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THREE NEW SPECIES OF PHYSA

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Physa goodrichi, new species

Plate I, figs. 1-2

Description: Shell sinistral, large, globose, imperforate, translucent. Color brownish straw, varicose bands light straw yellow. A light tinge of purplish coloration is found on the type and two paratypes, similar but not so evident as in *P. ancillaria vinosa* Gld. Whorls 4½-5, the last whorl very globose. Spire rather short, nuclear whorl slightly darker. Aperture large, rounded, slightly flaring at the base. Columellar lip consisting of a very thin deposit on the body whorl. Palatal lip labiate, light straw in color with the inner border reddish brown. Sutures slightly impressed, whorls shingled, margined at suture with a very narrow light colored band. Columella rather thin, nearly straight, slightly twisted, white in coloration. Sculpture consisting of rather coarse growth lines, not even as to spacing or height. Cross striae found on one specimen in the type lot.

Type: Museum of Zoology, University of Michigan, Catalog No. 29520; south fork of Powell River, Big Stone Gap, Virginia.

Measurements of type lot¹

	Length	Width	Ap. length	Ap. width	
Type	18.5	13	15	8 mm.	U. of M. 29520
Paratypes	20	13.4	15	7.6	U. of M. 5582
	16.8	11	12.5	6.5	
	16.5	10	11.7	6	
	16.3	9.5	12	6	
	15.5	9.3	11	5.5	
	14.5	8.8	10	5	
	20.5	12.5	15	7	Walker 36289
	20	12	15	6.5	
	18	11.5	13	6	
	16	10	12	5	
	19	11.5	13.5	7	Clench 2176
	16.5	11.3	12	6	
	18	11.5	13.5	6	A. N. S. P.
	16	10.2	12	6	U. S. N. M.

Paratypes deposited: Museum of Zoology, University of Michigan; Academy of Natural Sciences, Philadelphia; United States National Museum; collections of Dr. Bryant Walker, P. S. Remington, and the author.

Remarks: This species has been confused with *P. gyrina* and *P. crandalli* Baker. It differs mainly from *P. gyrina* in being more inflated and larger, and in having a less acute spire, a purplish color and more convex whorls. All of the specimens examined of this species are from the upper Tennessee drainage area, not extending into Alabama. Its affinities are mainly with the *P. crocata* group and it can be placed between that species and *P. inflata* Lea.

***Physa johnsoni*, new species²**

Plate I, fig. 3

Description: Shell sinistral, small, globose, thin. Color dark

¹ All specimens in the type lot were collected by Mr. Calvin Goodrich, for whom I take pleasure in naming the species.

² This species is named in honor of C. W. Johnson, who sent the material for determination.

reddish horn, sometimes faintly striated. Whorls $4\frac{1}{2}$ to 5, convex and well rounded, nuclear whorl darker in color. Spire rather short, terminating in an acute apex. Aperture well rounded, flaring slightly at the base. Palatal lip very thin, rarely labiate. Parietal lip of a thin deposit only on body whorl. Columella rather narrow, not twisted, inclined toward the left and not abruptly terminating in the body whorl but gradually continuing the general contour. Suture very well impressed, slightly indented. Sculpture of very fine growth lines but no cross striae. The loss of the periostracum on some of the most prominent growth lines gives it the appearance of striations as noted above. Varicose bands rare and most noticeable when seen from within the aperture.

Measurements of type lot

	Length	Width	Ap. length	Ap. width	
Type	7.5	5.2	6	2.5 mm.	U. of M. 33066
Paratypes	5.8	4	4.5	2	U. of M. 33066
	6.2	4	4.5	2	
	6	4	4.5	2	
	6.5	5.5	5.3	2.5	Bos. Soc. Nat. Hist.
	5.5	3.8	4.5	2	
	6	4	4.4	2.1	

Type: Museum of Zoology, University of Michigan, Catalog No. 33066; middle spring, Hot Sulphur Springs, Banff, Alberta, Canada, Owen Bryant, collector.

Paratypes deposited: Museum of Zoology, University of Michigan; Academy of Natural Sciences, Philadelphia; United States National Museum; Boston Society of Natural History; collection of Bryant Walker and my own collection.

Remarks: This species differs mainly from *P. cupreonitens* Cockerell, a species described from a hot spring at Wellsville, Colorado,³ in being more globose, and in having a slightly shorter spire, a horn colored (not white) aperture, and the columella inclined to the left. The general size and suture characters are about the same in both species. It is quite dif-

³ Cockerell, T. D. A., Jour. Conc., 1889, 63.

ferent from *P. jennessi* Dall, the only other closely related species, described by Dall⁴ from east of the Mackenzie delta at Bernard Harbor, northern Canada. This species is larger than *P. johnsoni*, has a lighter color, a more pronounced columellar lip and a straighter columella, and is more elongate. The lack of numerous varicose bands on *P. johnsoni* is in all probability due to the uniformity of the ecological conditions throughout a large part of the season.

A second lot of this species is contained in the collection of Bryant Walker. The material consists only of bleached specimens collected by E. C. Case in a deposit below the swimming basin. All characters, with the exception of the color, agree with the type lot. The temperature of the spring from which the type material was obtained was noted on the label as "about 92° F."

Brues⁵ made a study of the animal life in the thermal waters of Yellowstone National Park and in addition has reviewed all forms of mollusks reported from other thermal waters. The records for *Physa* in these waters are more numerous than those of other species, both in Europe and America. Most of the American forms have been determined as *P. heterostropha*, or varieties of this species, and *P. gyrina*. It is very doubtful if any of the forms are either *P. heterostropha* or *P. gyrina*, or even varieties of these species. The range of *P. heterostropha* is limited to the area east of the Mississippi River and north of the Ohio, while the range of *P. gyrina* extends from New York west to eastern South Dakota and eastern Nebraska and does not extend south of the Ohio River or the southern tier of counties in Missouri.

Physa michiganensis, new species

Plate I, fig. 4

Description: Shell sinistral, medium in size, elongate-ovate. Color light horn to straw yellow, surface shining in young specimens. Whorls 5, slightly convex, nuclear whorl not noticeably darker than remaining whorls. Spire produced,

⁴Dall, W. H., Canadian Arctic Exp., Vol. VIII, Pt. A, 1919, 20.

⁵Brues, C. T., Proc. Am. Acad. Arts Sciences, Vol. 59, 1924, 416-419.

acute. Aperture rounded to slightly ovate, interior yellowish white. A decided flaring at the base and lower half of the palatal area. Palatal lip thin, labiate a little below margin. Parietal lip consisting of a thin deposit on the body whorl. Columella inclined slightly to the left, narrow, slightly twisted, terminating rather abruptly at the central portion of the body whorl. Suture rather deeply impressed but not indented. Sculpture of fine, irregularly spaced growth lines. Varicose bands few or absent. When present, yellowish white to white in color. Not noticeably colored on the outside.

Measurements

	Length	Width	Ap. length	Ap. width	
Type	9.5	6	6	2.5 mm.	U. of M. 33068
Paratypes	9	5.5	6.5	2.5	U. of M. 33069
	8.5	5	6	2.5	
	9	5.5	7	3	
	9.5	6	7	3	Clench 1500
	9.5	6	6.5	3	
	9	6	6	2.5	
	9	6.5	6	2.5	Walker 82648
	8	6	5.5	2.5	
	8.5	5	6	2.5	

Type: University of Michigan, Museum of Zoology, Catalog No. 33068; stream 1 mile west of Geddes, Washtenaw County, Michigan, W. J. Clench, collector, April, 1923.

Paratypes deposited: University of Michigan, Museum of Zoology; United States National Museum; Academy of Natural Sciences, Philadelphia; collection of Bryant Walker and my own collection.

Remarks: Many of the Michigan records referred to as *P. anatina* Lea are in all probability this species. Many examples from several localities agree in all details and they can be separated from *P. anatina* on several of the structural

characters. The general size and shape have hitherto confused these two species in Michigan. The complete lack of *P. anatina* records based on recent material from Ohio and Indiana was first noted and initiated a more critical study of the Michigan forms. All material so far seen from this area, labeled *P. anatina*, has been referred to this new species. Baker⁶ has listed two fossil records of *P. anatina* from a Pleistocene deposit in Logan County, Ohio. It is possible that these Pleistocene forms are *P. michiganensis* and not *P. anatina*. Furthermore, Baker⁷ does not list *P. anatina* occurring as a fossil in his "Life of the Pleistocene." Baker⁸ records *P. anatina* from three localities in Illinois; Hardin Co., in the south on the Ohio River, Adams Co., on the Mississippi River, and McHenry Co., in the northern portion of the state. It is possible that this northern record is based upon some form of *P. integra*, the remaining records are just without the range as known to me.

With the exception of these Illinois records the present distribution of *P. anatina* is apparently confined to west of the Mississippi from Iowa and Nebraska south to Texas and not west of the Rocky Mountains. *P. michiganensis* differs from *P. anatina* in being less shining, usually a little smaller, with more deeply impressed sutures and whiter color. *P. anatina* is more amber and has much more brownish or reddish color on the varicose bands. The columella of *P. anatina* terminates more abruptly on the body whorl.

P. michiganensis is confined mostly to small creeks and it usually is found on the under side of leaves in the more quiet water along the edges. Its relationships are apparently with the *integra* group and it can be placed next to *Physa integra walkeri* Crand. It is more elongate than *P. integra* and the variety *walkeri* and also differs in the shape of the aperture.

⁶ Baker, F. C., Nautilus, Vol. XXXIII, pt. 4, 1920, 126; Jour. Geol., Vol. XXVIII, 1920, 450.

⁷ Baker, F. C., Univ. of Illinois Bulletin, Vol. XVII, No. 41, 1920.

⁸ Baker, F. C., Bulletin Ill. State Lab. Nat. Hist., Vol. VII, Art. VI, 1906, 99.

PLATE I

All hair lines represent 10 mm.

- FIG. 1-2. *Physa goodrichi*, new species. Type.
FIG. 3. *Physa johnsoni*, new species. Type.
FIG. 4. *Physa michiganensis*, new species. Type.



