

# Freshwater Mollusks Collected by the United States and Mexican Boundary Surveys

BY

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TRACING THE TYPE LOCALITIES of several freshwater mollusks led to a review of collections made by the two commissions that surveyed the boundary between the United States and Mexico, in 1849 - 1855 and 1891 - 1894. The present paper summarizes the species collected, relocates the localities as precisely as possible, and corrects previously published identifications. I have emphasized study of specimens from west of the continental divide, but the summary of published information concerning all of the collections is intended to be complete.

The mollusks collected during the first boundary survey have never been treated as a group before. Indeed, malacological literature gives no indication that they are a result of that survey. DALL (1896) reported on collections by the second survey, but as his paper omitted some specimens and gives erroneous localities for others I have thought it worthwhile to review collections by both boundary expeditions.

A general account of the boundary surveys, as well as other early explorations in the west, was published by WALLACE (1955). This summary is briefer and more accessible than the official reports of the boundary commissions. It also provides historical background and comments on the numerous lighter aspects - strange as it may seem - of these surveys.

Geographic coordinates in the form "NH 14-5 C-5" designate a 15-minute quadrangle as explained more fully by TAYLOR (1966a: 28). The letters and first number (NH 14) are part of the system of reference of the "International Map of the World, 1 : 1 000 000" published under auspices of the United Nations Cartographic Office; they designate a quadrangle 4 degrees of latitude by 6 degrees of longitude. "NH 14-5" designates a subdivision, 1 degree by 2 degrees, in the system used by the U. S. Army Map Service and U. S. Geological Survey for maps at scale 1 : 250 000.

## ABBREVIATIONS

Names of Institutions housing specimens cited herein have been abbreviated as ANSP, Academy of Natural Sciences of Philadelphia, Pennsylvania; MCZ, Museum of Comparative Zoology, Cambridge, Massachusetts; and USNM, U. S. National Museum, Washington, D. C.

### First Boundary Survey (1849 to 1855)

One of the series of Commissioners of the United States and Mexican Boundary Survey was J. R. Bartlett, who published a voluminous account (BARTLETT, 1854) of his travels together with a map showing his route. Dr. T. H. Webb, Surgeon and Secretary to the survey party, collected mollusks at localities I have discussed below. The survey was completed by W. H. Emory, whose official account (EMORY, 1857) includes no mention of mollusks except in the report by PARRY (1857), and no indication that any mollusks were collected.

BARTLETT's account (1854) is precise enough to permit relocation of several molluscan type localities. These are listed in the order of collection.

1. Llano River, Texas. Type locality of *Lampsilis bracteata* (GOULD, 1855 b) and *Quadrula petrina* (GOULD, 1855 b). Collected October 18, 1850 (BARTLETT, 1854, v. 1, p. 64), probably not far from the present crossing of U. S. highway 87 southeast of Mason, Mason County, Texas (NH 14-5 C-5).

JOHNSON (1964) illustrated type material of the two species from this locality: plt. 31, fig. 4, holotype (MCZ 169 291) of *Quadrula petrina*; and plt. 31, fig. 5, lectotype (USNM 84966) of *Lampsilis bracteata*.

2. Comanche Creek, Texas. Type locality of *Anodonta imbecillis horda* GOULD (1855 b). Collected October 18,

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1850 (BARTLETT, 1854, v. 1, p. 65), 9 miles from the preceding locality, close to the present site of Mason, Mason County, Texas (NH 14-5 C-5).

JOHNSON (1964: 88) selected as lectotype the specimen (British Museum, uncatalogued) illustrated by SOWERBY (1867, plt. 18, fig. 66) as *Anodon hordeum*. Subsequently the measured holotype has been found in Gould's collection at the U. S. National Museum (USNM uncatalogued) by R. I. JOHNSON (personal communication, March 1967).

3. Pecos River, Texas. One of two original localities of *Physa humerosa* GOULD (1855 a). Bartlett's party crossed the Pecos October 29, 1850, and then traveled northward along the west side until November 5 (BARTLETT, 1854, v. 1, pp. 93 - 109). Horse-head Crossing is a plausible site of collection; it is near the bridge on U. S. highway 67-385 over the Pecos, where the river forms the boundary between Crockett and Pecos Counties, Texas (NH 13-3 A-2).

Collections made by Dr. Webb in Arizona, Baja California, and California might have been made en route to San Diego, California, in late 1851 and early 1852, or (more probably) on the return journey eastward in 1852. The report by WEBB to BARTLETT (1854, v. 2, pp. 1 - 5), and BARTLETT's (1854, v. 2, p. 550) statement about Webb's collections, indicate loss of baggage and physical hardships on the westward trip.

4. Colorado Desert or Cienega Grande, Baja California and California. Type locality of *Biomphalaria gracilentia* (GOULD, 1855 a), the type specimen collected by Webb. GOULD also cited Webb as one of the collectors of original material of *Physa humerosa*, *Planorbis ammon*, and *Tryonia protea*, but whether Webb or W. P. Blake collected the type specimen is not determinable and does not matter in this case. Bartlett and Webb crossed the Colorado Desert to Fort Yuma June 5 to 9, 1852 (BARTLETT, 1854, v. 2, pp. 129 - 152).

5. "River Gila, near San Diego" (seemingly one locality) was cited by GOULD (1862: 216) as the source of *Physa virgata*. "River Gila, and near San Diego" (evidently two localities) was the original form (GOULD, 1855 a). I have found only one San Diego near the Gila River; it was on the route traveled by Dr. Webb and is probably the type locality. The name was given by Father Garcés November 12, 1775, to a group of Indian rancherías that Coues (1900, v. 1, p. 117) identified as being most likely at Kenyon's. This was a stage station on the overland mail route, about in the NE¼ T. 5 S., R. 7 W., Maricopa County, Arizona (NI 12-7 A-4).

If San Diego is taken as a second locality, additional to the Gila River, there are two possible identities. One is the city in southern California, where Bartlett and Webb

stayed in the spring of 1852. The other was on the Rio Grande in New Mexico, upstream from El Paso. Dr. Webb crossed the river here at least three times: in the spring of 1851, en route to and from the copper mines at Santa Rita del Cobre (BARTLETT, 1854, v. 1, pp. 178 - 181), and on April 27, 1851, when the Survey party as a whole traveled westward (BARTLETT, 1854, v. 1, p. 215).

JOHNSON (1964, plt. 44, fig. 5) illustrated his lectotype (MCZ 72995) of *Physa virgata*. I have examined one series of paratypes (USNM 27966), but not the specimen (ANSP 17244a) identified by H. B. BAKER (1964) as the holotype.

6. Bartlett mentioned collecting mollusks only once, and strangely the specimens seem never to have been recorded in scientific writings, nor has anyone else collected mollusks there. The entry is for August 6, 1852, 8 miles west of Janos, Chihuahua: "In the afternoon we crossed a fine clear stream, thirty to forty feet wide and about two deep, occasionally expanding into ponds twice that depth, and encamped on the opposite bank where there was excellent grass. This stream is a branch of the river which passes Janos and Correlitos, the latter being known both as the San Miguel and as the Casas Grandes River. Like other streams in Mexico, it takes the names of the several towns it passes. In it we caught a sufficient number of trout to give us all a meal. We also collected specimens of unios, which abound here . . ." (BARTLETT, 1854, v. 2, p. 337). The locality is shown on the American Geographical Society's Map of Hispanic America, 1:1 000 000, Sonora sheet (1937) as Arroyo del Salto del Ojo (NH 12-6 D-2).

7. Ojo Caliente, Chihuahua. "*Cochliopa*" chihuahua (PHILSBRY, 1928) was described from 4 shells found on an herbarium sheet of *Myriophyllum heterophyllum* in the Academy of Natural Sciences of Philadelphia. The specimens were collected by George Thurber, October, 1852. Thurber was botanist on the first Boundary Survey (BARTLETT, 1854, v. 1, p. 47), the party camping at Ojo Caliente on October 16, 1852 (BARTLETT, 1854, v. 2, p. 410). The narrative gives the location as 12 miles south of Carrizal and a mile north of the "river Carmen" (now Río del Carmel); these distances and the map by BARTLETT (1854) are consistent with the place shown as Ojo Caliente de Santa Rosa on the American Geographical Society's Map of Hispanic America, 1:1 000 000, Chihuahua sheet (1934) (NH 13-4 B-3).

For the convenience of anyone trying to relocate the type locality on the ground, I quote Bartlett's description:

"Ojo Caliente is a spring which rises from the plain about one hundred and fifty yards from the base of a rocky hill. Its temperature is nearly the same as that of the atmosphere. A small pool about one hundred and twenty feet in circuit, and from three to four deep, is here

formed, with a sandy bottom, from which warm water bubbles up in many places; this water has an outlet through a small creek into the river Carmen, in which creek some fish were taken and preserved for specimens" (BARTLETT, 1854, v. 2, p. 410).

8. Puntigudo, Nuevo Leon. The type locality of *Uniomermus tetralasmus manubius* (GOULD, 1855 b) is "Chihuahua, 60 miles from Camp Ringgold." According to the itinerary this locality would have been about 30 miles southwest of Mier, Tamaulipas, at the village of Puntigudo where Bartlett and Webb passed December 18, 1852. BARTLETT (1854, v. 2, p. 507) noted "A small stream passes here, one of the tributaries of the Alcantra."

Neither of the names Alcantra or Puntigudo appears on modern maps. The map by ROEMER (1935; first published in 1849 and dating to 1845-1847) shows the "Ac-lantro R." flowing into the Rio Grande near Mier, evidently the Río Alamo of modern usage.

Puntigudo is identified by WISLIZENUS (1848: 78) as "a burnt village on a creek, which is one of the headwaters of the Alamo," 15 miles northeast of Cerralvo, Nuevo Leon, and 30 miles southwest of Mier, Tamaulipas. This description and WISLIZENUS' map show that the site of Puntigudo is about 3 miles northeast of the modern town General Treviño, Nuevo Leon, on the Río Agualeguas, a tributary of Río Alamo (NG 14-5 B-6).

JOHNSON (1964, plt. 32, fig. 5) illustrated the holotype (MCZ 169447) of *Uniomermus tetralasmus manubius*.

9. *Sphaerium nobile* (GOULD, 1855 b) was described from "near San Pedro, California," a locality known now to be in error. A possible locality might seem to be the San Pedro River drainage of southern Arizona, crossed by Bartlett and Webb several times. Yet a paratype of *S. nobile* (USNM 11592) seems to me to be *S. striatinum* (LAMARCK) and not *S. triangulare* (SAY), the only similar species in Arizona. Hence a "San Pedro" farther east is most likely, perhaps San Pedro Springs at San Antonio, Texas, where Bartlett and Webb camped September 27 to October 9, 1850 (BARTLETT, 1854, v. 1, pp. 38 - 48).

I found no explicit statement about the scope or final disposition of Webb's collection of mollusks. BARTLETT (1854, v. 1, p. viii) mentioned that zoological collections were divided between the Smithsonian Institution and Boston. The Tenth Annual Report of the Smithsonian Institution, for 1855 (p. 47) mentions "The fruits of the travels of Dr. Thos. Webb, in the more western portions of northern Mexico," but does not refer explicitly to shells. The *Proceedings of the Boston Society of Natural History* for December 21, 1853 (4: 395) referred to the "collection of Dr. Webb, now on deposit with the Society," from which the shells were referred to Dr. Gould. Whether these were all of Webb's collections, and whether addition-

al locality data will turn up, depends on unpublished sources, if any.

### Second Boundary Survey (1891 to 1894)

During the second Boundary Survey mollusks were collected by E. A. Mearns, who like T. H. Webb was medical officer to the party. Unlike Webb, MEARN'S (1907) wrote an exemplary account of his itinerary and collecting localities. This work is of value because of its detailed description of places that have been modified subsequently by agriculture and irrigation development. DALL's (1896) report on the mollusks mislocates some localities, or locates them less precisely than Mearns. In the following list the mollusks are discussed by Mearns' collecting stations, in east-west sequence. In all cases quotations describing the localities are from Mearns' account. The citation of USNM catalogue numbers indicates I have examined the specimens, the lack of such citation that I have not been able to find the specimens in USNM collections. Revised identifications of the species, and occurrence by locality, are listed in Table 1.

Mearns station 1 (NI 14-12 C-6, D-6). Fort Worth, Tarrant County, Texas. "Birds and shells were collected on the South Fork of Trinity River January 30 and 31, 1892, by Mearns and Holzner." DALL (1896: 368) recorded *Limnaea bulimoides* LEA (USNM 130185) and *Physa mexicana* PHILIPPI (USNM 130225). The latter set is labeled "Rio Grande, Ft. Worth, Texas," giving rise to the suspicion that this series is from El Paso (Mearns station 5).

Mearns station 2 (NH 14-7 B-2). Fort Clark, Kinney County, Texas. "The post is located at the head of Las Moras Creek, a wooded stream encircling it on three sides. . . ." Mearns made a few collections in 1892 and 1893, but most of the mollusks were collected in 1897-1898 after the report by DALL (1896) had been published. The following list of species was published by MEARN'S (1907: 77):

|                                      |                                  |
|--------------------------------------|----------------------------------|
| <i>Limnaea columella</i> (SAY)       | (USNM 151544)                    |
| <i>Limnaea humilis</i> SAY           |                                  |
| <i>Physa osculans</i> HALDEMAN       | (USNM 218412)                    |
| <i>Planorbis liebmanni</i> DUNKER    |                                  |
| <i>Planorbis tumidus</i> PFEIFFER    | (USNM 218424)                    |
| <i>Planorbis trivolvis</i> SAY       |                                  |
| <i>Planorbis bicarinatus</i> SAY     | (USNM 151533)                    |
| <i>Valvata guatemalensis</i> MORELET | (USNM 151532,<br>218425, 218426) |
| <i>Ammicola peracuta</i> WALKER      |                                  |
| <i>Ammicola</i> sp.                  |                                  |
| <i>Sphaerium elevatum</i> HALDEMAN   |                                  |

Table 1

Freshwater Mollusks Collected by E. A. Mearns during the Second United States and Mexican Boundary Survey.

|  | Mearns Localities |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
|--|-------------------|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|--|
|  | 1                 | 2 | 5 | 8 | 24 | 25 | 46 | 58 | 66 | 67 | 68 | 73 | 76 | 77 | 81 | 91 | 92 | 219 |  |
| <i>Bakerilymnaea techella</i> (HALDEMAN, 1867)             | ×                 | × |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Physa virgata</i> GOULD, 1855 a                         | ?                 | × | ? | × | ×  | ×  | ×  |    | ×  |    | ×  |    | ×  |    |    |    | ×  | ×   |  |
| <i>Elliptio popeii</i> (LEA, 1857)                         |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Lampsilis anodontoides</i> (LEA, 1830)                  |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Cyrtoneias tampicoensis berlandieri</i> (LEA, 1857)     |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Carunculina parva compressa</i> (SIMPSON, 1900)         |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Carunculina parva mearnsi</i> (SIMPSON, 1900)           |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Carunculina parva texasensis</i> (LEA, 1857)            |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Megalonaias gigantea</i> (BARNES, 1823)                 |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Quadrula couchiana</i> (LEA, 1860)                      |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Anodonta imbecillis horda</i> GOULD, 1855 b             |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Sphaerium partumeium</i> (SAY, 1822)                    |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Sphaerium striatinum</i> (LAMARCK, 1818)                |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Pisidium compressum</i> PRIME, 1852                     |                   |   |   | × |    |    | ×  | ×  |    |    |    |    |    |    |    |    |    |     |  |
| <i>Cincinnatia peracuta</i> (PILSBRY & WALKER, 1889)       |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Cochliopina niograndensis</i> (PILSBRY & FERRISS, 1906) |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| " <i>Amnicola</i> " sp.                                    |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Fossaria obrussa</i> (SAY, 1825)                        |                   |   |   |   |    |    |    |    | ×  |    |    |    |    |    |    |    |    |     |  |
| <i>Pseudosuccinea columella</i> (SAY, 1817)                |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Biomphalaria liebmanni</i> (DUNKER, 1850)               |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Helisoma anceps</i> (MENKE, 1830)                       |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Planorbella trivolvis</i> (SAY, 1816)                   |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Planorbella tenuis</i> (DUNKER, 1850)                   |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| " <i>Bythinella</i> " <i>palomasensis</i> PILSBRY, 1895    |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Anodonta dejecta</i> LEWIS, 1875                        |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Sphaerium triangulare</i> (SAY, 1829)                   |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Anodonta californiensis</i> LEA, 1852                   |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Physa humerosa</i> GOULD, 1855 a                        |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Biomphalaria gracilentia</i> (GOULD, 1855 a)            |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |
| <i>Tryonia protea</i> (GOULD, 1855 a)                      |                   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |     |  |

*Sphaerium solidulum* PRIME (USNM 151 541, 216 217, 216 218, 216 219)

*Pisidium compressum* PRIME

*Lampsilis anodontoides* LEA

*Lampsilis texasensis* LEA (USNM 151 536, 151 540)

*Lampsilis texasensis compressus* SIMPSON (USNM 151 539, 152 059)

*Lampsilis berlandieri* LEA (USNM 151 548)

*Lampsilis mearnsi* SIMPSON (USNM 151 549, 308 846)

*Anodonta imbecillis* SAY

*Unio popeii* LEA (USNM 308 943)

*Quadrula undulata* BARNES

*Quadrula couchiana* LEA (USNM 308 855)

From the earlier collections by Mearns, 1892 - 1893, DALL (1896: 368 - 371) recorded *Physa mexicana* PHIL-

IPPI from Fort Clark (USNM 130 226), *Planorbis tumidus* PFEIFFER from Las Moras Creek (USNM 130 228), *Unio couchianus* LEA without locality (USNM 130 207, 152 058), *Unio undulatus* BARNES from Kinney County, and *Unio popeii* from Kinney County (USNM 130 175, 151 538). From the description of his collecting by MEARN'S (1907) I suppose that all of these specimens came from nearby Fort Clark, in spite of the discrepant published data. C. T. SIMPSON (1900) described *Lampsilis mearnsi* from Mearns' collections around Fort Clark.

Two labels with a series of paratypes of *Lampsilis mearnsi* (USNM 151 549) provide discrepant locality data. One label says "Ft. Clark, Texas," the other "Elm Cr., 24 mi. S. Ft. Clark, Texas." The label of USNM 308 846 says "from pool, 20 mi. S. of Ft. Clark, Texas," with a note on the back quoting Mearns: "These are

topotypes, collected at the same time and place as the types."

The specimens of *Cochliopina riograndensis* (PILSBRY & FERRISS) recorded by TAYLOR (1966b: 177) from Kinney County, Texas, without more precise data probably come from Mearns' collection at Fort Clark.

Mearns station 5 (NH 13-1 D-2). El Paso, El Paso County, Texas. Collections were made by Mearns in February, March, and November, 1892, and June, 1893. MEARNS (1907: 80) noted that "Fresh-water mollusks are numerous in the Rio Grande." DALL (1896: 368-369) recorded *Limnaea bulimoides* LEA (USNM 130 186, 130 235) and *Planorbis tumidus* PFEIFFER (USNM 130 239) from the Rio Grande "near El Paso." BAKER (1945, plt. 98, fig. 25; plt. 99, figs. 9, 10) illustrated some of the "*Planorbis tumidus*" as *Helisoma tenue sinuosum* (BONNET). I suspect the record by BAKER (1911: 216) of *Galba bulimoides techella* from the Rio Grande, near El Paso, is based on Mearns' specimens.

Mearns station 8 (NH 13-1 D-7). "Palomas Lakes, Mimbres Valley, Chihuahua, Mexico. One mile south of Monument No. 21." Collections were made from April 7 to 15, 1892. DALL (1896: 368-370) recorded *Physa mexicana* PHILIPPI (USNM 130 183), *Bythinella palomasensis* PILSBRY (USNM 130 016) and *Pisidium compressum* PRIME (specimens not found). PILSBRY (1895) described *B. palomasensis* from these specimens, the label of which gives the locality as "Mimbres valley near boundary monument 19." Monument 21 is in the W $\frac{1}{2}$  sec. 18, T. 29 S., R. 7 W., and monument 19 in the E $\frac{1}{2}$  of sec. 14 of the same township, 4.6 miles to the east. The types of *B. palomasensis* were not alive when collected, for the shells are white and bleached. They are perhaps fossil, or at least stream-drifted.

Mearns station 24 (NH 12-3 B-5). Hall's Ranch, Guadalupe Canyon, Sonora. "Camp was made at Monument No. 73, in the canyon." The locality is 2100 feet west, 900 feet south of the northeast corner sec. 21, T. 24 S., R. 32 E., Cochise County, Arizona. Mearns camped here in July and August, 1892; and August and October, 1893. DALL (1896: 368) recorded *Physa mexicana* PHILIPPI (USNM 130 182) from Guadalupe Canyon, New Mexico.

Mearns station 25 (NH 12-3 B-6). San Bernardino Ranch, Cochise County, Arizona. "Camp was made at Monument No. 77, in a mesquite flat between the San Bernardino Springs and the neighboring San Bernardino River." Mearns' collections seemingly came from the Rio San Bernardino on both sides of the boundary. The river crosses the boundary line in the San Bernardino grant, in what would be the NW $\frac{1}{4}$  sec. 23, T. 24 S., R. 30 E., Cochise County, Arizona. Mearns camped here in July and September, 1892; and in August and October, 1893.

DALL (1896) recorded several species from "San Bernardino River," variously quoted by him in Arizona, New Mexico, and northern Mexico: *Physa mexicana* PHILIPPI (USNM 130 219), *Planorbis tumidus* PFEIFFER (USNM 130 230, 130 233), *Sphaerium solidulum* PRIME (USNM 130 236), *Pisidium compressum* PRIME (USNM 130 241), and *Anodonta dejecta* LEWIS (USNM 130 208).

Victor Sterki applied the manuscript name *Sphaerium eminens* to this collection of *Sphaerium*. No formal description has been published but BROOKS & HERRINGTON (1944: 95) cited *S. eminens* in the synonymy of *S. striatinum* LAMARCK. In my opinion these specimens are *S. triangulare* (SAY). SIMPSON (1893) described *Anodonta mearnsiana* (a synonym of *A. dejecta*) from this collection.

The *Physa* (USNM 130 219) is identified as *Physa virgata* in a comprehensive sense, but the series is not typical and might come from an unusual habitat, or represent another species. Some of the smaller specimens are usual *P. virgata* in shape, but most are short-spined with an expanded body whorl.

Mearns station 46 (NI 12-11 A-4). Tucson, Pima County, Arizona. Mearns collected both living and stream-drifted specimens in the Santa Cruz River near Tucson, in October, November, and December, 1893. From the river drift "near Tucson" DALL (1896: 368-369) recorded *Limnaea desidiosa* SAY and *Aplexa hypnorum* LINNAEUS, and from the Santa Cruz River near Tucson, DALL (1896: 368-369, 373) listed *Physa mexicana* PHILIPPI (USNM 130 220), *Planorbis tumidus* PFEIFFER (USNM 130 237), and *Anodonta dejecta* LEWIS (USNM 130 172, "Tucson;" USNM 130 180, "Santa Cruz River, near Tucson"). STEARNS (1901: 289) suggested the "*Aplexa hypnorum*" might prove to be one of the Mexican species now classified in *Physa* (*Stenophysa*), but I consider the single specimen (USNM 130 188) is only an elongate *Physa virgata*. Some of the "*Planorbis tumidus*" (USNM 130 237) were illustrated by BAKER (1945, plt. 98, figs. 9-13; plt. 99, figs. 4-8) as *Helisoma tenue sinuosum* (BONNET). The record of *Limnaea desidiosa* was assigned by BAKER (1911: 272) to *Galba obrussa* (SAY). A lot of *Pisidium compressum* PRIME (USNM 130 243) was not mentioned by DALL (1896).

Mearns station 58 (NH 12-1 D 5). "Rancho de Agua Dulce, Sonoyta River, Sonora, Mexico. This place is about 6.4 kilometers (4 miles) southwest of Monument No. 173." Mearns collected here in January and February, 1894. DALL (1896: 369) recorded *Planorbis tumidus* PFEIFFER from "Sonoyta River, northern Mexico." The specimens are USNM 130 229, one of which was illustrated by BAKER (1945, plt. 98, fig. 14) as *Helisoma tenue sinuosum* (BONNET), from "Sonoyta" Creek, Sonora.

Mearns station 66 (NI 11-12 D-2). Gila River at Gila City (now Dome), Yuma County, Arizona. "Along the Gila River are numerous sloughs, bordered with cat-tail, tule, cane, sedge, and rush." A series of *Physa virgata* GOULD (USNM 187481) collected by Mearns during March 1 to 5, 1894, was not mentioned by DALL (1896).

Mearns station 67 (NI 11-12 C-3 A). Yuma, Yuma County, Arizona. "This station is on the left (east) bank of the Colorado River, at the mouth of the Gila," where Mearns collected in March and April, 1894. DALL (1896: 369) recorded *Planorbis tumidus* PFEIFFER (USNM 130232, 130234).

Mearns station 68 (NI 11-12 B-4). Monument No. 204. "This camp was beside a laguna of the Colorado River, at the east edge of the bottom land," sec. 12, T. 11 S., R. 25 W, Yuma County, Arizona. Mearns collected here during March, 1894. DALL (1896: 373) recorded *Anodonta dejecta* LEWIS from "Colorado River, near the Mexican boundary." The specimens (USNM 130171) are labeled monument 204. A series of *Physa virgata* GOULD (USNM 130224) from this collection was overlooked by DALL (1896).

Mearns station 73 (NH 11-3 D-4). "Left (east) bank of the Colorado River, opposite the mouth of Hardy River, Sonora, Mexico." Mearns collected mollusks here during March, 1894. DALL (1896: 373) recorded *Anodonta dejecta* LEWIS from "mouth of Colorado River" (USNM 128801).

Mearns station 76 (NI 11-12 C-5). Seven Wells, Baja California. "This station is 8 kilometers (5 miles) south of Monument No. 213." Mearns collected mollusks here during April, 1894. Seven Wells was a former watering place on the wagon road between Yuma, Arizona, and San Diego, California. It is shown on the U. S. Geological Survey "Reconnaissance map of the Salton Sink, California" (1908), scale 1 : 500 000. DALL (1896: 368-369) recorded *Planorbis tumidus* PFEIFFER (USNM 130238) and *Physa mexicana* PHILIPPI (USNM 130217, subfossil?) from Seven Wells, Arizona.

Mearns station 77 (NI 11-12 C-5). Gardners Laguna, Baja California. "Station about 10 kilometers (6 miles) south of Monument No. 216." Mearns collected here during April, 1894. This was evidently one of a series of ponds and sloughs along the course of the Alamo River at that time. DALL (1896: 369) recorded *Planorbis tumidus* PFEIFFER (USNM 128952).

Mearns station 81 (NI 11-12 C-7 or D-7). Laguna Station, Imperial County, California. "Station about 11 kilometers (7 miles) north of Monument No. 224," where Mearns camped May 3 to 6, 1894. This locality was a

station on New River, about sec. 25, T. 16 S., R. 12 E. DALL (1896: 369, 373) recorded *Planorbis tumidus* PFEIFFER (specimens not found), *Anodonta dejecta* LEWIS (USNM 128812) and *A. californiensis* LEA (USNM 128817).

Mearns station 91 (NI 11-11 C-2). "Thomas Cameron's Ranch, San Diego County, California, 13 kilometers (8 miles) nearly north of Monument No. 240." Mearns collected here June 21 to 23, 1894. Cameron Valley is traversed by La Posta Creek in secs. 9, 10, and 16, T. 17 S., R. 5 E., evidently the source of the specimens (USNM 130218) that DALL (1896: 368) recorded as *Physa mexicana* PHILIPPI.

Mearns station 92 (NI 11-11 D-2). "Campbell's Ranch, at Laguna Mountains (Coast Range), San Diego County, California, 31 kilometers (19 miles) north of Monument No. 240." Mearns collected here June 9 to 21, 1894. DALL (1896: 368-369) recorded as from "Laguna, 20 miles north of Campo" *Physa mexicana* PHILIPPI (USNM 130223) and *Planorbis liebmanni* DUNKER (specimens not found). The locality is evidently either Big Laguna Lake or Little Laguna Lake, both in sec. 10, T. 15 S., R. 5 E.

Monument 219 (NI 11-12 C-6B). This monument on the international boundary is in sec. 15, T. 17 S., R. 15 E., Imperial County, California, about 3½ miles east of Calixico. Mearns assigned no station number. The specimens are all fossils from the surface of the desert, and were recorded by DALL (1896: 369, 373, 376) as *Planorbis tumidus* PFEIFFER (specimens not found), *Anodonta californiensis* LEA (USNM 128802), *Physa humerosa* GOULD (specimens not surely found), and *Amnicola protea* GOULD. The series of *Physa* from this locality might be USNM 130184, a set of subfossil *P. humerosa* labeled as collected by Dr. Mearns but without locality data.

A series of subfossil specimens of *Physa humerosa* GOULD (USNM 130450) is labeled as coming from "Salt Creek, W. side of Colorado Desert," collected by Mearns. This collection is not from any of MEARNS' (1907) numbered stations.

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## LITERATURE CITED

- BAKER, FRANK COLLINS**  
 1911. The Lymnaeidae of North and Middle America, Recent and fossil. Spec. Publ. Chicago Acad. Sci. 3: i-xvi+1-539; pls. 1-58  
 1945. The molluscan family Planorbidae; collation, revision, and additions by Harley Jones Van Cleave. Urbana (Univ. Illinois) i-xxxvi+1-530; pls. 1-141
- BAKER, HORACE BURRINGTON**  
 1964. Type land snails in the Academy of Natural Sciences of Philadelphia. Part III. Limnophile and thalassophile Pulmonata. Part IV. Land and fresh-water Prosobranchia. Proc. Acad. Nat. Sci. Philadelphia 116: 149-193 (20 Oct. 1964)
- BARTLETT, JOHN RUSSELL**  
 1854. Personal narrative of explorations and incidents in Texas, New Mexico, California, Sonora, and Chihuahua, connected with the United States and Mexican Boundary Commission, during the years 1850, '51, '52, and '53. New York (D. Appleton & Co.); 2 vols., map and illus.
- BROOKS, STANLEY TRUMAN & HARRY BIGGAR HERRINGTON**  
 1944. The Sphaeriidae, a preliminary survey. The Nautilus 57: 93-97
- COUES, ELLIOTT**  
 1900. On the trail of a Spanish pioneer; the diary and itinerary of Francisco Garcés (Missionary Priest) in his travels through Sonora, Arizona, and California, 1775-1776 . . . New York (Francis P. Harper), 2 vols.
- DALL, WILLIAM HEALEY**  
 1896. Report on the mollusks collected by the International Boundary Commission of the United States and Mexico, 1892-1894. Proc. U. S. Nat. Mus. 19: 333-379; pls. 31-33
- EMORY, WILLIAM HEMSLEY**  
 1857. Report on the United States and Mexican boundary survey . . . U. S. 34<sup>th</sup> Congress, 1<sup>st</sup> session, Sen. Exec. Doc. 108, House Exec. Doc. 135, 1 (1): i-xvi+1-258; maps and illus.
- GOULD, AUGUSTUS ADDISON**  
 1855 a. New species of land and fresh-water shells from western (N.) America. Proc. Boston Soc. Nat. Hist. 5: 127-130  
 1855 b. [Descriptions of shells]. Proc. Boston Soc. Nat. Hist. 5: 228-229  
 1862. Otia conchologica. Boston (Gould & Lincoln): 1 to 256
- JOHNSON, RICHARD IRWIN**  
 1964. The Recent Mollusca of Augustus Addison Gould. Bull. U. S. Nat. Mus. 239: 1-182; pls. 1-45  
 (28 July 1964)
- MEARNS, EDGAR ALEXANDER**  
 1907. Mammals of the Mexican boundary of the United States; a descriptive catalogue of the species of mammals occurring in that region, with a general summary of the natural history, and a list of trees. Bull. U. S. Nat. Mus. 56: i-xv+1-530; pls. 1-13
- PARRY, CHARLES CHRISTOPHER**  
 1857. Physical and geological description of the country from the initial point on the Pacific to the junction of the Gila and Colorado. In W.H. Emory, Report on the United States and Mexican boundary survey . . . U. S. 34<sup>th</sup> Congress, 1<sup>st</sup> session, Sen. Exec. Doc. 108, House Exec. Doc. 135, 1 (2): 78-99
- PILSBRY, HENRY AUGUSTUS**  
 1895. A new Mexican *Bythinella*. The Nautilus 9: 68-69  
 1928. Mexican mollusks. Proc. Acad. Nat. Sci. Philadelphia 80: 115-117
- ROEMER, FERDINAND**  
 1935. Texas, with particular reference to German immigration and the physical appearance of the country. Transl. from the German by Oswald Mueller. San Antonio, Texas (Standard Printing Co.): i-xii+1-301; map
- SIMPSON, CHARLES TORREY**  
 1893. A new *Anodonta*. The Nautilus 6: 134-135  
 1900. New and unfigured Unionidae. Proc. Acad. Nat. Sci. Philadelphia 52: 74-86; pls. 1-5
- SOWERBY, GEORGE BRETtingham**  
 1867-1870. Monograph of the genus *Anodon*. In Lovell Augustus Reeve, Conchologia Iconica 17. London (L. A. Reeve). 37 col. pls. and sheets of text
- STEARNS, ROBERT EDWARD CARTER**  
 1901. The fossil fresh-water shells of the Colorado Desert, their distribution, environment, and variation. Proc. U. S. Nat. Mus. 24: 271-299; pls. 19-24
- TAYLOR, DWIGHT WILLARD**  
 1966 a. Summary of North American Blancan nonmarine mollusks. Malacologia 4: 1-172  
 1966 b. A remarkable snail fauna from Coahuila, México. The Veliger 9 (2): 152-228; pls. 8-19; 25 text figs.  
 (1 October 1966)
- WALLACE, EDWARD S.**  
 1955. The great reconnaissance. Boston and Toronto (Little, Brown & Co.): 1-288
- WISLIZENUS, FREDERICK ADOLPHUS**  
 1848. Memoir of a tour to northern Mexico, connected with Col. Doniphan's expedition, in 1846 and 1847. U. S. 30<sup>th</sup> Congress, 1<sup>st</sup> session, Misc. Doc. 26: 1-141; maps