59.4(7)

Article XIII.—FRESH WATER MOLLUSCA FROM COLORADO AND ALBERTA[1]

By Frank Collins Baker

I.—COLORADO

During the months of July and August, 1916, Professor Frank Smith, of the Department of Zoology, University of Illinois, while engaged in biological work at the School of Mountain Biology of the University of Colorado, at Tolland, Gilpin County, collected a number of mollusks that are of more than passing interest, several of the species being new to the Colorado fauna and two new to science. Professor Smith made careful field notes concerning the different lakes visited and these are of value in connection with the ecology of these mollusks. These notes, as far as they relate to the collection herein considered, appear below, contributed by Professor Smith.

Examinations were made of about 25 small mountain lakes and ponds which are at altitudes varying from 8100 to 11,350 feet and are within a few miles of the mountain laboratory of the University of Colorado. The laboratory which was the center of activity is located at Tolland on the Denver and Salt Lake (Moffat) R.R., and from it a part of the continental divide with numerous associated high-altitude lakes and streams are easily accessible. The locations and relations of these bodies of water are well shown on the topographic maps (U. S. Geol. Survey) of the Central City and Blackhawk quadrangles.

Attention was divided among several groups of Invertebrata besides Mollusca and it is not improbable that a more extended and thoroughgoing search would result in finding at least Sphæriidæ in some of the places where they were not found in 1916. In the majority of the lakes no mollusks whatever were found. Apparently the Unionidæ are not represented at all, while Sphæriidæ were found in about 30 per cent of the lakes and ponds examined, including one of 10,850 feet altitude.

Physa and *Galba* were limited to three bodies of water of which none has an altitude of over 9600 feet. *Planorbis* of moderately large size was found in but one, and that is near the lower limit of altitude; while *Planorbis* species of small size were found in five and quite probably are present in still others although, unfortunately, specimens were retained from only three. No aquatic snails were found above an altitude of 9600 feet. The collecting operations were limited to the shallow parts of the lakes where the depth did not exceed four feet, but this included the greater part of the areas having rooted plants or coarser forms of algæ.

Pactolus Pool lies close to the railroad, about two miles east of Rollinsville and seven miles east of Tolland, and the area is approximately two acres. The collection was made in the absence of the writer by students who presumably made no effort to collect the small forms.

---

[1]Contribution from the Museum of Natural History, University of Illinois, No. 5.

Smartweed Lake, which yielded the greatest variety of mollusks, is slightly more than one mile north from Rollinsville (five miles east-northeast from Tolland), has an area of but two or three acres and an altitude of about 8575 feet. Throughout most of its area, the lake is rather shallow and has a good deal of coarse emergent vegetation and considerable quantities of coarse algæ. The general conditions resemble those of lakes of lower altitude more than do those of most of the lakes visited.

East Lake is a shallow pond of less than an acre in area, and located about a quarter of a mile east of the laboratory, with an altitude of about 8850 feet.

Park Lake is about one-fourth of a mile northeast from the laboratory, has an area of approximately ten or twelve acres, and an altitude of 8880 feet. The vegetation is rather scanty in amount. Although this lake was examined more frequently and more thoroughly than any of the others, it yielded but one species of snail, a small *Planorbis*, and a species of *Pisidium*, of neither of which any specimens happen to have been preserved. Small near-lying ponds also contained a small form of *Planorbis* and a *Pisidium*, of the latter of which specimens were preserved and are listed in this paper.

Lily Lake (near Lake Eldora) is a small pond about two miles north by east from Tolland and at an altitude of about 9375 feet. It is shallow and has a considerable amount of vegetation.

The Teller Lakes are about two miles southwest from Tolland, and are at an altitude of slightly less than 9600 feet. The largest of these lakes (Teller Lake) has an area of approximately four acres and a considerable part of it is shallow with scattered rooted plants and considerable algæ. Three specimens of a new species of *Physa* were found here on June 30, 1916, but at a second visit, July 26, none were found although a search was made for them. No other species of snails were found in these lakes and no snails whatever in any others with an altitude of over 9500 feet. Teller Lake and North Teller Lake each yielded two species of Sphæriidæ, the latter lake being much smaller (area less than an acre) with less shallow water and almost no coarse vegetation.

East Crater Lake is about four miles west by south from Tolland, at an elevation of about 10,450 feet. It is but little more than a mile from the crest of the divide and presumably has climatic conditions that are too severe for mollusks other than *Pisidium*. North Forest Lake is a little more than four miles west by north from Tolland at an elevation of about 10,850 feet, is only about a mile from the divide, and also yielded no mollusks other than *Pisidium*.

Eight other lakes and ponds of an altitude of more than 10,850 feet (James Peak Lake, Echo Lake, Corona Lake and Reservoir, two of the Arapahoe Lakes, and two of the Crater Lakes) apparently are without mollusks. In but two of the eight lakes and ponds having the lowest altitudes of the series was there an appararent dearth of molluscan life, and the search in these two was limited to a very small part of the shore and a very brief time interval.

It is but fair to state that the collection was made without realization that it might prove to contain new forms, or be otherwise of special interest, and hence it received less time and attention than it otherwise might, and it is quite probable that more extended collecting operations may increase the number of lakes found to contain mollusks and also increase the number of species found in some of them.

My thanks are due Dr. V. Sterki for the identification of the Sphæriidæ as well as for some of the notes on this family contained in the text.

TABLE OF DISTRIBUTION

	Colorado Record	Pactolus Pool 8100 ft. Alt.	Smartweed Lake 8575 ft. Alt.	East Lake 8850 ft. Alt.	Tolland Ponds 8880 ft. Alt.	Lily Lake 9375 ft. Alt.	Largest Teller Lake 9600 ft. Alt.	North Teller Lake 9550 ft. Alt.	East Crater Lake 10,450 ft. Alt.	North Forest Lake 10,850 ft. Alt.
Musculium raymondi	Second							A		
Pisidium tenuissimum	First		C							
Pisidium huachucanum	Second				14	3		4		2
Pisidium rotundatum	First					5				
Pisidium variabile	Third						4			
Pisidium (possibly new)	First						1		3	
Galba palustris	Common	4	7							
Planorbis plexata	Second		1							
Planorbis vermicularis	First					14				
Planorbis similaris	New		A	A						
Physa ampullacea	First	2								
Physa smithi	New						3			
Physa traskii	First		7							
Number of species		2	5	1	1	3	3	2	1	1
Collecting period, hours			2	3	2	1	2	1	1	½

A, abundant (more than 40 specimens); C, common (more than 20 specimens); figures indicate number of specimens found.

In the table, the relation of the species to altitude, time given to collecting, etc., are shown.

Specimens of the Colorado Mollusca have been deposited by Professor Smith in The American Museum of Natural History.

Musculium raymondi Cooper

North Teller Lake, altitude 9550 feet.

Dr. Sterki says of this species "This *Musculium* may be a form of *ryckholti* Norman, common in northern Europe and very variable." *M. ryckholti* has been recorded from Michigan and parts of Canada. Henderson (1907, p. 95) lists it from Saguache, Colorado, following Sterki (1903, p. 93), but the latter author refers the Colorado specimens to *raymondi* rather than to *ryckholti*, though calling attention to the relationship of the two species. The shells of this species are peculiar in being very round with strikingly calyculate beaks. This is apparently the second record for the State of Colorado.

Pisidium tenuissimum Sterki

Smartweed Lake, altitude 8575 feet.

Of this species Dr. Sterki remarks, "the find is of more interest than a new species would be." The Colorado specimens much resemble individuals from small lakes in Michigan. This species is widely distributed, occurring as far north as Yukon Territory (*vide* Sterki). The present specimens furnish the first record for Colorado.

Pisidium huachucanum Pilsbry and Ferriss

Small ponds near Tolland, altitude 8880 feet; North Forest Lake, altitude 10,850 feet; North Teller Lake, altitude 9550 feet; Lily Lake, altitude 9375 feet.

This is the second record of this species from Colorado, the first being by Mr. E. E. Hand (1914, p. 144) from Jefferson County at an altitude of 7500 feet. Mr. Hand found these shells in a little pond about 10 by 12 feet, and Professor Smith found them in similar small ponds near Tolland (Henderson, 1912, p. 55).

Pisidium rotundatum Prime

Lily Lake, altitude 9375 feet.

Several small specimens of this species, of an exceptionally light color, were collected from this small lake. This is the first record from Colorado.

Pisidium variabile Prime

Largest Teller Lake, altitude 9600 feet.

This is the third record of this species from the State.

Pisidium species

East Crater Lake, altitude 10,450 feet; Largest Teller Lake, altitude 9600 feet.

Several specimens of a *Pisidium* were found at these localities which cannot at present be placed in any species.

The *Pisidium* fauna of Colorado now numbers ten species, four of which occur in the neighborhood of Tolland; two species new to the State are included in this number. A careful search of the many mountain ponds and lakes which occur in Colorado would doubtless bring to light a number of species of this genus heretofore unknown in the State.

Galba palustris (Müller)

Pactolus Pool, altitude 8100 feet; Smartweed Lake, altitude 8575 feet.

This protean Lymnæid was abundant in these bodies of water. The shells are typical of the species.

Planorbis plexata Ingersoll

Smartweed Lake, altitude 8575 feet.

A single specimen from this lake seems referable to the species described by Ingersoll (1874, p. 402). The specimen at hand, as well as those described by Ingersoll, seems separable from *trivolvis*. In *plexata* the last whorl partly envelops the preceding whorls causing the last whorl to be very disproportionate in size; while in *trivolvis* the whorls are regularly and evenly coiled, normally. In *plexata* the umbilical opening is large and deep while in *trivolvis* it is small. The aperture of *plexata* is also rounder than in *trivolvis*. Viewed from the aperture the last whorl in *plexata* is seen to bend to the left while in *trivolvis* it continues in the regular discoidal plane of the whorls. The color of the shell in *plexata* is greenish-horn and the shell is quite thin.

Since the publication of Ingersoll's paper in 1874, little has been said or written about this *Planorbis*, it being generally considered a synonym of *trivolvis*, as have been all the larger species of this genus. What relation this species may bear to *Planorbis tenuis* Philippi, I can-

not say, typical specimens of that species not being at hand for comparison. P. *tenuis* was described from Mexico and it may extend its range northward. Tryon (1870, p. 200) says "all the west coast specimens included by Mr. Binney in *Planorbis trivolvis*, are referable to this species, which entirely replaces *trivolvis* west of the Rocky Mountains." The figures on Plate VI (7–9) of the Monograph are similar to *plexata*, but whether these are the same as the Mexican *tenuis* is another question. It seems scarcely possible that the Mexican species should extend its range as far north as Colorado and the west coast *trivolvis* cited by Tryon may perhaps more properly be called *plexata*. The Colorado specimen here identified as *plexata* is certainly distinct from the eastern *trivolvis* and should be designated under a separate name. The type locality is St. Mary's Lake, Colorado. I have the same shell from a pond near Lake Como, Bitter Root Mountains, Montana (collected by L. E. Daniels, 1912).

Planorbis vermicularis Gould

Lily Lake, altitude 9375 feet.

A dozen specimens of a small *Planorbis* from this lake are referred to *vermicularis*. This species is common in Oregon and northern California and is cited by Dall (1905, p. 95) from Vancouver Island, B. C. It will probably be found to be widely distributed in the states west of the Rocky Mountains.

The Lily Lake specimens are reddish-horn in color and are smaller than specimens from Oregon, the largest specimen measuring 4 mm. in greatest diameter. This is the first record from Colorado but it will probably be found in many other places. It has doubtless been catalogued by many as *parvus* which it somewhat resembles, and to which it is referred as a synonym by some conchologists. A comparison of authentic specimens of the two species, however, shows them to be quite distinct.

Planorbis similaris, new species

Figure 1

Smartweed Lake, altitude 8575 feet; East Lake, near Tolland, altitude 8850 feet (immature).

Shell thin, yellowish or brownish-horn, translucent in immature shells, opaque in adult shells; upper surface slightly concave in the middle, lower side concave; whorls 4, regularly increasing in diameter, rounded above and below; periphery rounded near the base of the shell, the body whorl sloping upward at an angle of 45 degrees in some specimens, and abruptly rounding into the base of the shell below;

umbilicus very broad, not very deep, showing all of the whorls; aperture ovate and oblique in the immature shell, round and parallel with the whorls in the adult shell; sculpture consisting only of fine growth-lines; lip simple, not thickened within.

Height, 2.5; greatest diameter, 6.2; aperture height, 2; diameter, 2 mm. Holotype.

Height, 1.7; greatest diameter, 4.7; aperture height, 1.4; diameter, 1.5 mm. Paratype.

This small *Planorbis*, which occurs so abundantly in Smartweed Lake, appears to be undescribed. Its nearest relative, curiously enough, seems to be a postglacial fossil found in Illinois, *Planorbis altissimus* (Baker, 1919, p. 94). It differs from that species in having a rounder aperture, a rounder periphery, *altissimus* having a bluntly angular periphery, and in the aperture which is regularly arched, ovate or round in *similaris* while in *altissimus* it is strongly shouldered at the suture and the aperture is quite oblique, and there is a blunt angle at the lower part of the outer lip. Adult *similaris* is much larger than *altissimus;* in specimens of the size of adult *altissimus*, *similaris* has a shell two-thirds grown, and the aperture is regularly rounded above, while in *altissimus* there is a distinct shoulder. The last whorl of *altissimus* is also narrower and the whorls are more tightly coiled than in *similaris*, the sutures, also, not being as deep. *Similaris* differs from *parvus*, which it somewhat resembles, in its larger size, rounder aperture, and the peculiar reamed-out appearance which is so characteristic of the lower surface of *parvus*.

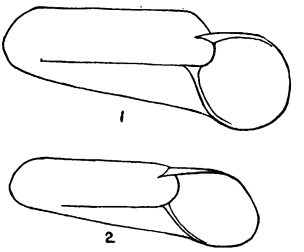

Fig. 1. *Planorbis similaris* Baker, 1, holotype, adult; 2, paratype, immature; × 6.

The shell of *similaris* is of the same size as that of *hirsutus* and of *deflectus*, but those species have a more or less distinct carina at the periphery, and the aperture and body whorl are quite differently shaped. This is evidently the *Planorbis* cited by Henderson (1912, p. 62), under *Planorbis parvus*, from Tolland, collected by Dodds. *Similaris* will probably be found in collections labeled *parvus*. The writer has seen no authentic *parvus* from Colorado or other western states, although it may be found there. Most of the small *Planorbis* with rounded periphery have been called *parvus* and a revision of all these small forms will doubtless reveal several species included under this all-embracing name, as has been the case with *Lymnæa palustris* and other fresh-water pulmonates.

Physa ampullacea Gould

Figure 2

Pactolus Pool, altitude 8100 feet.

Under this name Binney (1865, p. 79) has figured two species, neither of which exactly conform to Gould's diagnosis. Gould describes the spire as elevated and acute, the last whorl as inflated, the sutures decidedly impressed, and the aperture as broadly ovate. He says further that "It accords most nearly with Haldeman's Plate III, fig. 9, which was given him as *P. sayii*, Tappan." Comparing the diagnosis with the figures it is evident that figure 133 is not *ampullacea* and figure 134 is too compressed and the spire is too dome-shaped. Wishing to settle the status of this species and to know just what the type form might be like, I wrote to Dr. Paul Bartsch, of the United States National Museum, who very kindly compared the cotypes deposited by Gould in the Smithsonian collection with Binney's figures. Dr. Bartsch reports as follows:

Your letter of the 14th came to hand this morning, and I have made the examination of *Physa ampullacea* Gould you wish, with the following results. Figure 133 is evidently not based upon any specimen in the Museum collection. Cat. No. 9170, U. S. N. M., contains Gould's two cotypes. Figure 134 represents one of the specimens which has the right margin of the last whorl, as well as part of the outer lip near the base broken. This might justify the artist, in a measure, in drawing the narrow outline represented by him. Personally I think the figure should be more gibbose and not so flattened on the right side. Figure 135 is evidently also based upon a fragment of which practically only half of the shell remains. The outline of this corresponds beautifully with the figure, but the detail may have been pencilled in from the other individual. It is also possible that this specimen may have been broken after the figure was made.

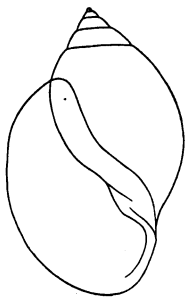

Fig. 2. *Physa ampullacea* Gould; × 1½.

I would say, looking at the two, that figure 135 probably represents more nearly the norm of the species than 134, but the two are undoubtedly the same thing, 134 being simply a faulty drawing.

Tryon, in the continuation of Haldeman's Monograph, evidently figures the same two specimens (Plate VI, figs. 5–6) and remarks that Binney's figure 133 represents *Physa traskii* Lea. Figure 6 is said to represent a distorted specimen (Haldeman's Mon., p. 129).

Two specimens collected by Professor Smith are undoubtedly *ampullacea*, answering perfectly to Gould's diagnosis. They resemble Binney's figure 135, but the spire is more acute and longer, the last whorl is more gibbous, and the sutures are very well impressed. One speci-

men has the outer lip flattened near the suture somewhat as in Binney's figure 134. The two specimens measure as follows:

Length, 23; width, 14; aperture length, 18; width, 9 mm. (specimen figured).

Length, 19; width, 11; aperture length, 14; width, 7 mm.

The columella is marked by a very strong, gyrate plait and the inner lip is folded back over the parietal wall, forming a widespread callus which completely closes the umbilical chink.

Physa ampullacea is, then, a valid, very characteristic species of the western American region, not particularly related to any other species though resembling in a way large specimens of *Physa sayii* Tappan, as suggested by Gould. The few authentic records indicate a wide distribution; these are, St. Michael, Norton Sound, Alaska (Dall, 1905, p. 103), British Columbia (Whiteaves, 1906, p. 117), Nevada (Walker, 1916, p. 5), Montana (Elrod, 1902, p. 173), Oregon (Binney, 1865, p. 79), Washington, California, Utah, and Idaho (Henderson and Daniels, 1917, pp. 51–65). It is thus seen to occur from Colorado to California and northward to Alaska. The suggestion that Lea's *Physa nuttalli*, from Lewis River, Oregon, is the same as *ampullacea* seems scarcely possible, if Lea's figure in the Observations (Plate XXIV, fig. 93) correctly represents the species. Both *ampullacea* and *nuttalli* are listed from British Columbia by Whiteaves (*op. cit.*, p. 117), the latter identified by Dall. *P. ampullacea* is probably widely distributed in Colorado where it may have been identified as the protean *gyrina*.

Physa smithi, new species

Figure 3

Largest Teller Lake, altitude 9600 feet.

Shell compressed, cylindrical, elongated, thin; color dark horn to blackish or blotched with dark: spire short, broadly conic; whorls probably (spire decollated) 5–6, narrow, the last whorl narrow and compressed, cylindrical; sutures well impressed; the slope of the whorl is at such an angle that a line drawn from the spire to near the periphery of the body whorl would touch the greater portion of the whorls; aperture long, seven-ninths the length of the whole shell, narrow above, expanded below, the slope of the upper part of the outer lip continuing the general slope of the spire without marked break; outer lip flattened in the center, margined with red; columella reflexed over the body whorl, forming a distinct, heavy, twisted or gyrate plait, and leaving a very narrow flattened umbilical chink at the base of the fold; the inner lip forms a wide spreading callus over the body whorl; sculpture consisting of heavy impressed spiral lines; in old specimens the growth-lines form heavy longitudinal streaks in a somewhat zebra fashion.

Length, 17.5; width, 11; aperture length, 13; width, 6.5 mm. Holotype (figured). Length, 14.5; width, 9; aperture length, 11.5; width, 5 mm. Paratype.

The striking features of this apparently distinct species are the cylindrical body whorl and the very sloping shoulders of the whorls, forming an almost unbroken line from apex to aperture. All of the specimens of this species have the upper spire whorls decollated, the space left being filled in with shelly matter by the animal as in the case of some Goniobases.

This *Physa* has probably been called *gyrina*, but the whole shape of the shell is different, the aperture, the heavy plait on the columella, the heavy columella callus, and the peculiar shape of the upper part of the body whorl, all differ from this common Mississippi Valley species. It is most nearly related to *ampullacea*, but differs markedly in its cylindrical shape, compressed body whorl and the shape of the aperture. Tryon's *propinqua*, which appears to be a recognizable species, is about the same size as *smithi*, but that species has a regularly arched outer lip not expanded at the lower part, and the body whorl is swollen, not compressed and cylindrical, as is *smithi*. Additional material may prove this species to be a variety of *ampullacea*, but the specimens at hand appear to mark it as a distinct species.

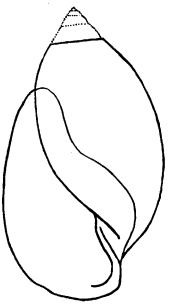

Fig. 3. *Physa smithi* Baker, holotype; × 2.

Physa traskii Lea

Smartweed Lake, altitude, 8575 feet.

A single adult specimen, 19 mm. in length, and a number of young and immature individuals were collected from this lake. The adult specimen is typical, according perfectly with Lea's description and figure (Observations, p. 119, Plate XXIV, fig. 80). The dimensions are: length, 20; width, 12 mm. *Traskii* was originally described from Rio los Angelos, California. It has a wide range, having been authentically recognized from Colorado to California. According to Pilsbry and Ferriss (1811, p. 198) *traskii* is a synonym of *Physa virgata* Gould; if this be true, the distribution will be extended to Arizona and New Mexico.

The specimens collected by Professor Smith provide the first authentic record for Colorado. It is interesting to note that the locality is on the eastern side of the continental divide. Henderson (1907, p. 183) recorded *virgata* from several parts of Colorado, but the reference to this species is said to be doubtful.

Two species of land shells were collected on the shore of Pactolus Pool. These are:

Zonitoides arborea (Say) and

Pyramidula cronkhitei anthonyi Pilsbry.

II.—ALBERTA, CANADA

Among several land and fresh-water mollusks collected in Alberta and submitted to the writer by The American Museum of Natural History for identification, there is a small lymnæid that is apparently undescribed. This portion of Canada undoubtedly has a large fauna of fresh-water pulmonates—*Lymnæa, Planorbis, Physa,* etc.—and many new forms of these genera will be found when this wide territory is more thoroughly searched for mollusks and other invertebrate life.

Galba alberta, new species

Figure 4

Shell elongate in outline; periostracum yellowish-horn in color; surface marked by heavy growth-lines crossed by distinct incised spiral lines; whorls five and a half, regularly increasing in size, a trifle shouldered below the suture; spire broadly acutely

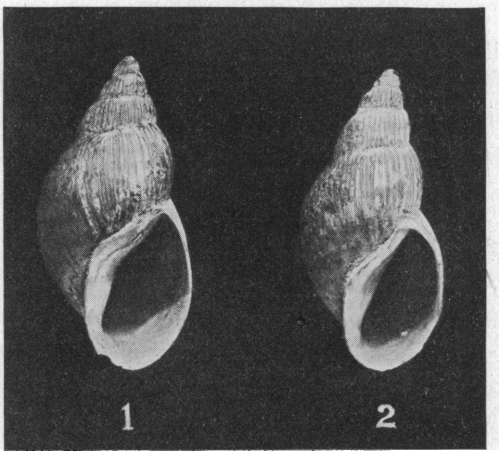

Fig. 4. *Galba alberta* Baker, 1, holotype; 2, paratype; ×3½

conic, about as long as the aperture; nuclear whorls a trifle more than one volution, rounded, smooth, wine-colored; sutures impressed; aperture ovate, rounded above and below; outer lip thin, with acute margin; inner lip broadly reflected over the parietal wall forming a spreading callus; the lower part of the reflection is erect, forming a broad, smooth, rounded pillar lip without a plait; there is a small, open umbilical chink.

Length, 12; width, 6.5; aperture length, 6.0; width, 3 mm. Holotype A. M. N. H., No. 2529*a*.

Length, 11.5; width, 5.7; aperture length 5.5; width, 2 mm. Paratype A. M. N. H., No. 2529*b*.

Radula formula: $\frac{11}{3\text{–}6}+\frac{2}{3}+\frac{10}{2}+\frac{1}{1}+\frac{10}{2}+\frac{2}{3}+\frac{11}{3\text{–}6}$ (23–1–23). The lateral teeth are bicuspid, the mesocone rather long and wide, the ectocone short and wide; the 11th and 12th teeth are transition, tricuspid, the entocone placed rather high up on the mesocone; the 13th to 23rd teeth have the cusps at the distal end, 3–6 in number, varying in size as in the marginal teeth of all lymnæids. The radula most nearly resembles that of *Galba cubensis* figured on Plate VII, F, of the author's Monograph of American Lymnæidæ.

Brazean Lake, Alberta, Canada.

This lymnæid is a typical *Galba*, having bicuspid lateral teeth and an hour-glass-shaped pillar lip without a plait. It resembles some individuals of *Galba caperata* Say, but differs in the texture of the surface, the form of the inner lip, and in the general shape. It is most nearly like *Galba cubensis aspirans* Pilsbry, and the holotype of *alberta* quite closely resembles figure 18 on Plate XXVII of the writer's Monograph. The resemblance is, however, only superficial, the surface of *alberta* being heavily spirally striate while that of *aspirans* is smooth. The new species differs from all described lymnæids and may be easily recognized by its elongate-ovate outline, strong spiral striation, and smooth, folded inner lip. Spiral striation appears to be rare among the species of typical *Galba* and for this reason the new species is of special interest.

Galba (Stagnicola) traskii (Tryon)

Several specimens of this western lymnæid were collected in the Brazean River, Alberta. They resemble figure 8 on Plate XXXIX of the Lymnæa monograph before referred to. As far as known to the writer, this is the second record from Alberta (and also from Canada), a previous citation being Banff (Baker, *op. cit.*, p. 369). *Traskii* is probably widely distributed in western Canada, and it it is to be looked for especially in the lakes and rivers of British Columbia and Alberta.

Bibliography

Baker, Frank Collins. 1919. Description of a New Species and Variety of *Planorbis*. Nautilus, XXXII, pp. 94–97.

Binney, W. G. 1865. Land and Fresh-water Shells of North America. Part II. Pulmonata, Limnophila and Thallasophila. Smithsonian Miscellaneous Collections, No. 143, pp. 1–161.

Dall, William Healy. 1905. Land and Fresh-water Mollusks of Alaska and adjoining Regions. Harriman Alaska Expedition, XII, pp. 1–171.

Elrod, Morton J. 1902. A Biological Reconnoissance of the Vicinity of Flathead Lake. Bull. Univ. Montana, Biological Series, No. 3, 177 pp.

Haldemann, S. S. 1843. A Monograph of the Fresh-water Univalve Mollusca of the United States. Pp. 1–32.

Hand, E. E. 1914. Sometimes Locality Adds Interest to a Shell. Nautilus, XXVII, p. 144.

Henderson, Junius. 1907. The Mollusca of Colorado. Part I. Univ. Colorado Studies, IV, No. 2, pp. 7–96; Part II. Idem, No. 3, pp. 167–185.

1912. The Mollusca of Colorado. Part III. *Op. cit.*, Nos. 2–3, pp. 53–63.

Henderson, Junius, and Daniels, L. E. 1917. Hunting Mollusca in Utah and Idaho in 1916. Proc. Academy Natural Sciences, Philadelphia, LXIX, pp. 48–81.

Ingersoll, Ernest. 1876. Report of the Natural History of the United States Geological and Geographical Survey of the Territories, 1874. Special Report on the Mollusca. Annual Report U. S. Geol. Geog. Surv. Terr., 1874, pp. 385 (389)–410.

Lea, Isaac. 1866. Observations on the Genus *Unio*, etc., XI, pp. 1–146, Plates I–XXIV.

Pilsbry, Henry A., and Ferriss, James H. 1911. Mollusca of the Southwestern States, V. Proc. Acad. Nat. Sci., Philadelphia, LXIII, pp. 174–189.

Sterki, Victor. 1902. Some notes on the North American Species of *Calyculina*, with New Species. Nautilus, XVI, pp. 89–93.

Tryon, Geo. W., Jr. 1870. A Monograph of the Fresh-water Univalve Mollusca of the United States. Continuation of Prof. S. S. Haldeman's work. Philadelphia, pp. 1–238.

Walker, Bryant. 1916. The Mollusca collected in Northwestern Nevada by the Walker-Newcomb Expedition of the University of Michigan. Occasionl Papers, Museum of Zoology, Univ. Mich., No. 29, pp. 1–8.

Whiteaves, J. F. 1906. Notes on some Land and Fresh-water Shells from British Columbia. Ottawa Naturalist, XX, pp. 115–119.