PALEOCENE FRESHWATER MOLLUSKS FROM SHERIDAN COUNTY, WYOMING.[1]

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ABSTRACT. Nine species of freshwater mollusks are recorded from a horizon just above the commonly accepted base of the Wasatch formation in Sheridan County, Wyoming. Three of these have been reported hitherto only from the Paleocene. Of the 7 gastropods, 3 are new and include a new genus in the Planorbidae.

INTRODUCTION.

THIS paper records a collection of freshwater mollusks made in August, 1944, by Vaughan W. Russom, geologist, of Hobart, Oklahoma. The locality is on the farm of Thomas C. Prettyman, in sec. 6, T. 54 N., R. 76 W., about 6 miles northeast of Arvada, Sheridan County, Wyoming. Mr. Russom describes the horizon as just below the Arvada coal bed. The only references in the literature to these fossils, so far as known to the writer, are contained in a report by R. W. Stone and C. T. Lupton, published in (1910). They remarked (p. 122): "This [Arvada] coal bed is readily recognized by the occurrence beneath it of a bed of gray sandstone carrying an abundance of large and small gastropods and a *Unio*." By general agreement, the top of the Roland coal bed, 125 to 225 feet below the Arvada bed, has come to be considered the boundary between the Paleocene Fort Union formation and the lower Eocene Wasatch formation. (See A. A. Baker, 1929.) The character of the sediments changes very little at this coal bed, however, and the boundary, at least in the immediate region, is arbitrarily chosen and merely one of convenience. The fossil horizon therefore lies in the basal part of the Wasatch formation as thus delimited, though, with the exception of the new species, the determinable forms in the collection have been previously reported mostly from the Fort Union formation in Wyoming, Montana, and North Dakota.

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The specimens are in the collections of the United States National Museum.

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COMPOSITION AND AGE OF THE FAUNA.

The seven species of gastropods, representing five genera in three families, and two species of pelecypods, in two families, that comprise the fauna are as follows:

Viviparidae: *Viviparus raynoldsanus* Meek and Hayden.
Viviparus sp. undet.
Lioplacodes limnaeiformis (Meek and Hayden).
Lioplacodes mariana Yen, n. sp.
Amnicolidae: *Hydrobia victa* Yen, n. sp.
Planorbidae: *Gyraulus militaris* (White).
Carinorbis planospiralis Yen, n. gen. and sp.
Unionidae: *Elliptio silberlingi* Russell.
Sphaeridae: *Pisidium* sp.

The dominant forms, in size and abundance, in this collection are *Viviparus* and *Lioplacodes* (a genus probably related to living *Campeloma* and *Lioplax*). With them are a few specimens of unionids, and scattered among them are numerous small planorbids and other gastropods. The present-day relatives of the species of *Viviparus* and *Lioplacodes* generally prefer a mud or fine-sand bottom in open water. The living relatives of the small planorbids prefer a habitat on vegetation or in empty shells of larger gastropods. The abundance of the larger molluscan shells with few other elements suggests that they represent an accumulation of dead shells drifted by currents and waves into the littoral area, where they became associated with the planorbids that were living there. The deposit suggests the presence of a large body of water, of which the present material represents a shore deposit.

In regard to age, as noted above, the horizon lies in the basal part of the Wasatch formation, as arbitrarily delimited. The occurrences elsewhere, however, of three of the four previously named species are in beds generally assigned to the Fort Union and its equivalents. Faunally, therefore, the horizon is still Paleocene.

SYSTEMATIC ACCOUNT.

Family VIVIPARIDAE.

VIVIPARUS RAYNOLDSANUS (Meek and Hayden).

Plate 1, Fig. 3.

Proc. Acad. Nat. Sci., Philadelphia, 13, p. 446, 1861 (*Vivipara*).

This species seems to be characterized by its large size, a fully matured individual being 46 mm. in height, 32.5 mm. in

width, its gently convex whorls rounded or obscurely angulated along the periphery of the body whorl. Exposed surface of the whorls is generally smooth; however, peristomal marginal lines and growth striae are well shown. A number of individuals bear spiral lines on the early whorls.

Many specimens are contained in the present collection, and there seems to be little doubt that it was of common occurrence over the area. As is usual in fossil occurrences of viviparids, the operculum has not been observed, a feature that may perhaps be attributed to its more perishable composition.

U. S. Nat. Mus. 103820.

VIVIPARUS sp. undet.

Plate 1, Fig. 2.

Three examples, with the last one to two whorls preserved, differ from the preceding species by their spiral sculpture and the greater convexity of the whorls. The surface bears two carinae, the upper one forming a shoulder of the whorl, the lower one marking its periphery. The exposed surface generally bears also coarse growth lines and rather fine spirals. The peristome is continuous and has a moderately thick margin. The imperfect state of preservation does not permit a satisfactory identification of the species.

U. S. Nat. Mus. 103821.

LIOPLACODES LIMNAEIFORMIS (Meek and Hayden).

Plate 1, Figs. 4a, b.

Proc. Acad. Nat. Sci., Philadelphia, vol. 8, pp. 118, 278, 1856 (*Bulimus*).

The generic position of this species has been variously estimated. It has been assigned to *Bulimus*, *Bulimulus*, *Thaumastus*, and *Hyperaulax* by many who believed it to be terrestrial. Material collected from Alberta was assigned by Russell (1929) to *Campeloma*, a genus comprising a few living forms and mainly characterized by its ovately globose outline, large size of shell with strongly convex and slightly shouldered whorls, and well-thickened columella. The present species does not seem to possess such features.

On account of its size and general outline of the shell, this species may more naturally be assigned to *Lioplacodes*, a genus

described from the Cretaceous and characterized by its narrowly perforate shell of elongately ovate outline, gently to scarcely convex whorls, and well-thickened and continuous peristomal margin.

Prashad in 1928 maintained that *Lioplacodes* shows no distinction from *Lioplax* (p. 219). However, it seems to the writer that all species of *Lioplax* found in the living fauna have a narrow and moderately deep umbilicus, a shell of ovately globose outline, strongly convex whorls, which often form deeply impressed sutures. These features are not represented in species of *Lioplacodes*.

U. S. Nat. Mus. 103822.

LIOPLACODES MARIANA Yen, n. sp.

Plate 1, Figs. 5a, b, c.

Shell narrowly perforate, oblong-ovate in outline; spire highly turreted in sharply conical form, having the last whorl proportionally dilated and descending in front. Whorl increasing rapidly in size and gently convex, its exposed surface appearing to be nearly straight above the periphery and quite convex above the suture. Sculpture consists of distinct growth lines and spiral striae. Occasional lines of former peristomal margins mark the surface of the larger whorls. Aperture pyriform, having its peristomal margin continuous and slightly thickened within; outer lip more or less retreating at upper part, produced at lower part, and slightly arched at the base. Inner lip oblique and nearly straight at the columella. Gently curved at the parietal margin and obtusely arched in the median part.

Altitude of shell	20.0	18.0	21.5+
Width of shell	10.0	9.0	12.0
Height of aperture	8.0	6.5	8.7
Width of aperture	6.0	5.5	7.0
Number of whorls	7.0	7.0	4.0+ (last 4 whorls)

The species resembles *L. nebrascensis* (Meek and Hayden) described from the Fort Union of North Dakota. However, it differs from that species by the more elongate outline of the shell, more convex whorls which coil normally below the peri-

phery, and by having its body whorl much less dilated and more descending in front.

Holotype: U. S. Nat. Mus. 103823; paratypes: U. S. Nat. Mus. 103824.

Family AMNICOLIDAE.

HYDROBIA VICTA Yen, n. sp.

Plate 1, Fig. 8.

Shell ovately oblong in outline, almost imperforate, and of small size; having a highly turreted spire, which tapers gently toward the apex. Whorls increasing rather gradually in size, coiling slightly below the periphery and separated by an incised suture; the whorls are scarcely convex, bearing fine lines of growth and occasionally marked by former peristomal margins on the larger whorls. The body whorl is gently dilated and obtusely angulated along the periphery. Aperture ovate, arched at posterior end; outer lip and parietal margin thin, columella short but moderately thickened.

Altitude of shell	9.8+
Width of shell	4.2
Height of aperture	2.9
Width of aperture	2.1
Number of whorls	7.0+

The species resembles *Hydrobia utahensis* White, described from the "Bitter Creek group at west base of Musinia Plateau." [Wasatch Plateau], Utah. (Powell, 1876). However, it differs by its larger size and more convex whorls.

Holotype: U. S. Nat. Mus. 103826.

Family PLANORBIDAE.

GYRAULUS MILITARIS (White).

Plate 1, Fig. 7.

U. S. Nat. Mus. Proc., vol. 3, p. 159, 1880 (*Planorbis*).

A number of examples agree well with this species as described from the head of Soldiers Fork, Utah. The species is characterized by its rapidly increasing whorls, which are slightly convex on the upper surface and more roundly convex below the periphery, so that they appear more or less flat on the apical or top side, and concave on the basal side. The peristome is continuous, with a short and obliquely straight columella.

U. S. Nat. Mus. 103828.

CARINORBIS Yen, n. gen.

Shell of small size, nearly flat or slightly concave above and decidedly concave in the umbilical view. Whorls few, rapidly increasing in size, all visible on both sides; strongly carinated or keeled along the periphery and pronouncedly angulated at the latero-basal margin. The carina has a sharp and produced margin, which is not embraced by the succeeding whorl. Exposed surface of the whorls generally flat or gently concave, bearing fine but distinct lines of growth. Aperture slightly oblique and angular in outline. Umbilicus wide.

Genotype: *Carinorbis planospiralis* Yen.

The genus seems to be comparable to *Platytaphius* Pilsbry (1924). However, it is different by the much smaller size of the shell, almost flat on its apical aspect, and the conspicuous carinae. *Platytaphius* was originally described from the living fauna of Lake Titicaca, Peru. Two Pliocene species from Malheur County, Oregon, were subsequently assigned to the genus by Henderson and Rodeck (1934).

It may be an ancestral form of *Angulorbis* (Yen, 1944), which was described from the Pliocene at Hammett in south Idaho. However, it differs by the flat surfaces of the whorls, simpler sculpture, and more angularly flattened outline.

CARINORBIS PLANOSPIRALIS Yen, n. sp.

Plate 1, Figs. 6a, b, c.

Shell of small size and thin substance, having a flatly depressed spire and scarcely convex base. Whorls increasing rapidly, the apical one rounded and appearing to be smooth, subsequent ones strongly carinated along periphery, coiling immediately below the carina, last one angulated also at latero-basal margin, however, it is not so sharp as the peripheral carina. The exposed surfaces are generally flat or slightly concave, bearing distinct growth lines. Suture superficial, but well-marked by the peripheral carinae. Aperture slightly oblique, subregularly pentagonal in outline, biangulated on outer lip margin, having a thin parietal wall and a short columella. Umbilicus wide and deep.

Altitude of shell	2.0	1.7
Width of shell	4.2	4.0
Height of aperture	2.0	1.5
Number of whorls	4.	3¾

This species is totally unlike those planorbid forms known from various early Tertiary formations. It seems to be better compared with some Pliocene species, such as "*Platytaphius*" *milleri* Henderson and Rodeck, described from Oregon. However, it differs by its almost flat spire and clearly angulated whorls. Its relationship with the multicarinated forms recorded in the later Tertiary formations cannot for the present be positively traced out, but it may be the ancestral stock of the more advanced types described from later formations.

Holotype: U. S. Nat. Mus. 103829; paratype: U. S. Nat. Mus. 103830.

Family UNIONIDAE.

ELLIPTIO SILBERLINGI Russell

Plate 1, Fig. 1.

Jour. Washington Acad. Sci., vol. 24, p. 128, figs. 1, 2, 1934.

A few examples in the present collection agree well with this species, which was described from upper Paleocene beds at Eagle coal mine, Bear Creek, Carbon County, Montana. This species can be separated with advantage from *E. danae* (Meek and Hayden), known from the Upper Cretaceous formations, although the shell features of the two species exhibit much resemblance.

Length	95.0
Height	42.0
Maximum convexity	20.0+

U. S. Nat. Mus. 103831.

Family SPHAERIIDAE.

PISIDIUM sp. undet.

A single specimen with closed valves has been found in the collection. It may possibly be related to, if not identical with, *Pisidium saginatum* White.

U. S. Nat. Mus. 103832.

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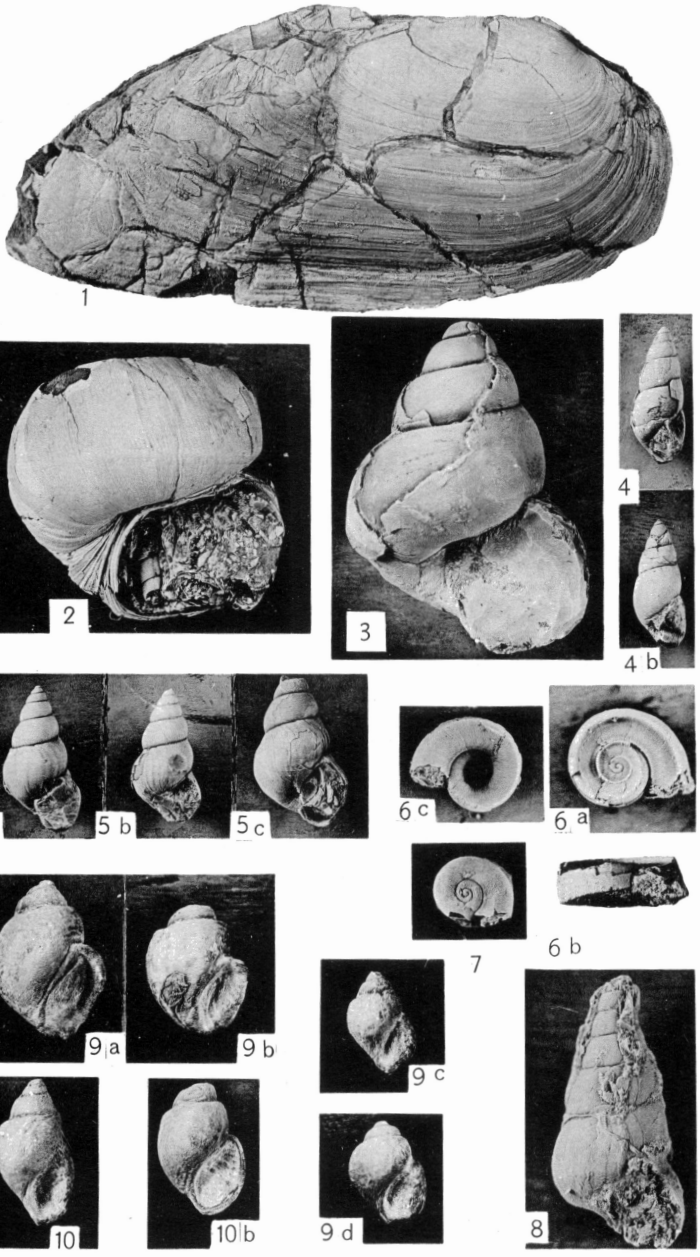
EXPLANATION OF PLATE.

Fig. 1. *Elliptio silberlingi* Russell. x 1.
Fig. 2. *Viviparus* sp. undet. x 1.
Fig. 3. *Viviparus raynoldsanus* (Meek and Hayden). x 1.
Fig. 4a, b. *Lioplacodes limnaeiformis* (Meek and Hayden). x 1.
Fig. 5a, b, c. *Lioplacodes mariana* Yen. x 1.
5a. Holotype.
5b, c. Paratypes.
Fig. 6a b, c. *Carinorbis planospiralis* Yen. x 4.
6a, b. Holotype.
6c. Paratype.
Fig. 7. *Gyraulus militaris* (White). x 4.
Fig. 8. *Hydrobia victa* Yen. x 4. Holotype.
Fig. 9a, b, c, d. *Triasamnicola pilsbryi* Yen and Reeside. x 2.
9a. Holotype.
9b, c, d. Paratypes.
Fig. 10a, b. *Triasamnicola latispira* Yen and Reeside. x 2.
10a. Holotype.
10b. Paratype.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