

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Invertebrate Abstract

Element Code:

IMGASL9130

Data Sensitivity:

No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Physa gyrina*

COMMON NAME: Tadpole Physa, Left-handed Snail, Spinning Snail, Pouch Snail, Tadpole Snail

SYNONYMS: *Physella gyrina*, *Physa salina*, *Physa gouldi*, *Physa goodrichi*, *Physa saffordii*, *Physa warreniana*, *Physa whitei*, *Physa elliptica*, *Physa hawnii*

FAMILY: Physidae

AUTHOR, PLACE OF PUBLICATION: Say, Thomas. 1821. Description of univalve shells of the United States. Journal of the Academy of Natural Sciences of Philadelphia. 2(1):149-179.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Taylor (2003) lists this species as *Physella* [= *Physa*] *gyrina*. It is likely that *Physella wrighti* is the evolutionary source of the ancestral population from which *Physella johnsoni* and *Physella gyrina* were derived (Remigio et al., 2001). Dillon et al. (2004) found postmating reproductive isolation between *P. acuta* and *P. gyrina*. Possibly *Physa wrighti*, *Physa aurea*, and *Physa gyrina* (from Cooper Springs, Virginia, only) may be part of a single monophyletic species (Wetherton and Guralnick, 2004). Dillon and Wethington (2004) reported no postzygotic reproductive isolation between populations of *P. gyrina*, *P. ancillaria*, *P. aurea*, *P. microstriata* and *P. utahensis* collected at or near their type localities. The results of the Dillon and Wethington (2006) genetic survey of Michigan physid populations suggested that *P. sayii* and *P. parkeri* are synonyms of *P. gyrina*. Additional junior synonyms postulated by Dillon et al. (2006) include *P. crocata*, *P. elliptica*, *P. inflata*, *P. hildrethiana*, *P. microstoma*, *P. lordi*, and *P. oleacea*. A study of molecular phylogeny of the family Physidae conducted by Wethington and Lydeard (2007) resulted in proposed monophyly of the family and supported six major clades, each with a corresponding difference in penial morphology; with *Physa gyrina* falling within the type b group.

Physa gyrina and *P. ancillaria* are genetically very similar and they can interbreed at least to some extent. Mitochondrial DNA can separate these two species into the two groups, but allozymes cannot. Recent allozyme study showed that geography is more important than shell shape with regards to genetic distance between populations of both forms. It is possible that *P.*

gyrina may be one amazingly diverse and phenotypically plastic species. *Physa ancillaria* is more restricted geographically and in habitat. There may be an underlying physiological difference between these two species which affects how well the animals get oxygen and thermo-regulate based on the difference in culture ability (Dillon & Wethington in press, Wethington 2004).

Physella gyrina is comprised of three subspecies *P.p. atearni*, *P.p. latchfordi*, *P.p. utahensis*.

DESCRIPTION: The shell of *Physella gyrina* is skinny with a prominent spire. Coiling sinistral; no shoulder where last whorl meets spire; spiral striae conspicuous reddish band on the inside of the outer lip. For the *gyrina* group, the apex is proportionally longer, about 0.3-0.5 times the length of shell. Shell is usually opaque in adults and range in color from pale yellow, to dark with red stripes, to black, with a dark red callus inside the lip. Mature sizes can range from being extremely small, 4 to 5 mm, to extremely large, up to 24 mm. (Wethington, 2004). Physid snails lack an operculum, have a raised coil, and have a sinistral opening (that is, the opening is to your left when you hold the shell with the spire upwards and the opening facing you). These snails also possess a heavily vascularized pseudobranch projecting from their foot. This acts as an accessory gill (Ecology Illustrated Field Guides, 2000).

AIDS TO IDENTIFICATION: The clades of the family are phylogenetically different, have distinctive penial morphology, and to some extent have distinctive shell morphology. Shell morphology has an environmental component in addition to a genetic component so using shell alone to distinguish members of this group can lead to mistakes in identification. Classification schemes are based solely on morphology and both are weighted with regards to penial characters (Wethington 2004).

Physella gyrina and *P. ancillaria* are very similar but can be distinguished from one another through close examination of the shell, though this is not the best method. *Physa ancillaria*'s shell is globose, versus the elliptical-ovate shape of *P. gyrina*, with a more flat spire, generally thicker, and sometimes with prominent shoulder. The penial morphology of both these species (of the same group) includes a preputial gland present along with a two-part penial sheath (one part glandular, one part muscular). The two sheaths are roughly equal in size (Wethington 2004).

ILLUSTRATIONS: Line drawing (Burch and Tottenham in http://www.cofc.edu/%7Edillonr/Amys_Physidae_Supplement.pdf)
Color photo (JER in Ecology Illustrated Field Guides <http://info.wlu.ca/~wwwbiol/bio305/Database/Physella.htm>)
Color photo (In <http://www.femorale.com>)
Color photo (USGS in <http://www.npwrc.usgs.gov/resource/inverts/mollusks/species/42.htm>)

TOTAL RANGE: Species distributed in temperate and sub-Arctic North America, in Canada, the United States, and in to Mexico. Introduced into Europe.

RANGE WITHIN ARIZONA: Found in high elevations in discontinuous areas on the Mogollon Plateau and the White Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: A freshwater pulmonate with a specialized ability to live under harsh conditions, including polluted habitat. Although these snails generally glide along the surfaces of submerged rocks and vegetation, they have also been observed to move vertically in the water column by "spinning", which involves attaching a thread of mucus to a firm substrate, and then moving upward or downward, trailing this "tether-line". Although the physids are pulmonate snails, they do not have to return to the water surface to replenish their air supply. Oxygen can be absorbed from the water through the body surface (Ecology Illustrated Field Guides, 2000).

REPRODUCTION: The species *Physella gyrina* is hermaphroditic and has the ability to self fertilize. Members of the Physella family can have between 1 and 3 generations per year and in some cases, they can reproduce continually (e.g. warm springs) (Wethington 2004). For *Physella gyrina* mate rejection occurs in 4 ways: shell swinging, shell jerking, increasing distance to the gonopore, and making head/preputium contact. Fecundity increased with the size of sperm recipients but decreased with the size of the sperm donor. (De Witt 1991).

FOOD HABITS: These snails are scrapers (grazers) and scavengers; diet consists of diatoms, periphyton, and aufwuchs (Ecology Illustrated Field Guides, 2000).

HABITAT: This species is found in rivers, streams, intermittent ponds, and large lakes all over North America. The Physidae family has a widespread and varied habitat due to its ability to survive under harsh conditions, so long as the overall environment is stable and rich. According to Ecology Illustrated Field Guides (2000), *Physella gyrina* can be found in lotic-erosional habitat, on coarse sediment.

ELEVATION:

PLANT COMMUNITY:

POPULATION TRENDS: Pip and Stewart (1976) found that densities of *Physella gyrina* peaked from June to July in Manitoba, Canada. A general limitation of these studies is that year-round sampling is not possible because of an ice layer during the winter. While Sankurathri and Holmes (1976) also did not sample for *Physella gyrina* under the ice in their control area, a thermally influenced experimental area of a lake near Edmonton was sampled year-round. Even though *P. gyrina* were found to reproduce year-round in the experimental area, peak snail densities also were recorded during the summer (Lepitzki 2002).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 3 (AZGFD, AWCS 2022)
None (AGFD SWAP 2012)
OTHER STATUS: None

MANAGEMENT FACTORS: This species is an exotic, aquatic nuisance.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION**REFERENCES:**

- Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.
- Arizona Game and Fish Department. 2022. Arizona Wildlife Conservation Strategy: 2022-2032. Arizona Game and Fish Department, Phoenix, Arizona. 378 pages.
- Barker, G.M. 2001. The Biology of Terrestrial Molluscs. CABI Publishing UK. Pp: 127-134.
- DeWitt, T.J. 1991. Mating behavior of the Freshwater pulmonate snail, *Physa gyrina*. American Malacological Bulletin 9: 81-85. Available: <http://wfsc.tamu.edu/faculty/tdewitt/AMB%201991.html>.
- Dillon, R.T., Jr. and A.R. Wethington. 2004. No-choice mating experiments among six nominal taxa of the subgenus *Physella* (Basommatophora: Physidae). *Heldia*, 6: 69-78.
- Dillon, R.T., Jr. and A.R. Wethington. 2006. The Michigan Physidae revisited: A population genetic study. *Malacologia*, 48: 133-142.
- Dillon, R.T., Jr., B.T. Watson, and T.W. Stewart. 2006a. The freshwater gastropods of North Carolina. Created 26 August 2003 by Rob Dillon, College of Charleston, Charleston, South Carolina. Available online: <http://www.cofc.edu/~fwgna/FWGNC/index.html>. Last updated September 2007.
- Dillon, R.T., Jr., C.E. Earnhardt, and T.P. Smith. 2004. Reproductive isolation between *Physa acuta* and *Physa gyrina* in joint culture. *American Malacological Bulletin*, 19(1/2): 63-68.
- Ecology Illustrated Field Guides, Available at: <http://info.wlu.ca/~wwwbiol/bio305/Database/Physella.htm>. Last revision: February 2, 2000. Accessed on September 6, 2005.
- Femorale. Available: <http://www.femorale.com>.
- [Http://www.applesnail.net/content/snails_various.php](http://www.applesnail.net/content/snails_various.php).
- Lepitzki, D.A.W. 2002. Status of the Banff Springs Snail (*Physella johnsoni*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 40, Edmonton, AB. 29 pp.

- Available at: <http://www3.gov.ab.ca/srd/fw/status/reports/snail/pop.html> , Accessed on October 13, 2005.
- NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer> Accessed on December 19, 2005.
- Preston-Mafham R. & K. 1993. The Encyclopedia of Land Invertebrate Behaviour. The MIT Press, Cambridge, MA. Pp: 12-13.
- Remigio, E.A., D.A.W. Lepitzki, J.S. Lee, and P.D.N. Hebert. 2001. Molecular systematic relationships and evidence for a recent origin of the thermal spring endemic snails *Physella johnsoni* and *Physella wrighti* (Pulmonata: Physidae). Canadian Journal of Zoology, 79: 1941-1950.
- Say, Thomas. 1821. Description of univalve shells of the United States. Journal of the Academy of Natural Sciences of Philadelphia. 2(1):149-179.
- Taylor, D.W. 2003. Introduction to Physidae (Gastropoda: Hygrophiila); biogeography, classification, morphology. Revista de Biologia Tropical (International Journal of Tropical Biology and Conservation), 51, supplement 1: 1-287.
- USGS. Available: <http://www.npwrc.usgs.gov/resource/inverts/mollusks/species/42.htm>
- Wethington, A.R. 2004. Family Physidae. Purdue University. Available at: http://www.cofc.edu/%7Edillonr/Amys_Physidae_Supplement.pdf Accessed on September 6, 2005.
- Wethington, A.R. and C. Lydeard. 2007. A molecular phylogeny of Physidae (Gastropoda: Basommatophora) based on mitochondrial DNA sequences. Journal of Molluscan Studies, 73(3): 241-257.
- Wethington, A.R. and R. Guralnick. 2004. Are populations of physids from different hot springs different lineages? American Malacological Bulletin, 19(1/2): 135-144.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2006-01-24 (BT)
 2006-02-13 (AMS)
 2020-07-10 (KSL)
 2023-01-10 (MBL)

To the user of these abstracts: you may use the entire abstract or any part of it. We do request, however, that if you make use of these abstracts in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX (= year of last revision as indicated at end of abstract). X...X (= taxon of animal or plant). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.