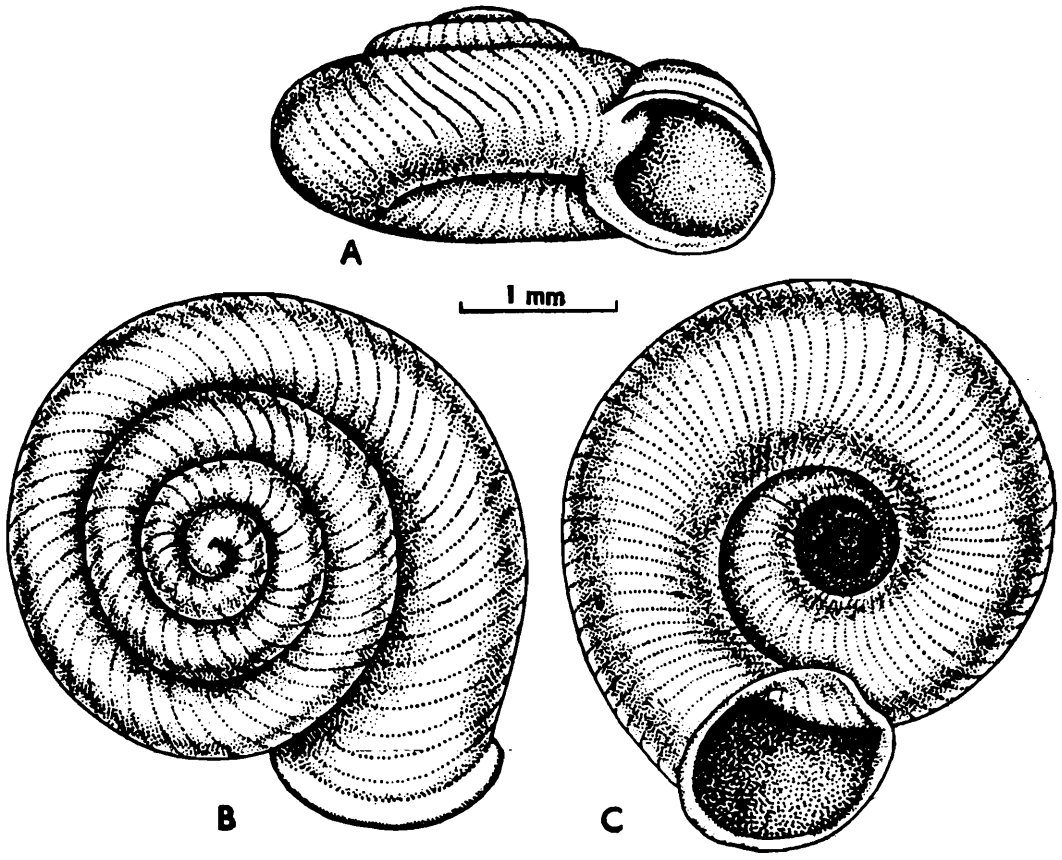
Measurements (in mm.)	
Major diameter	2.8
Minor ,,	2.0
Height	1.7

2. **Vallonia ladacensis** (Nevill, 1878)
(Text-figs. 1, 2)

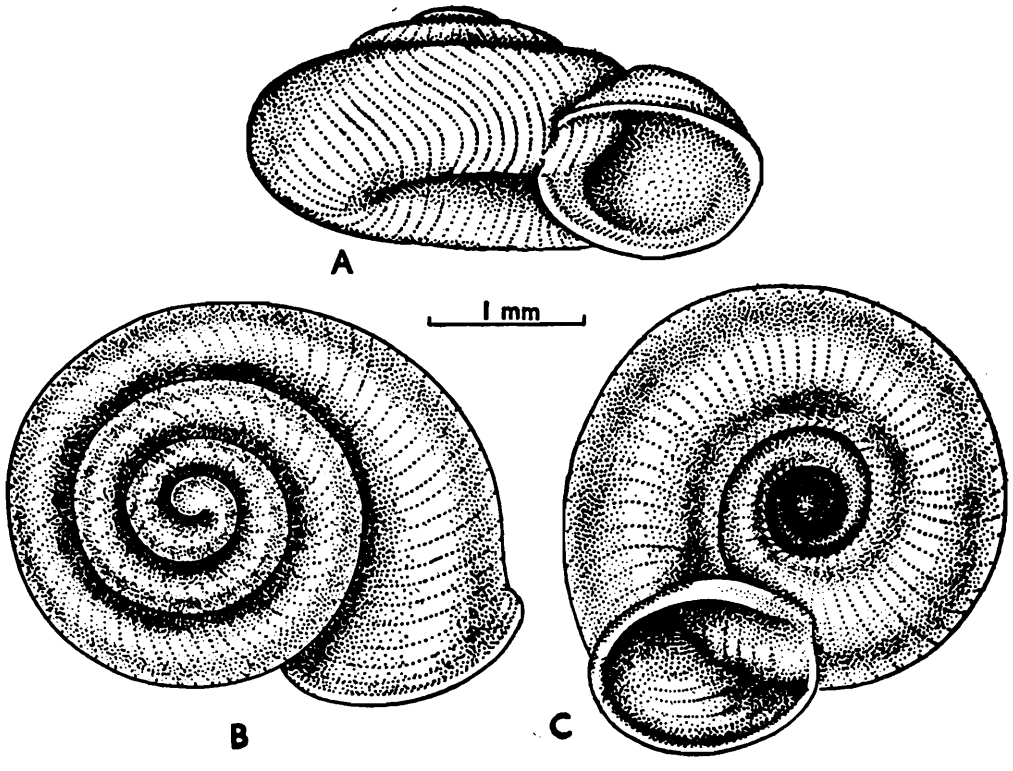
1878. *Helix* (*Vallonia*) *ladacensis* Nevill, *Sci. Res. Sec. Yarkand Mission*, Mollusca, London : 4 (Type-locality : Mataian in the Dras Valley, Ladakh).
1882. *Helix* (*Vallonia*) *ladacensis* : von Martens, *Mem. Acad. Sci. St. Petersburg*, (7) **30** (11) : 3.
1893. *Vallonia ladacensis* : Sterki, *Proc. Acad. nat. Sci. Philad.*, Philadelphia, p. 275.
1914. *Vallonia ladakensis* : Gude, *Fauna Brit. India, Mollusca*, II (Trochomorphidae—Janellidae), London, p. 226.

Material.—No. of examples studied : 17 : Lot A : Coll. ? : (i) 2 exs., Kashmir ; (ii) 9 exs., Leh (Ladak) ; Lot B : Coll. *A. S. Rajagopalaiengar* : (iii) 6 exs., Sta. 12 - underneath stones on the bank of the Lidar river, Pahalgam, 2. vii. 1955.

Distribution.—India : Kashmir ; Ladakh : Mataian, Dras Valley, Leh ; Punjab : Spiti ; Western Tibet ; Turkestan : Tian-Shan Mountains.



TEXT-FIG. 1. *Vallonia ladacensis* (Nevill) (Lectotype).
A. Front view. B. Dorsal view. C. Ventral view.



TEXT-FIG. 2. *Vallonia ladacensts* (Nevill) (A specimen from Pahalgam).
A. Front view. B. Dorsal view. C. Ventral view.

Remarks.—The original material of Nevill, on which this species was described, is available in the Zoological Survey of India. It contains three specimens labelled as "Type". Nevill (1878 b), however, had not formally designated any type, hence we have taken the opportunity to select one shell from the original material and designate it as "Lectotype", bearing Reg. No. M 18328/3, Zoological Survey of India (Text-fig. 1 A, B and C).

We have compared our specimens with the type material, and find that it is conspecific with the latter. However, in the shells under study the number of whorls are $4\frac{1}{2}$ i.e., one less than in the lectotype. The spire is slightly more suppressed and the outer lip slightly more transversely expanded. These minor variations may be due to the shells having not attained full development. The ribs are closely set and fine as in the "Type". Also, the umbilicus is prominently wide open, through which the whorls can be traced up to the apex.

Measurements (in mm.)

	Lectotype	Kashmir specimens Largest	Smallest
Major diameter	4.0	3.5	2.4
Minor „	3.25	2.8	2.0
Height	2.0	1.6	1.1

Family ENIDAE

Genus **Ena** (Leach) Turton, 1831

Type-species : *Bulimus montanus* Draparnaud

*1786. *Bulimus* Scopoli, *Deliciae Florae. et. Faunae Insubricae*, **1** : 67 (Preoccupied by *Bulimus* Scopoli, 1777 for a genus under family Amnicolidae).
*1831. *Ena* (Leach MS) : Turton, *Man. Shells Brit. Islands* : 81 (in syn.)
*1831. *Bulimina* : Ehrenberg, *Symb. Phys. Anim. Evert.*, ser. I. Mollusca, decas prima, signature *d.* fourth page (non *Bulimina* D'Orbigny, 1826) (Preoccupied by *Bulimina*, a genus of Foraminifera).
1839. *Buliminus* : Beck, *Index Mollusc.*, : 68 (as a subgenus of *Bulimus*).
*1840. *Ena* Turton, *Man. Land & Freshwater Shells*, Ed. 2 : 182.

The name *Ena* Turton, is the available valid name for the genus, others (synonymy vide supra) being preoccupied.

This genus is represented by four species and a variety in the collection.

3. **Ena candelaris** (Pfeiffer, 1846)

1846. *Bulimus candelaris* Pfeiffer, *Proc. zool. Soc. Lond.* : 40 (Type-locality : not mentioned).
1849. *Bulimus candelaris* : Reeve, *Conch. Icon.*, **5**, sp. 408.
1855. *Bulimulus candelaris* : Adams, *Gen. Rec. Moll.*, **2** : 159.
1878. *Buliminus (Petraeus) candelaris* var. Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 20.

* Not seen in original

1914. *Ena candelaris* : Gude, *Fauna Brit. India Mollusca* II (Trochomorphidae-Janellidae), London : 243-244.

Material.—No. of examples studied : 464 : Lot A : Coll. ? (i) 30 exs. (16 sinistral + 14 dextral), Tinali and Kashmir (Mixed collection) ; Lot B : Coll. *S. L. Hora* : (ii) 12 exs., Sta. 4-Shankarachrya Hill*, 28.iv.1954. Lot C : Coll. *A. S. Rajagopalaiengar* : (iii) 120 exs., Sta. 4-Below stones, Shankaracharya Hill, Srinagar, 20.vi. 1955 ; (iv) 88 exs., Sta. 4a—on the grass, Shankaracharya Hill, Srinagar ; 20-21.vi.1955 ; (v) 105 exs., Sta. 4a—on the grass, Shankaracharya Hill, Srinagar, 21.vi.1955 ; (vi) 24 exs.,—on plants at Bareen, near Srinagar, 24.vi.1955 ; (vii) 115 exs., Sta. 9—Bed of a dried-up streamlet, Bareen, near Srinagar, 26.vi.1955.

(All the examples under Lots B and C are sinistral).

Distribution.—North-west India : Fort Lockhart ; Kashmir : Srinagar, Shankaracharya Hill ; Jhelum Valley above Kokala ; Pakistan : Tinali ; Tibet.

Remarks.—The large collection of this"candle-like" form before us is of uniform nature, without much noticeable individual variation. The whorls are 9 and "rudely finely striated" excepting for the two apical whorls. The shells are "dead-white" and the margin of aperture ivory white. They represent various stages of growth. Juvenile forms are of conical shape, body whorl prominently keeled and with the margin of the aperture not expanded.

Nevill (1878b) records both dextral and sinistral forms together from Tinali and observes "the dextral form appears to have been found more abundant than the sinistral", whereas Theobald (1878) reporting the species from Murree and various places in Kashmir comments that "sinistral shells are most numerous but dextral ones also occur not rarely" Nevill (1878a) in his "Hand list" cites 3 examples (all sinistral) from "Takt-i-Soliman" Further, he (1878b) quotes Lydekkar having noticed the two forms not usually found absolutely together. Our study also reveals that Lots B and C (above) contain only sinistral shells. It is likely that these specimens are drawn from homogeneous population (s) occurring in the area and in which only the sinistral character appears to prevail.

The live snails were found sticking to blades of grass, leaves etc. of plants and aestivating during spells of dry weather in June. With the onset of rainy or humid condition they were observed to come out and actively crawl about.

4. **Ena stoliczkana** (Nevill, 1878)

1878. *Bulimus* (*Petraeus*) *stoliczkanus* Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 19. (Type-locality : Sonamarg, Kashmir).

Material.—No. of examples studied : 12. Lot A. Coll. ? (i) 2 exs., Sonamarg ; Lot B. Coll. *K. K. Tiwari* : (ii) 10 exs., crawling on stones, Banihal, 15.vii.1955.

Distribution.—India : Kashmir.

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*Also known as "Takht-e-Suleman".

Remarks.—The specimens of Lot A (i) above, which are from identified collections of Zoological Survey of India are quite large in size. They agree with Nevill's (1878b) fig. 27.

The specimens of Lot B (ii) above are of much smaller size and they are strikingly similar to Nevill's figs. 25 and 26.

The umbilicus is narrowly rimate and partially covered by the reflected columella. Whorls are 7. In the two juveniles present in the collection they are $5\frac{1}{2}$.

5. **Ena mainwaringiana** (Nevill, 1878)

1878. *Bulimus mainwaringianus* Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 19. (Type-locality : Murree, West Punjab).

1881. *Napaeus mainwaringianus*: Theobald, *J. Asiat. Soc. Beng.*, **50** (2) : 47-48.

1902. *Bulimus (Subzebrinus) mainwaringianus* : Kobelt, *Conch-Cab.*, **1** (13) (Buliminidae) : 937.

1914. *Ena mainwaringiana* : Gude, *Fauna Brit. India, Mollusca* II (Trochomorphidae-Janellidae), London : 251.

Material.—No. of examples studied : 298. Lot A. Coll. ? : (i) 8 exs., Jhelum ; (ii) 1 ex., ZSI., Reg. No. M 6951/1, Gilgit, 5000 ft.; Lot B. Coll. *K. K. Tiwari* : (iii) 33 exs., on the slopes of Shankaracharya Hill, Srinagar, below stones, 5.vi.1955 ; (iv) 1 ex., Below stone, Chakua nullah, Batote, 30.vii.1955 ; Lot C. Coll. *A. S. Rajagopalaiengar* : (v) 100 exs., Sta. 4—Shankaracharya Hill, Srinagar, below stones, 20.vi.1955 ; (vi) 142 exs., Sta. 4—Shankaracharya Hill, Srinagar, below stones, 21.vi.1955 ; (vii) 5 exs., Sta. 9—Near Bareen village towards the mountain on the East, 26.vi.1955 ; (viii) 7 exs., Sta. 45—Underneath shrubby bushes in the slope behind the Telephone Exchange, Gulmarg, 1.viii.1955 ; (ix) 2 exs., Sta. 50—Beneath shrubby bushes in the slope opposite Tourist Bureau, Gulmarg, 3.viii.1955.

Distribution.—India : Kashmir ; Jhelum Valley ; Pakistan : Murree, Pakli Valley (Tandiani Hills) ; Lundi Kotal.

Remarks.—We have carefully examined Nevill's "Type" (Holotype-ZSI. Reg. No. M 18327/3) of this species, with which we have compared the collection under study and find that the latter agrees very well with it. The collection contains shells which are larger in size than the "Type" or any other shell in the entire hypodigm studied by Nevill (1878b).

The epidermis is of light horny brown, except for the 8 exs. in Lot A above, but without the "variegated opaque white markings." In a large number of shells the epidermis has peeled off exposing the white shell surface beneath. The mature shells are with 7 whorls while the juveniles are with 6. The columella is broadly reflected, straight and slightly subangulate. The umbilicus is rimate and partially occluded by the columella. The outer lip is not so much thickened as in the "Type"

In the Lot C (v) and (vi) above are present 5 and 2 large-sized shells respectively, which agree with Gude's fig. 92 on p. 252.

The largest shell measures 17×8 mm.

6. **Ena rufistrigata** (Reeve, 1849)

1849. *Buliminus rufistrigatus* Reeve, *Conch. Icon.*, London, **5**, sp. no. 570, pl. 78, fig. 570 (Type-locality : Base of the lower range of the Himalaya, between the rivers Jumna and Sutlej).
1878. *Buliminus (Petraeus) rufistrigatus* : Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 20.

Distribution.—India : Base of the lower range of the Himalayas between Jumna and Sutlej ; Jhelum Valley ; Outer hills from Jumna to the Indus (Kashmir) ; Lundi Kotal.

Remarks.—Gude (1914) has given a good synonymy and discussed at some length its affinities with the *eremita, sindicus, salsicola* and *spelaeus.*

A single good specimen from the second Yarkand Expedition material examined by Nevill is represented in the collection of Zoological Survey of India.

7. **Ena rufistrigata** (Reeve) var. **gracilis** (Hanley & Theobald, 1870)

1870. *Bulimus rufistrigatus* var. *gracilis* Hanley and Theobald, *Conch, Indica* : 10. (Type-locality : Between the rivers Jumna and Sutlej. Punjab).

Distribution.—India : Kashmir ; Kakerhati.

Remarks.—This variety is represented by 2 exs. in the Zoological Survey of India from the Second Yarkand Expedition collection studied by Nevill (1878b). We have carefully examined them and find that they are more slender than the typical form. Of the two shells one is mature and has 7 whorls and the other is juvenile with only 5 whorls.

Family ARIONIDAE

Genus **Anadenus** Heynemann, 1863

Type-species : *Anadenus giganteus* Heynemann

1863. *Anadenus* Heynemann, *Malak. Blätt.*, **10** : 138.

Godwin-Austen (1882) and Tryon (1885) have given the generic diagnosis of these slugs. Pilsbry (1898) has also traced the phylogeny of this genus *vis-a-vis* other genera of Arionidae.

This genus is represented in the collection by a single species.

8. **Anadenus altivagus** (Theobald, 1862).
(Pl. 1, Figs. 1-3)

1862. *Limax altivagus* Theobald, *J. Asiat. Soc. Beng.*, **21** : 489 (Type-locality : Cissutlej Hills near Fagu, Narkanda, Saraon, etc., Alt. 1828 to 2743 M.).
1882. *Anadenus altivagus* : Godwin-Austen, *Land and Freshwater Moll. India*, London, pt. 2 : 49.
1914. *Anadenus altivagus* : Gude, *Fauna Brit. India, Mollusca II* (Trochomorphidae-Janellidae), London : 470.

Material.—No. of examples studied : 21. Lot A : Coll. ? : (i) 1 ex., ZSI, Reg. no. M 14782/2, Gulmarg, Kashmir ; Lot B : Coll. *S. L. Hora* (ii) 1 ex., Sta., 44—On the way from Pahalgam to Biasarn (alt. 2438 m.), 15.vi.1954 ; Lot C : Coll. *A. S. Rajagapalaiengar* (iii) 3 exs., Sta. 50—Below shady plants in the slope opposite Tourist Bungalow, Gulmarg, 3.viii.1955 ; (iv) 16 exs., Sta. 51—Under shady plants, pieces of log etc., near Khilanmarg (alt. 3352 m.), 3.viii.1955.

Distribution.—India : Kashmir ; Himachal Pradesh : Simla, Kufri, Dalhousie ; Uttar Pradesh : Nainital ; Pakistan : Tandiani, Changligali near Murree ; Nepal.

Remarks.—While Godwin-Austen (1882) and Tryon (1885) consider *A. giganteus* Heynemann, as synonymous with *A. altivagus* (Theobald), Nevill (1878b) and Gude (1914) have treated the two species as distinct. Gude (1914), however, on the basis of a pencil remark by Godwin-Austen in a copy of the Land and Freshwater Mollusca of India at the British Natural History Museum, infers that Godwin-Austen has modified his earlier view and admitted *giganteus* as a distinct form.

According to Godwin-Austen (1882) the slugs were found to be in full activity and development during rains in June and July. Our observations also point to the same, for, the active life of these slugs seem to culminate into full sexual activity in August. Many slugs were seen in copulation by one of the authors (Rajagopal) in Khilanmarg (alt. 3352 M.) on 3rd August, 1955. The copulating pairs separated at the slightest disturbance. By careful handling one pair was successfully preserved with the respective external genitalia in a well extended condition (Lot B (iii) above. See Pl. 1, figs. 2 & 3).

In the Lot B (iii) above is a specimen, which during coitus acted as a functional male, with the penis preserved in a well-extended condition (Plate 1, fig. 2). The basal part of the penis is broad and swollen, while the distal part is narrow, short and pointed. The penis appears as if mounted on a platform. Below this platform is what Godwin-Austen refers to as the "reversed portion", in which embedded on all sides except the posterior are several rows of calcareous plates with spiny margins. Posteriorly, embedded in this portion is a large calcareous shield with undulating rows of longitudinal comb-like projections below and with sharp curving margin pointed at one end, above.

In the same lot is another specimen which was a functional female during coitus (Plate 1, fig 3). In this also similar calcareous structures as described for the male are present at corresponding places in the "reversed portion" Only the penis with its platform is not visible. In its place a much contracted genital orifice can be seen.

The slugs in life are dark greenish brown, the tentacles and head region being much darker. The animals secrete slime very profusely.

The slugs seem to prefer cool, shady and humid places as most of them were collected underneath shady plants, below pieces of decaying wood etc.

No good figure of this slug is available in literature. Therefore, a photograph of the best specimen present in the collection is reproduced here (See Pl. 1, fig. 1).

This is a new record of its occurrence in Kashmir.

Family ARIOPHANTIDAE

Genus **Syama** Godwin-Austen, 1908.

Type-species : *Macrochlamys prona* Nevill.

1908. *Syama* Godwin-Austen, *Fauna Brit. India Mollusca*, (Testacellidae and Zonitidae), London, : 152 (As a subgenus of *Euaustenia* Cockerell).
1931. *Syama* : Thiele, *Handbuch Syst. Weichtierk.*, Jena, **1** : 620.

This genus is represented in the collection by a single species.

9. **Syama splendens** (Hutton, 1838)

1838. *Nanina splendens* Hutton, *J. Asiat. Soc. Beng.*, Clacutta, **7** (1) : 215 (Type-locality : Mahasu, near Simla).
1878. *Nanina* (*Bensonia*) *splendens* : Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 18.
1908. *Euaustenia* (*Syama*) *splendens* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca* (Testacellidae and Zonitidae), London : 153.

Material.—No. of examples studied : 55. Lot A : Coll. ? (i) 10 exs., Rampur, Kashmir, 11.iv.1916 ; Lot B : Coll. *Baini Prashad* (ii) 1 ex., Sta. 7-Thajwas Margs near Sonamarg, Kashmir, (alt. 2743 m.), 17-23.vi.1921. Lot C : Coll. *S. L. Hora* (iii) 1 ex., Sta. 55-On way from Tangmarg (alt. 2194 M.) to Khilanmarg (alt. 3352 m.), 22.vi.1954. Lot D : Coll. *K. K. Tiwari* (iv) 1 ex.,—Batakut, 5 km south of Rest House, below stones, (alt. *ca* 2438 M.), 17.vi. 1955 ; Lot E : Coll. *A. S. Rajagopalaiengar* (v) 4 exs., Sta. 4—Below stones in Shankaracharya Hill, Srinagar, 21.vi.1955 ; (vi) 1 ex., Sta. 18—Among dead leaves underneath a bush at the base of Pissu Ghat, 6.vii.1955 ; (vii) 2 exs., Sta. 22—Stagnant pool by the side of the canal of Lidar River, Pahalgam, on way to Chandanwari, 8.vii.1955 ; (viii) 3 exs., Sta. 45—Underneath shrubby bushes in the slope behind the Telephone Exchange, Gulmarg, 1.viii.1955 ; (ix) 28 exs., Sta. 49—Underneath stones in a cool place off the 3rd km from Tangmarg to Gulmarg, 3.viii.1955 ; (x) 3 exs., Sta. 50—Beneath shrubby bushes in the slope opposite Tourist Bureau, Gulmarg, 3.viii.1955 ; (xi) 2 exs., Sta. 51—Under a rotting log of wood near Khilanmarg, 3.viii. 1955.

Distribution.—India ; Western Himalayas, near Mussoorie and Simla ; Kashmir ; Pakistan : Tinali.

Remarks.—The full grown large-sized shells are fairly stout and light horny brown or yellow in colour. The smaller ones are thin, fragile and when fresh glossy and deeply pink or light reddish.

Genus **Khasiella** Godwin-Austen, 1899.

Type-species : *Helix vidua* Hanley and Theobald.

1899. *Khasiella* Godwin-Austen, *Land and Freshwater Moll. India*, London, **2** : 129.
1908. *Khasiella* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca* (Testacellidae and Zonitidae), London : 157.

Godwin-Austen (1899) proposed the name *Khasiella* to include the snails which were anatomically different from *Euplecta* Semper. He originally proposed the name as a subgenus of *Euplecta* but later (1908) raised it to a genus.

This is represented in the collection by a single species.

10. **Khasiella hyba** (Benson, 1861)

1861. *Helix hyba* Benson, *Ann. Mag. nat. Hist.*, London, (3) **7** : 83 (Type-locality : Dahinkund, Sub-Himalaya, not far from Sutlej).
1870. *Helix hyba* : Hanley and Theobald, *Conch. Indica*, pt. 2, pl. 30, figs. 2 & 3.
1908. *Khasiella hyba* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca*, London : 162.

Material.—No. of examples studied : 7. Lot. Coll. *A. S. Rajagopalaiengar* (i) 1 ex., Sta. 9—In a hole on the top of the mountain, east of Bareen village, 26.vi.1955 ; (ii) 2 exs., Sta. 45—Underneath shrubby bushes in the slope behind the Telephone Exchange, Gul marg, 1.viii.1955 ; (iii) 4 exs., Sta. 49—Underneath a cool place off the 3rd km. from Tangmarg to Gulmarg, 3.viii.1955.

Distribution.—India : Kashmir : Hill behind Aijas, east of Wular Lake ; Western Himalayas : Dahinkund, Bari Doab ; Himachal Pradesh : Dalhousie and Chamba.

Remarks.—In the collection studied there are three adult shells which are in perfect agreement with the figure given by Hanley and Theobald (1870) and the description and figure of Blanford and Godwin-Austen (1908).

The four young shells found in the collection differ from the adults in being more depressedly conoid than trochiform with tumid ventral side. All the shells are sharply carinated.

Genus **Euaustenia** Cockerell, 1898.

Type-species : *Austenia scutella* Benson.

1891. *Euausteniae* Cockerell, *Ann. Mag. nat. Hist.*, (6) **7** : (as a section of *Austenia*).
1898. *Euaustenia* Cockerell : *Nautilus*, **12** : 10 (name emended).
1908. *Euaustenia* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca* (Testacellidae and Zonitidae), London : 148.

While Cockerell (1898) proposed *Euaustenia* as a section of *Austenia* Nevill, Blanford and Godwin-Austen (1908) raised it to a generic level, but Thiele (1931) again made it a section of *Macrochlamys* Gray. We follow Blanford and Godwin-Austen in treating it as a genus.

This is represented in the collection by three species.

11. **Euaustenia monticola** (Pfeiffer, 1848)

1848. *Vitrina monticola* Pfeiffer, *Proc. zool. Soc. Lond.*, **16** : 107 (Type-locality : not specified).
1859. *Vitrina scutella* Benson, *Ann. Mag. nat. Hist.*, (3) **3** : 188 (in part).
1878. *Helicarion monticola* : Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 15.
1888. *Austenia scutella* : Godwin-Austen, *Land and Freshwater Moll. India*, London, **1** : 232.
1908. *Euaustenia monticola* : Blanford and Godwin-Austen, *Fauna Brit. India. Mollusca* (Testacellidae and Zonitidae), London : 149.

Blanford and Godwin-Austen (loc. cit.) have given a comprehensive synonymy of this species.

Material.—No. of examples studied : 45. Lot. A : Coll. *A. S. Rajagopalaiengar* (i) 2 exs., Sta. 9—In a burrow up the mountain, east of Bareen near Srinagar, 26.vi.1955 ; (ii) 2 exs., Sta. 12—Eastern bank of Lidar river, Pahalgam, 2.vii.1955 ; (iii) 1 ex., Sta. 13—Underneath stone, on the way from Pahalgam to Chandanwari, 3.vii.1955 ; (iv) 9 exs., Sta. 20—Underneath stones, on the way from Pahalgam to Chandanwari, 7.vii.1955 ; (v) 7 exs., Sta. 21—Underneath moist stones near a canal of Lidar river on road from Chandanwari to Pahalgam, 7.vii.1955 ; (vi) 1 ex., Sta. 30—A swampy area by the roadside about $\frac{1}{4}$ km. from Thajiwara near Acchabal, crawling on weeds, 15.vii.1955 ; (vii) 1 ex., Sta. 49—Underneath stones in a cool place off 3rd km. from Tangmarg to Gulmarg, 3.viii.1955 ; (viii) 1 ex., Sta. 50—Beneath shrubby bushes in the slope opposite Tourist Bureau, Gulmarg, 3.viii.1955 ; Lot. B : Coll. *K. K. Tiwari* (ix) 1 ex., Paddy fields, Banihal, 15.vii.1955 ; (x) 15 exs., Below stones, Banihal alt. *ca.* 1632 ms., 18.vii.1955 ; (xi) 2 exs., Banihal, Crawling on the stones by the side of the road, 20.vii.1955 ; Lot. C : Coll. *K. S. Pradhan* (xii) 3 exs., Sta. 43—Shit Garhi, collected from below stones on moist ground about 4 km. N. W. of P. W. D. Rest House, Sonamarg, 30.vii.1955.

Distribution.—India : Northwest Himalayas to Nainital ; Pakistan : Murree.

Remarks.—Pfeiffer (1848) while describing the species from specimens out of the Cuming's collection states their localities as : "from Bengal, Landour, Himalaya, Almorah", without specifying the type-locality of his species.

Godwin-Austen (1888) says "considerable confusion exists with regard to *monticola*, *cassida* and *scutella*, and the localities in which they were originally collected" An idea of the extent of this confusion can be had by referring to Nevill (1878 b), Godwin-Austen (1888), and Blanford and Godwin-Austen (1908). Godwin-Austen (1888), while discussing the probable distinctness of identity of the two specimens *i.e.* the one from Kashmir (Nasmana) and the other from Khasi Hills (Teria Ghat) studied by Benson, asserts" I can state there is no form at all approaching it (*Austenia scutella* Benson) at Teria Ghat in Khasi Hills, nor have I seen anything like it either from Darjiling or Assam" We also think he is right in this.

The collection consists of shells which are fragile and of various sizes. There are some with the animal intact. All the shells are depressed with very flattened spire and subpapillate apex. Colour of shell is dirty green to olivaceous green. Live animals vary in colour. Some were observed with body tinged yellowish and the mantle and mid portion orange yellow. Others were dark bluish.

Measurements (in mm.)
Largest shell

Major diameter	25
Minimum ,, ...	20
Height ,, ...	10

12. **Euaustenia cassida** (Hutton, 1838)

1838. *Vitrina cassida* Hutton, *J. Asiat. Soc. Beng.*, 7 : 214 (Type-locality : Simla).
1878. *Helicarion stoliczkanus* Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, London : 15.
1908. *Euaustenia cassida* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca*, (Testacellidae and Zonitidae), London : 150.

Material.—No. of examples studied : 13. Lot. A : Coll. *S. L. Hora* (i) 5 exs., Sta. 2—Kashmir entrance of the Banihal Tunnel, (alt. *ca* 2712 km.), 24.v. 1954 ; (ii) 1 ex., Sta. 18—Acchabal Hatchery, 31.v.1954 ; (iii) 3 exs., Sta. 34b—A stream below Acchabal Hatchery spring, 13.vi.1954 ; Lot B : Coll. *A. S. Rajagopalaiengar* (iv) 1 ex., Sta. 34—Sticking to the side wall of a spring, Acchabal Hatchery, 17.vii.1955 ; Lot C : Coll. *K. K. Tiwari* (v) 1 ex., Below stone, Chakua nullah, Batote, 30.vii.1955 ; (vi) 2 exs., Found crawling on stones at Batote, 2.viii.1955.

Distribution.—India : Western Himalayas to Kumaon.

Remarks.—The collection studied contains shells which are more tumid than the previous species. The spire is convex, shell pale yellow. As Nevill (1878b) observes this species is found in company with the preceding one.

13. **Euaustenia theobaldi** (Godwin-Austen, 1888)

1888. *Austenia theobaldi* Godwin-Austen, *Land and Freshwater Moll. India*, London, 1 (vi) : 236. (Type-locality: Bichlari, Chinab Valley).
1908. *Euaustenia theobaldi* : Blanford and Godwin-Austen, *Fauna Brit. India, Mollusca* (Testacellidae and Zonitidae), London : 152.

Material.—No. of examples studied : 5. Lot. Coll. *A. S. Rajagopalaiengar* (i) 2 exs., Sta. 45—Underneath shrubby bushes in the slope behind the Telephone Exchange, Gulmarg, 1.viii.1955 ; (ii) 3 exs. Sta. 50—In the shrubby bushes opposite Tourist Bureau, Gulmarg, 3.viii.1955.

Distribution.—India : Chenab Valley, above the Bichlari River in Kashmir ; Dharmsala in the Kangra Valley.

Remarks.—The shells are dirty green, thin, horny, globose, with convex whorls. The aperture is nearly circular. The examples are with the animal intact. In life, they were pale reddish, the upper mantle portion covering the shell and the posterior half of the body being brighter red. Anterior half of the rim of the foot and the head region are finely granulated and dark. The tentacles are four and the darkest.

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VII—SUMMARY

The paper gives a systematic account of land molluscs of Jammu and Kashmir dealing with 13 species spread over four families, of which one species is a new record for Kashmir.

A "Lectotype" from Nevill's "Type" material of *Vallonia ladacensis* is selected and figured.

The justification for the use of the generic name *Ena* Turton is given and the confusion regarding the use of other generic names clarified (*vide* Synonymy).

An attempt has been made to specify the exact identity of *Euaustenia monticola* (Pfeiffer) and to explain the confusion arising out of Benson's identification of collection from two widely different localities.

A consolidated list of land molluscs known so far from Kashmir and its vicinity is also included.

VIII—REFERENCES

BLANFORD, W. T. & GODWIN-AUSTEN, H. H. 1908. *Fauna Brit. India, Mollusca.* (Testacellidae and Zonitidae), XV + 311 pp. London (Taylor & Francis).

COCKERELL, T. D. A. 1898. Note on *Mariaella dussumieri. Nautilus*, **12** : 9-10.

GODWIN-AUSTEN, H. H. 1882. *Land and Freshwater Mollusca of India*, London, pt 2 : 19-65.

GODWIN-AUSTEN, H. H. 1888. *Land and Freshwater Mollusca of India*, London, pt. 6 : 207-257.

GODWIN-AUSTEN, H. H. 1899. Address of the President. Appendix A. List of shells from Kashmir territory, north of the Pir Panjal and Kajnag ranges, including Yarkand. Appendix B. List of shells from Kashmir territory, south of the Pir Panjal and Kajnag ranges, including the Murree Hill and Hazara. *Proc. malac. Soc. Lond.*, 3 : 259-262.

GUDE, G. K. 1914. *Fauna of British India, Mollusca, II* Trochomorphidae Janellidae), xii+520 pp.—London (Taylor & Francis).

HANLEY, S. and THEOBALD, W. 1876, *Conchologia Indica*, London, pt. 2 : 11-18.

NEVILL, G. 1878a. *Handlist of Mollusca in the Indian Museum, Calcutta. Pt. I Gastropoda, Pulmonata and Prosobranchia-Neurobranchia*, Calcutta, xv + 338 pp.

NEVILL, G. 1878b. Mollusca II—Mollusca from Kashmir and neighbourhood of Mari (Murree) in the Punjab. *Sci. Res. Second Yarkand Mission*, Mollusca, London, : 14-21.

PEIFFER, L. 1848. Descriptions of twenty three new species of *Vitrina* from the collection of H. Cuming Esq. *Proc. zool. Soc. Lond.*, **16** : 104-109.

PILSBRY, H. A. 1898. Phylogeny of the genera of Arionidae. *Proc. malac. Soc. Lond*, **3** : 94-104.

RAJAGOPAL, A. S. and SUBBA RAO, N. V. 1968. Aquatic and amphibious molluscs of the Kashmir valley, India. *Proc. Symposium on Mollusca*, Part I, Marine Biological Association of India, Mandapam Camp : 94-120.

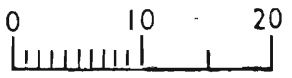
STERKI, V. 1893. Observations of *Vallonia. Proc. Acad. nat. Sci. Philad.*, : 234-279.

THEOBALD, W. 1878. Notes on the land and freshwater shells of Kashmir, more particularly of the Jhelum valley below Srinagar and the hills north of Jamu. *J. Asiat. Soc. Beng.*, **47** (2) : 141-149.

THIELE, J. 1931. *Handbuch der Syst. Weichtierkunde*, Jena, **1**, vi + 778 pp.—Jena (Verlag von Gustav Fischer).

TRYON, G. W. 1885. *Man. Conch.*, (2) **1** : 364 pp. + 60 pls.—Philadelphia (Published by the author)

WOODWARD, S. P. 1856, On the land and freshwater shells of Kashmir and Tibet, collected by Dr. T. Thomson. *Proc. zool. Soc. Lond.*, pt. 24 : 185-187.



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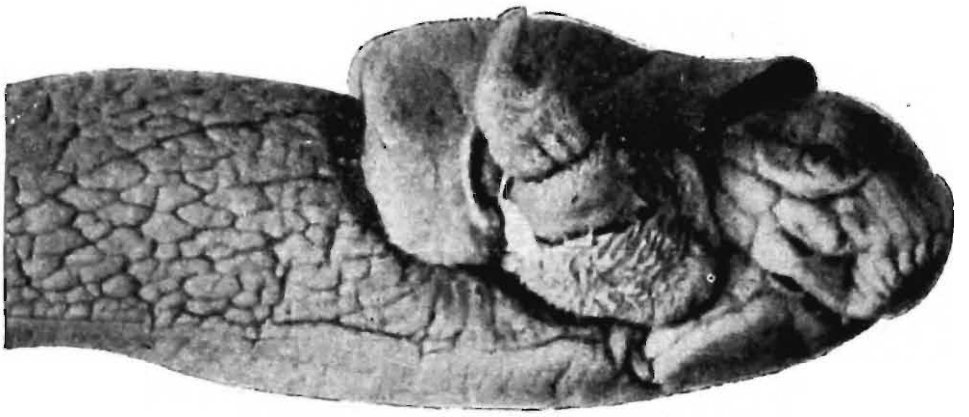

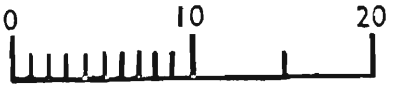

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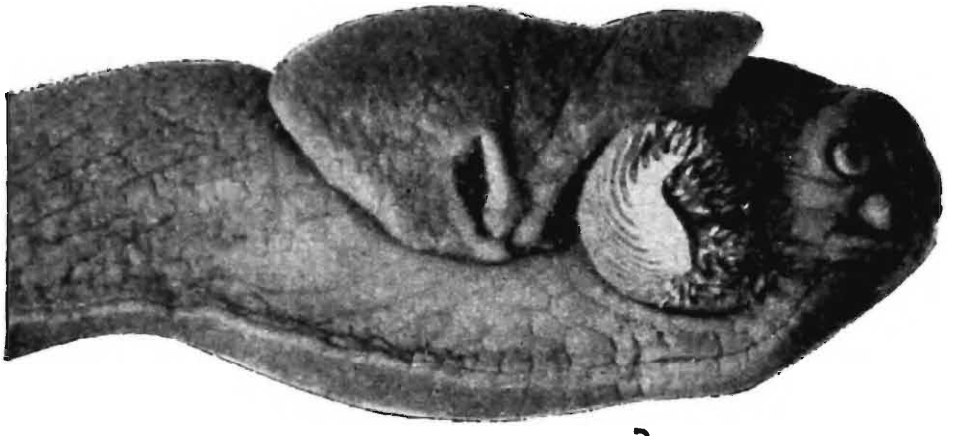

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PLATE 1. *Anadenus altivagus* (Theobald) from Khilanmarg, Kashmir.

Fig. 1. View of the slug from its right-side.
Fig. 2. The functional male slug with the "reversed portion" and the well-extended penis.

Fig. 3. The functional female slug with the genital orifice and the "reversed portion."