SCIENTIFIC RESULTS OF THE YALE NORTH INDIA EXPEDITION.

Biological Report No. 21.

AQUATIC AND AMPHIBIOUS MOLLUSCS.

By BAINI PRASHAD, *D.Sc., F.R.S.E., F.R.A.S.B., F.L.S., F.Z.S., F.N.I., M.B.O.U., Director, Zoological Survey of India, Calcutta.*

INTRODUCTION.

Mr. G. E. Hutchinson, the biologist attached to the Yale North India Expedition, entrusted to me for report the collection of freshwater molluscs, including amphibious molluscs of the family Succineidae. The collection was made mainly in the Kashmir Valley and Western Tibet and comprises representatives of the families Valvatidae, Amnicolidae, Lymnaeidae, Planorbidae, Succineidae, and Corbiculidae. As was to be expected, the fauna of this area is entirely Palaearctic; almost all the species represented are truly Palaearctic forms, but in a few cases special local races of some of the species have evolved in the area under consideration.

In all 17 species are represented in the collection and in the case of two species of the genus *Lymnaea* a number of distinct forms were found in the collection.

The main interest of the collection is a new species of the genus *Sphaerium* which I describe below as *Sphaerium kashmirensis*. Another species is represented by two young shells, but with the limited material available I have not considered it right to describe it as new.

In the case of all species, as complete references as possible to the literature dealing with molluscs of the area under consideration are given. References to monographic works in which detailed accounts of the different species are already available, are also included.

In addition to the collections made in the Kashmir Valley and Western Tibet, Mr. Hutchinson collected a few molluscs at Calcutta, some places in the Punjab and in the Nilgiri Hills. These are dealt with in the Appendix at the end of the paper.

My sincere thanks are due to Mr. G. E. Hutchinson for affording me the opportunity of studying this interesting collection. I have also to offer my apologies for the delay in the preparation of the report, but this has been inevitable owing to pressure of official work.

GASTROPODA.

Subclass *PROSOBRANCHIA.*

Family VALVATIDAE.

Thiele[1] in his monograph included *Andrusovia* Brusina[2] from the Caspian Sea with *Valvata* O. F. Müller as a second genus of the family

[1] Thiele, J. *Handb. Syst. Weichtierk.* I, p. 121 (1929).

[2] Brusina in Westerlund, C. A. *Rad. Jugoslav. Akad.* CLI, p. 133 (1903). I have not seen this work.

Valvatidae. In the same work he has suggested dividing the genus *Valvata*, as generally accepted by most workers, into a number of sections. I, however, am not adopting this division, as the differences between the various sections do not seem to be sufficiently marked for assigning the species to these sections.

Genus **Valvata** O. F. Müller.

1774. *Valvata*, Müller, *Verm. Terr. Fluv. Hist.* II, p. 198.
1926. *Valvata*, Kennard & Woodward, *Synonymy Brit. Non-Marine Moll.* p. 27.
1927. *Valvata*, Pilsbry & Bequaert, *Bull. Amer. Mus. Nat. Hist.* LIII, p. 243.

For the synonymy of the genus reference may be made to Kennard and Woodward, while the characteristics of the animal and shell are described in detail by Pilsbry and Bequaert.

In the collection before me the genus is represented by *V piscinalis* (Müller), which is widely distributed in Europe, Asia Minor, Northern Asia and Kashmir.

Valvata piscinalis (O. F. Müller).

1774. *Nerita piscinalis*, Müller, *Verm. Terr. Fluv. Hist.* II, p. 172.
1878. *Valvata piscinalis*, Nevill, *Sci. Res. Second Yarkand Mission, Mollusca*, p. 12.
1882. *Valvata piscinalis* var. *ambigua*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg* (7) XXX (No. 11), p. 48.
1910. *Valvata piscinalis*, Weber, *Zool. Jahrb. Syst.* XXIX, p. 307.
1926. *Valvata piscinalis*, Kennard & Woodward, *Synonymy British Non-Marine Moll.* p. 27.
1935. *Valvata piscinalis*, Mozley, *Trans. Roy. Soc. Edinburgh*, LVIII, p. 612, pl. ii, fig. 7.

Valvata piscinalis is represented in the collection from the following localities :—

K 5(2)	Bren Spur, Lokut Dal Lake, Kashmir; alt. *ca.* 5,200 ft. (Bren terrace exposure).	8 complete and a broken shell.
—	Same locality	3 large well preserved but weathered shells.
K 10(2)	Exposure along bank of Jhelum River below Pampur, Kashmir; alt. *ca.* 5,200 ft. Lower Shell-Bed. 25.iii.32.	2 complete shells embedded in dried mud, with a fragmentary shell of *Lymnaea* sp.
K 24 .	Nishat Bagh, Kashmir; alt. *ca.* 5,200 ft. In a pond. 7.iv.32.	4 fresh shells.
K 42(*a*) . .	Wular Lake, Kashmir: alt. *ca.* 5,180 ft. Littoral at Kiuhnus. 17.iv.32.	1 fresh shell.
K 42(*b*)	Also dredged in 1·5-2 metres of water. 18. iv. 32.	15 fresh specimens.
—	Top Shell-Bed between Man and Spangmik near Panggong Tso, W. Tibet. 1. vii. 32.	5 bleached shells.

The specimens from the pond at Nishat Bagh—St. K. 24, those collected from the littoral zone of the Wular Lake (K 42*a*) and those dredged in the same Lake from a depth of 1·5-2 metres, are of a greenish colour with the surface rather dull and rough. They agree in all respects with European specimens and shells from the Pankong Lake, Yarkand, recorded by Nevill.

The specimens from Bren Spur, Lokut Dal Lake—St. K 5(2)—are all weathered shells, mostly well preserved, which were dug out of dried earth. These specimens resemble the ones from Nishat Bagh, but are somewhat larger in size.

The five shells from the Top Shell-Bed between Man and Spangmik near Panggong Tso, W. Tibet, are all bleached and partly weathered.

Family AMNICOLIDAE.

I have followed Pilsbry and Bequaert[1] in adopting the family name Amnicolidae for Hydrobiidae and Paludestrinidae of older authors. This very large family is found almost all over the world, more particularly in the temperate and tropical zones.

In the collections before me it is represented by two subgenera of *Bulimus* Scopoli, *Bulimus* s. s. and *Alcinma* Annandale & Prashad. The genus *Bulimus* is a representative of the subfamily Buliminae, members of which are distinguished by the possession of a solid, mainly calcareous, and largely concentric operculum which is too large for retraction into the peristome, and is, therefore, lodged at its edge.

Genus **Bulimus** Scopoli.

1777. *Bulimus*, Scopoli, *Introd. Hist. Nat.* p. 392.
1927. *Bulimus*, Pilsbry & Bequaert, *Bull. Amer. Mus. Nat. Hist.* LIII.
1928. *Bulimus*, Rao, *Rec. Ind. Mus.* XXX, p. 427.
1929. *Bithynia*, Rao, *Rec. Ind. Mus.* XXXI, p. 283.

Pilsbry and Bequaert gave detailed reasons for adopting *Bulimus* Scopoli in preference to *Bithynia* Leach, and selected *Helix tentaculata* Linn. as its genus type. Kennard & Woodward[2] had a few years earlier, after reviewing the opinions of other workers, suggested that " *Bulimus* was an obvious mistranscription for *Bulinus* ; it must be treated as such, and discarded in future literature " In view of this Rao reverted to *Bithynia* in place of *Bulimus* in his second paper cited above. The matter was referred to the International Commission on Zoological literature, by Dr. H. A. Pilsbry, and in accordance with its decision, Opinion 116, *Bulimus* Scopoli with its genotype *Helix tentaculata* as selected by Pilsbry & Bequaert must replace *Bithynia* Leach 1818 with the same genotype.

Bulimus tentaculatus (Linn.).

var. **kashmiriensis** Nevill.

1885. *Bithynia tentaculata* var. *kashmiriensis*, Nevill, *Hand-List Moll. Ind. Mus.* II, p. 39.
1925. *Bithynia tentaculata* var. *kashmiriensis*, Prashad, *Rec. Geol. Surv. Ind.* LVI, p. 358, pl. XXIX, figs. 2-5.

A detailed synonymy of the typical form is published by Kennard & Woodward[3], and a good description with figures is to be found in

[1] Pilsbry, H. A. & Bequaert, J. *Bull. Amer. Mus. Nat. Hist.* LIII, p. 212 (1927).
[2] Kennard, A. S. & Woodward, B. B. *Proc. Malacol. Soc. London,* XVI, pp. 125, 126 (1927).
[3] Kennard, A. S. & Woodward, B. B. *Synonymy Brit. Non-Marine Mollusca,* pp. 14-16 (1926).

Moquin-Tandon[1]. Mozley[2] in recording the species from Northern Asia gives the geographical range of the species as " Europe ; Northern Asia, Kashmir, Punjab east of the River Indus, Annandale & Rao (1923) ; parts of North America, both living and in Pleistocene deposits, Baker (1928) " Other important references to the species are given in my part cited above.

As was stated in my paper cited above, Nevill gave the new name *kashmiriensis*, with measurements of a specimen, to a variety of *Bithynia tentaculata* which he recorded from Kashmir and Srinagar. In the above paper I also published the diagnostic characters and photographs of Nevill's variety from Kashmir.

The species is represented in the collection from the following localities :—

K 42 .	Wular Lake, Kashmir ; alt. *ca.* 5,180 ft. Littoral at Kiuhnus. 17.iv.32.	3 specimens.
K 46 .	Bakh Hajan, Kashmir ; alt. *ca.* 5,170 ft. *Jhil.* 19.iv.32.	13 specimens.

The fresh shells from both the localities are of a dull brownish green colour, with the growth lines rather feebly marked, but regular ; the suture is more deeply impressed than in the typical form, and the whorls are more tumid. The umbilical chink, though minute, is also more marked than in the typical form.

Nevill gives the measurements of his specimen as " Length 7, diam. 4½ mil." The measurements of the largest specimen from the Wular Lake are 5·4 mm. × 3·8 mm. and of one from Bakh Hajan *Jhil* 6·3 mm. × 4·2 mm.

Subclass *PULMONATA*.

Family LYMNAEIDAE.

Genus **Lymnaea** Lam.

1799. *Lymnaea*, Lamarck, *Prodr. Nouv. Clas. Coq.* p. 75.
1911. *Lymnaea*, Baker, *Chicago Acad. Sci.*, Sp. Publ. III, p. 134.
1925. *Limnaea*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 146.

The synonymy and diagnostic characters of the genus *Lymnae* are discussed at length in the works of Baker and Annandale & Rao, and it is not necessary, therefore, to deal with them here.

In the collections of the Yale North India Expedition the genus is represented by the subgenera or groups :—

Lymnaea s. s.—genotype *L. stagnalis* (Linn.) ;

Radix Montfort—genotype *L. auriclaria* (Linn.) ; and

Galba Schrank—genotype *L. truncatula* (Müll.).

---

[1] Moquin-Tandon, A. *Hist. Moll. France*, II, pp. 528, 529, pl. xxxix, figs. 23-44 (1856).

[2] Mozley, A. *Trans. Roy. Soc. Edinburgh*, LVIII, pp. 608, 609 (1935).

Subgenus **Lymnaea** s. s.

Lymnaea stagnalis (Linn.).

1758. *Helix stagnalis*, Linné, *Syst. Nat.* (Ed. X), p. 774.
1882. *Limnaea stagnalis*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 32.
1911. *Lymnaea stagnalis*, Baker, *Chicago Acad. Sci.*, Sp. Publ. III, p. 136.
1913. *Limnaea stagnalis*, Weber, *Abhandl. König. Bay. Akad. Wiss.* (*Math.-phys. kl.*) XXVI, p. 20.
1915. *Limnaea stagnalis*, Preston, *Faun. Brit. Ind. Freshw. Moll.* p. 106.
1925. *Limnaea stagnalis*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 147.
1935. *Lymnaea stagnalis*, Mozley, *Trans. Roy. Soc. Edinburgh*, LVIII, p. 615.

Mozley has recently resummarised the geographical range of the species as " the whole of Europe, except Iceland ; North Africa ; Northern Asia as well as Afghanistan and Kashmir ; and the greater part of North America to the north of 40°" Other references to the occurrence of the species in Central Asia and particularly in the Kashmir area are summarised in my notes incorporated in Annandale and Rao's paper cited above. In the collections of the Yale North India Expedition the species is represented by the forms *kashmiriensis* Prashad and *minor* Kobelt.

Form **kashmiriensis** Prashad.

1925. *Limnaea stagnalis* race *kashmiriensis*, Prashad in Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 148, figs. V, 9, 10.

The race *kashmiriensis* was described by me in the paper cited above, and its anatomy was dealt with by Annandale and Rao in the same paper.

This race was found to be widely distributed in the lakes of Kashmir, and in the collection under report it is represented from the following stations :—

K 19	Gagribal, Kashmir ; alt. *ca.* 5,190 ft. Closed swamp. 31.iii.32.	13 specimens in spirit.
K 15	Same locality . .	2 dried shells.

These specimens resemble in all respects the earlier collections from Kashmir. The measurements of the largest specimen are :—Length 40 mm. ; breadth 22 mm. ; length of aperture 24 mm. ; breadth of aperture 12·5 mm. A number of very young specimens in the collection seems to indicate that the animals must have been breeding about the time (March) they were collected.

Form **minor** Kobelt.

1925. *Limnaea stagnalis* form *minor*, Prashad in Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 150, fig. V, 8.

For synonymy and description of this race reference may be made to my notes in the publication cited above. In the Indian Museum it is represented from a pool at Srinagar, Kashmir, and from Shandur Lake, Shandur Pass between Chitral and Gilgit, at an elevation of 12,300 ft.

The Yale North India Expedition collected specimens of this race from the following station :—

K 46	Bakh Hajan, Kashmir ; alt. *ca.* 5, 170 ft. *Jhil.*	3 specimens in spirit.

Subgenus **Radix** Montfort.

1910. *Radix*, Montfort, *Conch. Syst.* II, p. 266.
1911. *Radix*, Baker, *Chicago Acad. Sci.*, Sp. Publ. III, p. 178.
1915. *Gulnaria*, Preston, *Faun. Brit. Ind. Freshw. Moll.* p. 110.
1925. *Radix*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 150.

For detailed characters of this subgenus reference may be made to Baker's work cited above. The type of the subgenus is the widely distributed Palaearctic species *L. auricularia* (Linn.).

Annandale & Rao recorded from India the following four species of the subgenus :—*L. auricularia* (Linn.), *L. lagotis* (Schrank), *L. persica* Issel and *L. brevicauda* Sowerby. In the collections made by the Yale North India Expedition there are representatives of all these species except *L.* persica.

Lymnaea auricularia (Linn.).

1758. *Helix auricularia*, Linné, *Syst. Nat.* (Ed. X), p. 774.
1877. *Limnaea auricularia* var. *ventricosa*, Kobelt in *Rossmässler Icon. Land Süssw. Moll.* V, p. 40, pl. cxxix, fig. 1244.
1878. *Limnaea auricularia* var., Nevill, *Sci. Res. Second Yarkand Mission, Mollusca*, p. 6.
1882. *Limnaea auricularia* var. *ventricosa*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 33, pl. iv, figs. 3, 4.
1910. *Limnaea* (*Gulnaria*) *auricularia* var. *ventricosa*, Weber, *Zool. Jahrb. Syst.* XXIX, p. 501.
1913. *Limnaea auricularia* var. *ventricosa*, Weber, *Abhandl. Königl. Bay. Akad. Wiss.* (*Math.-phys. kl.*), XXVI, p. 23.
1925. *Limnaea auricularia*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 158, figs. 1, 2, 4.
1935. *Lymnaea* (*Radix*) *auricularia*, Mozley, *Trans. Roy. Soc. Edinburgh*, LVIII, p. 620.

Mozley summarised the known distribution of this species as " Europe, as far south as Spain and Italy; Northern Asia ; Afghanistan; Kashmir " Annandale & Rao recorded it from the Kashmir Valley.

In the collections made by the Yale North India Expedition there are a series of specimens from the following two localities :—

K 5(2)	Bren Spur, Lokut Dal Lake, Kashmir ; alt. *ca.* 5,200 ft. Exposure Shell-Bed. 31. iii. 32.	2 broken, bleached shells.
L 58	Kyam ; Western Tibet ; alt. 15,630 ft. Hot Spring.	Many specimens in spirit.

The two broken shells from the " Exposure Shell-Bed " at Bren Spur can be assigned only doubtfully to this species, but the form of the spire, the suture and the remains of the body-whorl have led me to this identification.

The series of specimens from the hot spring at Kyam are all of a small size not exceeding 23 mm. in total length, and the shells of most specimens have a fairly thick, closely adhering encrustation of a brownish colour.

The shell is globose, thin, light brownish with the surface rather smooth and shining ; the last or body-whorl appears in some shells to be finely ribbed. Whorls about $3\frac{1}{2}$-4, convex, all well rounded, the last well expanded especially along the superior margin ; spire very small, acutely pointed ; suture deeply impressed, almost channeled ; aperture large, ovate, columella gently curved, becoming greatly twisted over the umbilical chink.

At first I had some doubt about assigning the Kyam specimens to *L. auricularia*, but after carefully comparing them with specimens from various localities in the collections of the Indian Museum I have come to the conclusion that they represent a dwarfed form of the species, probably produced as a result of the peculiar biological conditions prevailing in the hot spring.

Lymnaea lagotis (Schrank).

1803. *Buccinum lagotis*, Schrank, *Fauna Boica*, III, p. 290.
1874. *Limnaea lagotis*, von Martens in *Fedtschenko's Reise in Turkestan, Mollusca*, p. 26, pl. ii, fig. 22.
1878. *Limnaea lagotis* (in part), Nevill, *Sci. Res. Second Mission, Mollusca*, p. 7.
1882. *Limnaea lagotis*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 34.
1904. *Limnaea* (*Radix*) *lagotis*, Kobelt in *Rossmässler Icon. Land Süssw. Moll.* (N. F.) XI, p. 239.
1911. *Limnaea* (*Gulnaria*) *lagotis*, Andreae in *Futterer Durch* Asien, III, p. 75.
1913. *Limnaea lagotis*, Weber, *Abhandl. Königl. Bay. Akad. Wiss.* (*Math.-phys. kl.*), XXVI, p. 24.
1925. *Limnaea lagotis*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 151.

Annandale & Rao in their paper cited above have discussed at length the differences between the shells of *L. auricularia* and *L. lagotis* and described the five forms of the latter species which occur within Indian limits. Four of these, *viz.*, *striata* Andreae, *costulata* von Martens, *solidissima* Kobelt and *defilippii* Issel are represented in the collections of the Yale North India Expedition.

Form **striata** Andreae.

1911. *Limnaea* (*Gulnaria*) *lagotis* var. *striata*, Andreae in *Futterer Durch Asien*, III, p. 75, fig.
1913. *Limnaea lagotis* var. *striata* Weber, *Abhandl. Königl. Bay Akad. Wiss.* (*Math.-phys. kl.*), XXVI, p. 24, pl. i, figs. 10a-d, f. h.
1925. *Limnaea lagotis* form *striata*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 153, fig. I, 1.

Andreae remarked that his new var. *striata* from Sulai-ho in the Gobi Desert appears to be identical with the form recorded as *L. plicatula* Bens. var. *fasciolata* by von Martens[1] from Kuko-Nur. He, however, considered his form to be a variety of *L. lagotis*, and this was confirmed by Weber and Annandale & Rao.

In young shells of this form, as is clearly shown by Andreae's figures, there is fairly prominent spire, but in older shells (see figure in Annandale & Rao) the spire is very short as compared to the total length of the shell. The mouth is ovoid in the young stages, but becomes semicircular to auriculate in the adult. The shell bears fine vertical striae.

In the collections of the Yale North India Expedition it is represented from the following localities :—

K 21	Dal Lake, Kashmir ; alt. *ca.* 5,190 ft., in about 1·25 metres of water. 11. iv. 32.	3 specimens.
K 46	Bakh Hajan, Kashmir ; alt. *ca.* 5,170 ft. *Jhil.* 19. iv. 32.	4 specimens.
L 16	Spitok, Kashmir ; alt. *ca.* 10,730 ft. Deepest pond. 9. vi. 32.	5 shells.

[1] von Martens, E.—*Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 38, pl. iv, fig. 10.(1882).

From **costulata** von Martens.

1874. *Limnaea lagotis* var. *costulata*, von Martens, *Fedtschenko's Reise in Turkestan, Mollusca*, p. 26, pl. ii, fig. 24.
1878. *Limnaea lagotis* var. *costulata*, Nevill, *Sci. Res. Second Mission, Mollusca*, p. 8.
1882. *Limnaea lagotis* var. *costulata*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 50.
1925. *Limnaea lagotis* var. *costulata*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 153, fig. I, 7.

This form was described by von Martens as a variety of *L. lagotis* from shells collected in " Saissan-Sea," and was later recorded by Nevill from Leh. Nevill further remarked that the form figured by von Martens (fig. 22) as *L. lagotis* also belonged to this form ; in the specimens from Leh he found specimens which formed " every conceivable connecting link," though the columella " graduates from even a more rounded shape than figure 22 B to the straight (or slightly bent-back) form of figure 24 A." Weber[1] considered both the varieties *costulata* and *subdisjuncta* of von Martens to be only variations of *striata* Andreae. Annandale & Rao, with whose conclusions I agree, however, considered this form to differ from *striata* Andreae in its longer spire and having the mouth less expanded and less variable in shape. The columellar fold is, further, a little broader than in the var. *striata*.

In the collections of the Yale North India Expedition this form is represented from the following localities :—

K 15, 19	Gagribal, Kashmir ; alt. *ca.* 5,190 ft. Closed swamp. 31. iii. 32.	7 specimens.
L 14	Spitok, Kashmir ; alt. *ca.* 10,730 ft. 4. vii. 32.	1 specimen.
L 38	3 miles west of Mugleb, W. Tibet ; alt. *ca.* 13,700 ft. Drying pool with *Potamogeton*. 27. vi. 32.	15 specimens.
L 73	Chushol, W. Tibet ; alt. *ca.* 13,700 ft. 2nd pond below village. 9. viii. 32.	3 specimens.

Form **solidissima** Kobelt.

1872. *Limnaea lagotis* var. *solidissima*, Kobelt, *Malakozool, Blätt.* XIX, p. 77, pl. ii, figs. 17, 18.
1877. *Limnaea lagotis* var. *solidissima*, Kobelt in *Rossmässler Icon. Land Süssw. Moll.* V, p. 38, pl. cxviii, fig. 1242.
1878. *Limnaea lagotis* (in part), Nevill, *Sci. Res. Second Yarkand Mission, Mollusca*, p. 7.
1925. *Limnaea lagotis* var. *solidissima*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 154, figs. I, 3, 5.

Kobelt in describing the var. *solidissima* from a shell from the Himalayas remarked " Ueber das vorkommen dieser Form habe ich genaueres leider in Erfahrung bringen können ; wahrscheinlich sind die Verhaltnisse denen ähnlich, unter welchen *L. obliquata* vorkommt, und mit Sicherheit glaube ich ihre Heimath in einem See suchen zu müssen." Nevill surmised that Kobelt's type-specimen of the var. *solidissima* probably came from Lake Pankong. He apparently considered *solidissima* to be a variety of *L. lagotis*, but from this account it is not clear

[1] Weber, A.—*Abhandl. Konig, Bay. Akad. Wiss.* (*Math.-phys. kl.*), XXVI, p. 25, (1913).

as to whether he is dealing with the typical form of *L. lagotis* or the var. *solidissima*. Annandale & Rao remarked on the great variability of this thick-shelled form and added that " it probably lives in water of abnormal chemical composition." The figures of Kobelt represent a young shell, while very good figures of two adult shells showing the major variations in the form of the spire and the mouth aperture are published in Annandale & Rao's paper.

This form is represented in the collections of the Yale North India Expedition from the following localities :—

L 39	Tsar Tso, W. Tibet ; alt. 13,950 ft. 28. vi. 32.	3 specimens.
L 40	Panggong Tso, W. Tibet ; alt. 13,915 ft. " Upper Shell-Bed under Moraine," 28.vi.32.	17 shells (mostly bleached).
	Top Shell-Bed between Man-Spangmik, W. Tibet ; bottom shore about 1 mile from western bare end. 1.vii.32.	21 shells.
	Top Shell-Bed at Man, W. Tibet. 5.vii. 32.	12 shells.
L 72	Chushol, W. Tibet ; alt. 14,228 ft. Large pond. 1.viii.32.	1 specimen.
	Near L 72. 14.vii.32	2 specimens.

Form **defilippii** Issel.

1865. *Limnaea defilippi*, Issel, *Mem. Real. Accad. Sci. Torino*, (2) XXIII, p. 45, pl. iii, figs. 62, 63.
1925. *Limmaea lagotis* var. *defilippi*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 156, fig. I, 9.

Issel in describing his species from Lake Goktscha (alt. 5,500 ft.) in Armenia remarked that it appears to be intermediate between *L. stagnalis* and *L. auricularia*, while von Martens in the *Zoological Record* for 1865 (p. 279) added " almost too closely allied to *L. stagnalis* L." Nevill[1] in describing a new variety, *sirikulensis*, remarked " This is perhaps the most remarkable of the Yarkand species of *Limnaea* and the further removed from the typical forms of *L. auricularia* and *L. lagotis*, even more so than typical *L. defilippi*. As justly pointed out by Issel, it is intermediate between the above group and that of *L. stagnalis*." Annandale & Rao rightly considered Issel's species to be a form of *L. lagotis*, and after remarking on its general resemblance to the form *subdisjuncta* Nevill[2] stated that it is distinguished by its larger and more fragile shell and an additional whorl in the spire.

The specimens, which I assign to this form, have an elongate, scalariform spire distinctly marked off from the moderately tumid body-whorl ; in some specimens the spire is more elongate than others, while in others with a more channeled suture it is somewhat sunk into the body-whorl. The suture is generally moderately impressed and greatly slanting towards the posterior end of the mouth. The surface of the shells bears vertical costae almost as strong as in the form *costulata* von Martens, and in addition is decussately malleated, particularly in the region of

[1] Nevill, G.—*Sci. Res. Second Yarkand Mission, Mollusca*, p. 7 (1878).
[2] Nevill, G.—*op. cit.* p. 9 (1878).

the body-whorl. The aperture is more or less ovate with its outer margin almost regularly arched. I give below the measurements (in millimetres) of three specimens from an irrigation trench at Rampur (St. K 1) :—

Total length	19	18·6	18
Maximum breadth	14·4	14·7	14·5
Length of aperture	12·8	14	14
Breadth of aperture	10·2	10·5	11
Length of spire (dorsal)	5·8	4·5	4·8
Breadth of base of spire	6	5·8	5·5

This form is represented in the collections of the Yale North India Expedition from :—

K 1	Rampur, Kashmir ; alt. *ca.* 4,000 ft. In irrigation trench and fields. 18.iii. 32.	13 specimens in spirit.
K 34	Phashakuri near Pampur, Kashmir ; alt. *ca.* 5,200 ft. 7. v. 32.	3 dry shells.

Lymnaea brevicauda Sowerby.

1873. *Limnaea brevicauda*, Reeve, *Conch. Icon.* XVIII, pl. xv, sp. 105.
1876. *Limnaea brevicauda*, Hanley & Theobald, *Conch. Ind.* p. 64, pl. clvii, fig. 7.
1915. *Limnaea* (*Gulnaria*) *brevicauda*, Preston, *Faun. Brit. Ind. Freshw. Moll.* p. 111.
1925. *Limnaea brevicauda*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 156, fig. I, 6.

As pointed out by Annandale & Rao " this is one of the commonest molluscs in the lakes of the Kashmir Valley, to which the species is perhaps confined." The type-specimen was stated by Sowerby to be from Australia, but the error was corrected by Hanley & Theobald. The anatomy and relationships of the species are discussed in detail by Annandale & Rao.

In the collections of the Yale North India Expedition the species is represented from :—

K 3	Lokut Dal Lake, Kashmir ; alt. 5,190 ft.	5 specimens in spirit.
K 42	Wular Lake, Kashmir ; alt. 5,160 ft.	21 specimens (13 in spirit, 8 dry shells).

Subgenus **Galba** Schrank.

1803. *Galba*, Schrank, *Fauna Boica*, III, pt. 2, pp. 262, 285.
1911. *Galba* (in part), Baker, *Chicago Acad. Sci.*, Sp. Publ. III, p. 199.
1925. *Galba*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 161.
1926. *Galba*. Kennard & Woodward, *Synonymy Brit. Non-Marine Moll.* p. 42.

The synonymy of the subgenus *Galba* is dealt with at length by Kennard & Woodward. I follow Annandale & Rao in restricting this subgenus to forms which can be distinguished by the great development of the columellar fold of the shell.

In the collection under report the subgenus is represented by the type-species *L. truncatula* (Mull.).

Lymnaea truncatula (Müll.).

1774. *Buccinum truncatulum*, Müller, *Verm. Terr. Fluv. Hist.* II, p. 130.
1862. *Limnaeus truncatulus*, Küster in *Martini Chemnitz Conch. Cab.* I, Ab. 17b, *Limnaeus* etc., p. 17, pl. iii, figs. 24-27.
1878. *Limnaea truncatula* (in part) Nevill, *Sci. Res. Second Yarkand Mission*, Mollusca, p. 10.
1882. *Limnaea truncatula*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 41.
1911. *Limnaea* (*Limnophysa*) *truncatula*, Andreae in *Futterer Durch Asien*, III, p. 77.
1925. *Limnaea truncatula*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 161, fig. V, 3, 4, 5.
1926. *Limnaea* (*Galba*) *truncatula*, Kennard & Woodward, *Synonymy Brit. Non-Marine Moll.* p. 59.
1935. *Lymnaea* (*Galba*) *truncatula*, Mozley, *Trans. Roy. Soc. Edinburgh*, LVIII, p. 630.

Mozley sums up the geographical range of the species as " Europe including Iceland, Northern Africa ; Northern Asia, Afghanistan, Kashmir ; Alaska, Aleutin Islands, Yukon." Annandale & Rao recorded it from Leh in Little Tibet and from Chitral.

In the collections of the Yale North India Expedition the species is represented from the following localities :—

K 77	Dras, Kashmir ; alt. 10,144 ft. In a stream. 22. v. 32.	7 specimens.
L 3	Kangral, Kashmir ; alt. *ca.* 11,100 ft. 27 v. 32.	6 specimens.
L 14	Spitok, Kashmir ; alt. 10,730 ft. 4. vi. 32.	17 specimens.
L 18	Gulam Bagh, Chushod, Kashmir ; alt. *ca.* 10,600 ft. In a pond. 10. vi. 32.	5 specimens.
L 19	2 miles east of L 18 ; alt. *ca.* 10,600 ft. 10. vi. 32.	4 specimens.

All the above collecting stations are situated in Kashmir in the area adjoining Western Tibet.

Family PLANORBIDAE.

Genus **Planorbis** Geoffroy.

1767. *Planorbis*, Geoffroy, *Traité Coq.* p. 12.
1774. *Planorbis*, Müller, *Verm. Terr. Fluv. Hist.* II, p. 152.
1905. *Planorbis*, Dall, *Harriman Alaska Exped.* XIII, p. 80.
1921. *Planorbis*, Germain, *Rec. Ind. Mus.* XXI, p. 1.
1922. *Planorbis*, Annandale, *Rec. Ind. Mus.* XXIV, p. 360.
1924. *Planorbis*, Kennard & Woodward, *Proc. Malacol. Soc. London*, XVI, p. 9.
1925. *Planorbis*, Kennard & Woodward, *Synonymy Brit. Non-Marine Moll.* p. 66.
1931. *Planorbis*, Baker, *Proc. Zool. Soc. London*, p. 583.

As is clear from the publications cited above, there has been a great deal of difference of opinion regarding the genotype of *Planorbis* and the author to whom this genus should be assigned. Kennard & Woodward consider Geoffroy (1767) as the author of the genus with *Planorbis planorbis* (Linn.) as its genotype, while Dall, Germain and recently Baker, who has discussed the question at length, all assign the genus *Planorbis* to Müller and regard *Planorbis corneus* (Linn.) as its genotype. I follow Kennard & Woodward in the following notes.

Planorbis planorbis (Linn.).

Var. **tangitarensis** Germain.

1878. *Planorbis* (*Anisus*) *subangulatus* (?) var. (? n. species), Nevill, *Hand-List Moll. Ind. Mus.* Ik p. 243.
1878. *Planorbis* (*Tropidiscus*) *subangulatus* var., *Nevill, Sci. Res. Second Yarkand Mission, Mollusca,* p. 11.
1918. *Planorbis* (*Tropidiscus*) *planorbis* var. *tangitarensis,* Germain, *Bull. Mus. Hist. Nat. Paris,* XXIV, p. 276.
1921. *Planorbis* (*Tropidiscus*) *planorbis* var. *tangitarensis,* Germain, *Rec. Ind. Mus.* XXI, p. 77, pl. iv, figs. 3, 4, 8.

Germain's account may be consulted for a detailed description of this interesting variety. It was described from specimens collected by the Second Yarkand Expedition at North Tangitar.

The Yale North India Expedition collected 18 specimens at St. K 24—Nishat Bagh, Kashmir ; alt. *ca.* 5,200 ft.; in a pond. These specimens agree in all respects with the types of the variety from North Tangitar.

I also assign, with some doubt, 3 incomplete casts of shells collected from St. K 10(2)—Pampur, Kashmir ; alt. *ca.* 5,200 ft. Exposure along the Jhelum River opposite Island north of Pampur ; 4. iii. 32.

Genus **Gyraulus** Charpentier.

1837. *Gyraulus,* Agassiz *Ms.* in De Charpentier, *Denkschr. Schweiz. Gessel· Nat. Neuchatel,* I, p. 21.
1922. *Gyraulus,* Germain, *Rec. Ind. Mus.* XXI, p. 98.
1922. *Gyraulus,* Annandale, *Rec. Ind. Mus.* XXIV, p. 361.

Germain regards *Gyraulus* Agassiz as a subgenus of *Planorbis* Mull., but I follow Annandale in classing it as distinct genus.

Gyraulus pankongensis (Nevill) von Martens.

1878. *Planorbis* (*Gyraulus*) *albus* (in part), Nevill, *Hand-List Moll. Ind. Mus.* I, p. 245.
1878. *Planorbis* (*Gyraulus*) *albus* var. Nevill, *Sci. Res. Second Yarkand Mission, Mollusca,* p. 10.
1882. *Planorbis Pankongensis,* von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg,* (7) XXX, No. 11, p. 45, pl. iv, figs. 14*a-c.*
1890. *Planorbis* (*Gyraulus*) *pankongensis,* Westerlund, *Faun. Paläarct. Region Bimenconch,* Suppl. 1, p. 149.
1910. *Planoris* (*Gyraulus*) *pankongensis,* Weber, *Zool. Jahrb.* (*Syst.*) XXIX, p. 306.
1918. *Planorbis* (*Gyraulus*) *pankongensis,* Germain, *Bull. Mus. Hist. Nat. Paris,* XXIV, p. 280.
1922. *Planorbis* (*Gyraulus*) *pankongensis,* Germain, *Rec. Ind. Mus.* XXI, p. 110.
1925. *Gyraulus pankongensis,* Prashad, *Rec. Geol. Surv. Ind.* LVI, p. 359.

Nevill, though he recorded the specimens from the Lake Pankong as *P.* (*G.*) *albus* var., had given them the manuscript name *pankongensis,* and it was under this name that the species was described by von Martens from material sent to him by Nevill. Weber recorded some specimens collected by Zugmayer from the same Lake as *P.* (*G.*) *pankongensis,* but considered it to be only a local form of *P. glaber* Jeffr. and not of *P. albus* Müll., as the specimens did not show any spiral sculpture. Germain discussed the species at great length and was of opinion that von Martens was not justified in comparing this species with the South American *P. andecolus* d'Orbigny or the African *P. choanomphalus* von Martens. He considered it to be allied to *G. ladacensis* Nevill, but suggested that

" par sa forme générale et son enroulement, plus étroitement apparenté aux *Gyraulus* de la fauna européenne."

The Yale North India Expedition collected specimens of the species from the following localities :—

K 10	Pampur, Kashmir; alt. *ca.* 5,200 ft. Exposure along Jhelum river. 25. iii. 32.	7 complete, bleached shells.
K 34	Phashakuri, Kashmir; alt. *ca.* 5,200 ft. 7. v. 32.	9 specimens.
K 46	Bakh Hajan, Kashmir; alt. *ca.* 5,170 ft. *Jhil.* 19. iv. 32.	2 specimens.
L 14	Spitok, Kashmir; alt. *ca.* 10,600 ft. Marsh. 4. vi. 32.	6 specimens.
L 18	Chushod, Kashmir; alt. *ca.* 16,600 ft. Gulam Bagh. 10. vi. 32.	4 specimens.
L 19	2 miles east of L 18	3 specimens.
L 36	Between Durbuk and Tangtse, W. Tibet; alt. *ca.* 13,000 ft. In a pond.	8 specimens.
L 38	Between Tangtse and Mugleb, W. Tibet; alt. *ca.* 13,700 ft. 27. vi. 32.	12 specimens.
L 40	Panggong Tso, W. Tibet; alt. 13,915 ft. Upper Shell-Bed under moraine. 25. vi. 32.	51 shells, mostly bleached.

I have assigned the specimens from Stations K 10, K 34 and K 46 to this species with some doubt; they may represent a distinct species, but the material at my disposal is not sufficient for deciding this point.

Gyraulus ladacensis Nevill.

1878. *Planorbis* (*Gyraulus*) *laevis* var. *ladacensis*, Nevill, *Sci. Res. Second Yarkand Mission, Mollusca*, p. 10.
1882. *Planorbis Nevilli*, von Martens, *Mem. Acad. Imp. Sci. St. Petersbourg*, (7) XXX, No. 11, p. 35.
1890. *Planorbis* (*Gyraulus*) *Nevilli*, Westerlund, *Faun. Paläarct. Region Bimenconch*, Suppl. I, p. 149.
1918. *Planorbis* (*Gyraulus*) *ladacensis*, Germain, *Bull. Mus. Hist. Paris*, XXIV, p. 278.
1921. *Planorbis* (*Gyraulus*) *ladacensis*, Germain, *Rec. Ind. Mus.* XXI, p. 112.

I have nothing to add to the detailed account of this species by Germain.

The Yale North India Expedition collected this species from the following localities :—

	Between Man-Spangmik, W. Tibet; alt. *ca.* 14,000 ft. Top Shell-Bed. 1. vii. 32.	10 bleached shells.
L 47	Lung-Yun, W. Tibet; alt. 16,331 ft. Chagra Warm Spring. 8. vii. 32.	38 specimens.

Family SUCCINEIDAE.

Genus **Succinea** Draparnaud.

1801. *Succinea*, Draparnaud, *Tabl. Moll. Terr. Fluv. France*, p. 55.
1914. *Succinea*, Gude, *Faun. Brit. Ind. Mollusca* II (Trochomorphidae-Janellidae), p. 445.
1924. *Succinea*, Rao, *Rec. Ind. Mus.* XXVI, p. 377.

In the following notes on the specimens of the genus *Succinea* collected by the Yale North India Expedition, I have followed the excellent monograph of Rao cited above. All the specimens in the collection belong to the amphibious species, *Succinea indica* Pfeiffer.

Succinea indica Pfeiffer.

1849. *Succinea indica*, Pfeiffer, *Proc. Zool. Soc. London*, p. 133.
1914. *Succinea indica*, Gude, *Faun. Brit. Ind. Mollusca* II (Trochomorphidae-Janellidae), p. 447.
1924. *Succinea indica*, Rao, *Rec. Ind. Mus.* XXVI, p. 378, pl. xxviii, figs. 4-9.

Gude and Rao may be consulted for detailed information regarding the form of the shell and anatomy of this variable species.

The Yale North India Expedition collected shells of the species from the following localities :—

K 15, 19	Gagribal, Kashmir ; alt. *ca.* 5,190 ft. Closed swamp. 31. iii. 32.	6 specimens.
K 34	Phashakuri, Kashmir ; alt. *ca.* 5,200 ft. 7. v. 32.	3 specimens.
K 46	Bakh Hajan, Kashmir ; alt. *ca.* 5,170 ft. *Jhil.* 19. iv. 32.	1 specimen.
K 51	Bod Dal. Kashmir. 2. v. 32	5 specimens.

PELECYPODA.

Order *EULAMELLIBRANCHIATA.*

Family CORBICULIDAE.

In view of the fact that the generic name *Cyrena* Lam., as generally understood by most authors, is an absolute synonym of *Corbicula* Megerle,[1] Thiele[2] has suggested the family name Corbiculidae for Cyrenidae.

Genus **Corbicula** Megerle von Mühlfeldt.

1928. *Corbicula*, Prashad, *Mem. Ind. Mus.* IX, p. 14.

For the synonymy and distribution of the Asiatic species reference may be made to my paper cited above. In the collection before me the genus is represented by a single species—*C. cashmiriensis* Deshayes.

Corbicula cashmiriensis Deshayes.

1854. *Corbicula cashmiriensis*, Deshayes, *Proc. Zool. Soc. London*, p. 344.
1910. *Corbicula fluminalis* var. *oxiana*, *Weber*, *Zool. Jahrb. Syst.* XXIX, p. 308.
1928. *Corbicula cashmiriensis*, Prashad, *Mem. Ind. Mus.* IX, p. 20, pl. iii, figs. 14-18.

In my paper cited above I dealt with *C. cashmiriensis* in detail and pointed out the characters in which it differs from *C. fluminalis* (Müll.). The species, as pointed out in the paper cited above, is confined to Kashmir where it occurs in River Jhelum and the waters connected

---

[1] See Prashad B.—Lamellibranchia of the Siboga Expedition. Systematic Part II, Pelecypoda exclusive of the Pectinidae. *Siboga Expeditie*, LIIIc, p. 174 (1932).
[2] Thiele, J.—*Handb. Syst. Weichtierkunde*, II, p. 850 (1935).

with. Weber recorded specimens of the species from Wular Lake as *C. fluminalis* var. *oxiana*,

The Yale North India Expedition collected a single specimen of the species from St. K 1—Rampur, Kashmir ; alt. *ca.* 4,000 ft.; in an irrigation trench ; 18. iii. 32.

Genus **Pisidium** Pfeiffer.

1821. *Pisidium*, Pfeiffer, *Naturg. Deutsch. Moll.* I, pp. 17, 123.
1925. *Pisidium*, Prashad, *Rec. Ind. Mus.* XXVII, p. 407.
1933. *Pisidium*, Prashad, *Rec. Ind. Mus.* XXXV, pp. 1-8, pl. i.

The Indian and Tibetan species of the genus *Pisidium* are dealt with in detail in my papers cited above. The Yale North India Expedition collected the following species from Kashmir and Western Tibet :— *P. hydaspicola* Theobald, *P. zugmayeri* Weber, and *P. stoliczkanum* Prashad.

Pisidium hydaspicola Theobald.

1878. *Pisidium hydaspicola*, Theobald, *Journ. As. Soc. Bengal*, XLVII, p. 147.
1925. *Pisidium hydaspicola*, Prashad, *Rec. Ind. Mus.* XXVII, p. 414, pl. vii, figs. 5-7, pl. viii, fig. 5.

This species, which belongs to the subgenus *Eupisidium* Odhner, is confined to the Kashmir Valley. For detailed descriptions of the shell, animal and its distribution reference may be made to my paper cited above.

The Yale North India Expedition collected specimens of the species from the following localities :—

K 10	One mile north of Pampur, Kashmir ; alt. *ca.* 5,200 ft. Exposure along bank of Jhelum River. 25. iii. 32.	3 shells in dried mud.
K 24	Nishat Bagh, Kashmir ; alt. *ca.* 5,200 ft. Pond. 7. iv. 32.	20 specimens.

In addition there is a badly damaged shell from St. K 76—1 mile west of Dras, alt. *ca.* 10,000 ft., which probably also belongs to this species.

Pisidium stoliczkanum Prashad.

1933. *Pisidium stoliczkanum*, Prashad, *Rec. Ind. Mus.* XXXV, p. 5, pl. i, figs. 7, 8.

A detailed description of this interesting species from Yarkand was published in my paper cited above.

The Yale North India Expedition collected 5 valves from the Top Shell-Bed between Man-Spangmik, Western Tibet ; alt. *ca.* 14,000 ft. ; 1. vii. 37.

Pisidium zugmayeri Weber.

1910. *Pisidium* (*Fossarina*) *zugmayeri*, Weber, *Zool. Jahrb. Syst.* XXIX, p. 310.
1935. *Pisidium zugmayeri*, Prashad, *Rec. Ind. Mus.* XXXV, pl. i, figs. 1, 2.

This species was described from the Pankong Lake (Panggong Tso of Yale North India Expedition), Western Tibet, by Weber, while figures of the shell and hinge are published in my paper cited above.

The Yale North India Expedition collected with an Eckman Grab 2 complete shells and a right valve from St. L 78 —Yaye Tso, Western Tibet, alt. 15,373 ft.; 19.viii.32.

Genus **Sphaerium** Scopoli.

1777. *Sphaerium*, Scopoli, *Introd. Hist. Nat.* p. 397.
1921. *Sphaerium*, Prashad, *Rec. Ind. Mus.* XXII, p. 614.
1925. *Sphaerium*, Kennard & Woodward, *Synonymy Brit. Non-Marine Moll.* p. 300.
1927. *Sphaerium*, Pilsbry & Bequaert, *Bull. Amer. Mus. Nat. Hist.* LIII, p. 347.

Pilsbry & Bequaert are certainly wrong in stating that the genus *Sphaerium* is restricted mainly "to the Holarctic Region and is not known from the Oriental and Australian Regions." In the paper cited above I listed three species from India, *S. montanum* T. Canefri[1] from Burma, while *S. borneense* (Sowerby) and *S. cecilae* Prashad[2] are known from Borneo and Sumatra. The Yale North India Expedition collected a new species from the Wular Lake, Kashmir, which I describe below as *S. kashmirensis*.

Sphaerium kashmirensis, sp. nov.

Shell subquadrate, moderately swollen, sub-equilateral, moderately thick, anterior half of upper margin short, nearly straight, posterior part somewhat longer, markedly sloping; anterior margin evenly curving down to the very slightly arched lower margin; posterior margin slightly arched in the upper region, then sharply truncate. Umbones very prominent, very tumid, incurved, almost touching in the middle line. Epidermis of a light olive colour in the major part of the shell, of a yellowish colour along the margin, shining, with well marked, closely situated concentric striae, those in the regions of growth much better developed. Hinge apparently as in other species.

Type shell of *Sphaerium kashmirensis*, sp. nov. ×6.

Measurements (in millimetres).

	Holotype.	Single valve.
Length	6	5·8
Breadth	5·3	4·9
Thickness	3	..

[1] See Prashad, B.—*Rec. Ind. Mus.* XXII, p. 630, figs. 36, 37, (1921).
[2] Prashad, B.—*Rec. Ind. Mus.* XXII, p. 505, fig. 17, (1921).

Locality.—A complete shell, the holotype, and a left valve with a broken right valve were collected by the Yale North India Expedition at St. K 42—Wular Lake, Kashmir, alt. *ca.* 5,180 ft. ; Kiuhnus, dredged in 0·5-10 metres of water, on 18.iv.32.

S. kashmirensis appears to be allied to *S. montanum* T. Canefri from Burma, but is relatively shorter, with its anterior and posterior margins straighter and its sculpture more strongly developed.

Sphaerium sp.

A young complete shell and a broken valve of a species were collected on 4.vii.32 by the Yale North India Expedition from a swamp at St. L 14—Spitok, Kashmir, alt. 10,730 ft.

The shells differ from *S. kashmirensis* in their being less quadrate, and they probably represent another species. With the very limited material available, I, however, do not propose describing it as a new species.

APPENDIX.

GASTROPODA.

Family AMNICOLIDAE.

Bulimus (Alocinma) stenothyroides (Dohrn).

1857. *Bithynia stenotyroides*, Dohrn, *Proc. Zool. Soc. London*, p. 123.
1870. *Bythinia stenothyroides*, Hanley & Theobald, *Conch. Ind.* p. 18.
1884. *Bythinia stenothyroides*, Nevill, *Hand-List Moll. Ind. Mus. II*, p. 37.
1915. *Bithynia stenothyroides*, Preston, *Faun. Brit. Ind., Freshw. Moll.* p. 77.
1920. *Amnicola* (*Alocinma*) *stenothyroides*, Annandale, *Rec. Ind. Mus.* XIX, p. 43.

Dohrn's *Bithynia stenothyroides* was assigned by Annandale to the subgenus *Alocinma* Annandale & Prashad[1] of the genus *Amnicola* Gould, but as Pilsbry & Bequaert[2] have shown, *Alocinma* is not related to *Amnicola*, but belongs to the subfamily Buliminae, and should be treated as a subgenus of *Bulimus* Scopoli.

This species is, as was remarked by Nevill, extremely variable in the form of the spire and whorls. Extreme forms are easily distinguished but intermediate types are hard to separate from the allied species.

In the collections made by the Yale North India Expedition the species is represented by two typical shells collected at St. N 6—a pool near milestone 4 on Marimund—Connamara Rd., alt. *ca.* 7,500 ft., Nilgiri Hills, Peninsular India.

The species, which was described from Ceylon, has a wide range in Peninsular India, having been recorded from Madras, Trichinopoly, South Arcot, the Nilgiris, and Poona.

---

[1] Annandale, N. & Prashad, B.—*Rec. Ind. Mus.* XVIII, p. 23 (1919).
[2] Pilsbry, H. A. & Bequaert, J.—*Bull. Amer. Mus. Nat. Hist.* LIII, p. 213 (1927).

Family LYMNAEIDAE.

Genus **Lymnaea** Lam.

Subgenus **Pseudosuccinea** Baker.

1911. *Pseudosuccinea*, Baker, *Chicago Acad. Sci.*, Sp. Publ. III, p. 162.
1925. *Pseudosuccinea*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 171.

Specimens of two species of this subgenus, *viz.*, *L. acuminata* Lam. and *L. luteola* Lam. were collected by the Yale North India Expedition in the Punjab and the Nilgiri Hills.

Lymnaea acuminata Lam.

1822. *Lymnaea acuminata*, Lamarck, *Hist. Nat. Anim. saus Verteb.* VI (2), p. 160.
1858. *Lymnaea acuminata*, Lamarck, *Hist. Nat. Anim. saus Verteb.* (Ed. II), VIII, p. 411.
1922. *Lymnaea acuminata*, Annandale & Prashad, *Rec. Ind. Mus.* XXII, p. 568, pl. vii, figs. 1-3, text-fig. 12.
1925. *Limnaea acuminata*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, p. 177, fig. III.

The great variability in the form of the shell of this Indian species and its varieties is fully discussed by Annandale and Prashad and Annandale and Rao in the papers cited above.

In the collections of the Yale North India Expedition the species is represented by the forms :—*typica* Lam. and *hians* Sowerby.[1]

The exact localities for the two forms are as follows :—

Form **typica** Lam.

P 2 Sohawa, Rawalpindi Dist., Punjab. 22 specimens. 4.iii.32.

Form **hians** Sowerby.

N 5 Ootacamund, Nilgiri Hills, South India ; north margin of Lake. 3 specimens. 8.xi.32.

Lymnaea luteola Lamarck.

1822. *Lymnaea luteola*, Lamarck, *Hist. Nat. Anim. sans Verteb.* VI (2), p. 160.
1858. *Lymnaea luteola*, Lamarck, *Hist. Nat. Anim. sans Verteb.* (Ed. II), VIII, p. 411.
1925. *Limnaea luteola*, Annandale & Rao, *Rec. Ind. Mus.* XXVII, pp. 106, 183, fig. IV.

This interesting species is discussed in detail by Annandale and Rao in the papers referred to above. It is widely distributed in India, Burma and Ceylon.

In the collections of the Yale North India Expedition it is represented by the form *ovalis* Gray[2] from the following localities :—

Ootacamund, Nilgiri Hills ; alt. *ca.* 7,400 ft. Pond beyond cemetery. 23 specimens.

N 16 Avalancho, Nilgiri Hills, S. India ; alt. 6,500 ft. 14.xi.32. 9 specimens.

[1] For full details regarding these species reference may be made to the paper by Annandale & Rao cited above, pp. 180 and 182 respectively.

[2] For reference to this form see Annandale & Rao, *loc. cit.*, p. 184 (1925).

Family PLANORBIDAE.

Genus **Indoplanorbis** Annandale & Prashad

1921. *Indoplanorbis*, Annandale & Prashad, *Rec. Ind. Mus.* XXII, p. 578.
1923. *Indoplanorbis*, Rao, *Rec. Ind. Mus.* XXV, pp. 199-219, figs. 1-14.
1931. *Indoplanorbis*, Baker, *Proc. Zool. Soc. London*, p. 587.
1933. *Indoplanorbis*, Baker, *Journ. Morphol.* LV, pp. 1-9, pls. i, ii.

This genus was established by Annandale and the present author for the common large Planorbid of India, *Indoplanorbis exustus* (Deshayes), and the work of Rao and Baker on the anatomy of the species has fully upheld the separation of this species from the genus *Planorbis* Geoffroy.

Indoplanorbis exustus (Deshayes).

1834. *Planorbis exustus*, Deshayes, *Voyage Belanger Indes-Orient. Zool.*, p. 417. pl. i, figs. 11-13.
1921. *Planorbis exustus*, Prashad, *Rec. Ind. Mus.* XXII, p. 472.
1921. *Indoplanorbis exustus*, Annandale & Prashad, *id.*, p. 580.
1921. *Planorbis* (*Planorbis*) *exustus*, Germain, *Rec. Ind. Mus.* XXI, p. 26, pl. i, figs. 4-9 ; pl. iv, figs. 11, 17, 18, text-figs. 1-11, 13-16.

The great variation in the form of the shell of this highly variable species is discussed at length by Germain and Annandale and Prashad, while the anatomy has been described by Annandale and Prashad, Rao and Baker.

The Yale North India Expedition collected a single young shell of this species from St. P 2—Sohawa, Rawalpindi Dist. Punjab ; alt. 1,734 ft. ; 4.iii.32.

Genus **Gyraulus** Charpentier.

Gyraulus convexiusculus (Hutton).

1850. *Planorbis convexiusculus*, Hutton, *Journ. As. Soc. Bengal*, (2) XVIII, p. 657.
1919. *Gyraulus convexiusculus*, Annandale & Prashad, *Rec. Ind. Mus.* XVII, p. 52, fig. 7B.
1921. *Planorbis* (*Gyraulus*) *convexiusculus* and *P.* (*G.*) *saigonensis*, Germain, *Rec. Ind. Mus.* XXI, pp. 118, 119.

For detailed synonymy and description of the species reference may be made to the publications cited above. *G. convexiusculus* has a very wide range from " Lower Mesopotamia through Eastern Persia, Afghanistan and Northern India to Upper Burma, French Indo-China, China, Japan and the Malay Archipelago."

The Yale North India Expedition collected specimens of *G. convexiusculus* from the following localities :—

	Calcutta, Bengal ; from an artificial fountain in Dalhousie Square. 30.x.32.	1 specimen.
P 2	Sohawa, Punjab ; alt. 1,734 ft. 4.iii.32	9 specimens.
P 9	Khabakki Kabar, Punjab ; alt. 2,481 ft. 12.iii.32.	1 specimen.

Gyraulus sp.

A young specimen of *Gyraulus* from St. N 15—Ootacamund, Nilgiri Hills, cannot be identified specifically.

PELECYPODA.

Genus **Pisidium** Pfeiffer.

Pisidium clarkeanum G. & H. Nevill.

1871. *Pisidium clarkeanum*, G. & H. Nevill, *Journ. As. Soc. Bengal*, XL, pl. ii, p. 9 ; pl. i, figs. 4, 4*a-d*.
1925. *Pisidium clarckeanum* (*sic*), Prashad, *Rec. Ind. Mus.* XXVII, p. 408, text-figs. 1-3, pl. vii, figs. 1, 2 ; pl. viii, figs. 1, 2.

For a detailed description of this species reference may be made to my paper cited above. *P. clarkeanum* is widely distributed in India and Burma.

The Yale North India Expedition collected 2 specimens of this species from St. N 2—Ootacamund, Nilgiri Hills ; alt. 7,400 ft. ; in a pond, on 10.xi.32.