ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract

Element Code: IMGASJ0200
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pyrgulopsis morrisoni* Hershler and Landye
COMMON NAME: Page Springsnail
SYNONYMS: *Fonticella morrisoni*
FAMILY: Hydrobiidae

AUTHOR, PLACE OF PUBLICATION: Hershler, R. and J.J. Landye, 1988. Arizona Hydrobiidae (Prosobranchia:Rissoacea). Smithsonian Contributions to Zoology. Number 459:21,23

TYPE LOCALITY: Page Springs, Yavapai County, Arizona

TYPE SPECIMEN: Holotype, USNM 859041. Landye and Belk. 2 October 1973.

TAXONOMIC UNIQUENESS: There are 12 known species in the genus *Pyrgulopsis* in Arizona. (Pearson et al. 2014).

DESCRIPTION: A medium size species with shell height (height from top of shell to bottom of shell) of 1.8 to 2.9 mm (0.08-0.12 in.) with ovate or ovate-conic shell characterized by 3.75-4.5 slightly convex whorls. Inner lip is thin and usually adnate to body whorl. Aperture is less than half of the body whorl height. Umbilicus is open. Sexual dimorphism is significant (females larger than males). Pigment either absent from head-foot or consisting of light to moderate dusting throughout. Penial filament is either pigmented along the entire length or unpigmented. The penis has a large lobe, slender filament, and singular glandular ridge.

AIDS TO IDENTIFICATION: Due to the small size of this animal, it cannot be identified to species in the field but must be identified in a laboratory by a qualified authority. Therefore, to obtain specimens sift sand believed to contain the snail through an ordinary kitchen strainer. The rule of thumb, that spring snail species are specific to a particular location (i.e. a single spring or group of springs connected or close to each other), may be used as a means of preliminary identification. The penis has a large lobe, slender filament, and singular glandular ridge.

ILLUSTRATIONS:
Line drawings of pallial oviducts (Hershler and Landye 1988)
Photographs of shell (Hershler and Landye 1988)
Scanning electron microscope micrographs of radula (Hershler and Landye 1988)
Line drawings of penial (penis) variations (Hershler and Landye 1988)
Color Photos (various):
http://www.bing.com/images/search?q=Pyrgulopsis+trivialis&FORM=HDRSC2

TOTAL RANGE: Several springs along Oak Creek in the Bubbling Springs complex (Bubbling Springs Pond and Bass House Spring), the Page Springs complex (Cave [Page]

Spring, Bog Spring, Rusty Pipe Spring, Ash Tree Spring, and Drain Pipe Spring), and on private land (Lo Lo Mai Spring and Spring Creek) in Verde Valley, Yavapai County, and central Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The hydrobioid digestive system is typical of style-bearing neotaenioglossans. The mouth opens to a short oral area containing a pair of dorsolateral chitinous jaws composed of small, simple rodlets, immediately behind which is a well-developed buccal mass (situated within the snout). A pair of simple, unbranched tubular salivary glands, open anterodorsally to the buccal cavity and (almost always) pass posteriorly over the nerve ring, rarely stopping short of the ring, but never passing through it in hydrobioids. Hydrobioids have a taenioglossate radula (i.e. seven teeth per row) comprising numerous rows of cuspate teeth, each of which includes a typically squarish or trapezoidal central tooth flanked on each side by lateral, inner marginal, and outer marginal teeth. Teeth near the anterior end of the radula are often worn or broken, whereas the proximal portion of the ribbon has several to many rows of poorly differentiated or incompletely formed teeth. (Hershler and Ponder, 1998). Snails ≤1 week of age average 0.8-1.6 mm in shell height and have a single apical whorl. At 2-3 weeks snails are 1.6-2.2 mm in height and have two complete whorls. At 3-5 weeks snails are 2.2-2.6 mm in height with three complete whorls and noticeable shell coloration caused by algae growth. Adults past 6 weeks continue to develop shell coloration due to further algae growth. (Pearson et al. 2014)

REPRODUCTION: Most hydrobioids are oviparous, with females depositing small egg capsules, either singly or (rarely) in strings, on the substrate. A small number of hydrobioids are ovoviviparous, in which females brood shelled young in the pallial gonoduct. Hydrobioid egg capsules are typically hemispherical to spherical. Copulation in hydrobioids is usually via an anterior opening to the glandular oviduct. The ventral channel may be traversed at least in part by the penis, but it is more likely that the penis only enters the anterior most section. (Hershler and Ponder, 1998). Page Springsnails have an expected longevity of one year, reproducing once in their lives. There is evidence of a reproductive cycle beginning in mid-July and not ending until late fall, with peak reproductive periods occurring in July and August. (Wells et al. 2012)

FOOD HABITS: They eat the periphyton attached to the algae and aquatic macrophytes. Their diet consists primarily of diatoms.

HABITAT: *Pyrgulopsis morrisoni* "typically occurs on firm substrates such as rocks, vegetation, floating algal mats and submerged woody debris in association with slow to moderate flows of head springs, seeps and lateral spring runs. Populations appear to decline with increasing distance from the spring's source (Palmer 1991)." Occurance and high density of *Pyrgulopsis morrisoni* are associated with gravel and pebble substrates, lower levels of dissolved oxygen and low conductivity, and shallower water depths in rheocrene systems. (Martinez and Thome 2006)

Throughout the southwest *Pyrgulopsis* is found associated with the amphipod *Hyalella azteca* and pond snail *Physella virgata*. In Bubbling Springs Pond it was found to also be associated with ramshorn snails *Crangonyx gracilis* and *Planorbella duryi*.

ELEVATION: 3,300 - 3,600 ft. (1,007 - 1,098 m)

PLANT COMMUNITY: Aquatic vegetation associated with Oak Creek and the springs complex includes macrophytes such as *Nasturtium officinale* (watercress), *Lemna minor* (duckweed), *Berula erecta* (water parsnip), *Hydrocotyl verticillata* (water pennywort), *Veronica anagalli aquatica* (water speedwell), *Rumex verticillatus* (dock), *Elodea occidentalis* (waterweed), *Potamogeton gramineus* (pondweed), and algae such as *Rhizoclonium hieroglyphicum* and *Oscillatoria rubesens*. Riparian vegetation inludes *Fraxinus velutina* (velvet ash); *Populus fremontii* (Fremont cottonwood); *Plantanus wrighii* (Arizona sycamore); *Salix* sp. (willows); and *Prosopsis* sp. (mesquite).

POPULATION TRENDS: The population at Shea Springs is believed to be extirpated and no snails were found during recent surveys. Turtle Springs is also believed to be extirpated. (AZGFD Field Notes 2015). The population at Bass House Spring was recolonized following the repair of the connecting pipe from the springhead to the weir box, and this former extirpated site has been fully repatriated. Monitoring from 2001 to 2015 shows all extant populations listed above in "**Total Range**" continue to persist. (Sorensen and Martinez 2015).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: Removed from Candidate list, FWS 2015
[C USDI, FWS 2007-2014]
[C USDI, FWS 1996]
[C USDI, FWS 2002, 2004-2011]
[C USDI, FWS 1996, 1997, 1999]
[C2 USDI, FWS 1989, 1991, 1994]

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: According to Palmer (1991) the head springs at Bubbling Ponds should remain an intact system. The practice of water chlorination during drawdowns is no longer continued. In addition, "the total habitat area for the snail should not be reduced from current levels."

Threats: Restricted geographic distribution with associated potential for extinction due to chance events. Loss of habitat due to water development activities and downdraws. Trampling by wandering visitors or animals. **Management needs:** Implement species conservation agreement management actions that will preclude need for federal listing; periodic monitoring of snail populations and their habitats.

This Candidate Conservation Agreement with Assurances (CCAA) was developed and signed in March 2009. A revised CCAA was submitted to the USFWS in September 2015. The

latest summary on conservation activities and survey data is from Sorensen and Martinez 2015.

PROTECTIVE MEASURES TAKEN: Managed under a Candidate Conservation Agreement with Assurances (original March 2009, revised September 2015). Purchased the Page Family property (next to Bubbling Ponds Hatchery) in December 2014, including water rights. Built fencing around extant populations on hatcheries to protect from trespassing and trampling. Improvement to Bass House Spring enclosure and weir box between 2001 and 2009 resulted in the repatriation of that site. Established a refuge population at the Phoenix Zoo, between November 2009 and present. Discovered a new population at Spring Creek in July 2007. Searched other springs within the vicinity of Page Springs for new populations or habitat (Sorensen and Martinez 2015).

SUGGESTED PROJECTS: Population estimates and regular monitoring are needed. Perform habitat improvements including the addition of hard substrate to springs and reestablishing extirpated populations. Inquire with private landowners and property owners under CCAA.

LAND MANAGEMENT/OWNERSHIP: Arizona Game and Fish Department (Bubbling Springs complex, Page Springs complex, and all related springs); private (Lo Lo Mai Spring, Spring Creek, and Turtle Spring); and National Park Service (Shea Spring).

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Revised: 1992-03-24 (DBI)
1994-05-10 (DBI)
1997-11-13 (SMS)
1999-12-20 (DJG)
2004-07-23 (AMS)
2015-06-19 (AJM)
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