

## **Vale District Aquatic Snail Inventory**

[Final] Report to the Bureau of Land Management (Vale District)  
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## **INTRODUCTION**

The purpose of this project was to survey springs and streams in the Malheur and Owyhee drainages of the Vale District (southeast Oregon) for tiny springsnails (Hydrobiidae: *Pyrgulopsis*) and provide information to the BLM on the occurrence and distributions of these animals. *Pyrgulopsis* is the most diverse genus of aquatic gastropods in North America (124 species; Liu & Hershler, 2005) and typically lives in “permanent” (e.g., not subject to seasonal desiccation) springs which contain relatively clean water. This inventory will assist the BLM in its efforts to conserve and manage “sensitive” aquatic species and, if necessary, adjust land management practices to protect the habitats of these snails.

## **METHODS**

Fourteen (14) days were spent in the field during three separate trips to southeast Oregon in 2006-2007. During the first two trips (July, 2006; May, 2007) dozens of springs were visited using vehicle access. The 1<sup>st</sup> trip focused on the area to the south and east of Hwy 95; springs were accessed with the assistance of then BLM employee Cynthia Tait. The 2<sup>nd</sup> trip focused on the area north of Hwy 95 and south of Hwy 20; assistance in locating springs was provided by BLM hydrologist Shaney Rockefeller. The 3<sup>rd</sup> trip (September, 2007) involved kayaking along ca. 64 km of the Owyhee River (from Rome to “Hole in the Ground”) in order to access springs along this reach of stream; this excursion was organized by Shaney Rockefeller and other BLM staff.

At each site springsnails were searched for by visual examination of rocks and sweeping of a hand sieve through soft sediments and vegetation. Typically 15 minutes or

more were devoted to the search for springsnails. At snail-positive sites, sub-samples were preserved in 90% ethanol for DNA extraction and analysis and dilute formalin (after relaxation with menthol crystals) for morphological study. (Owing to logistical constraints the latter could not be done during the kayak trip.) UTM coordinates of each snail site were obtained using a Garmin GPS unit and digital photographs were also taken at all of these localities. (These data are available upon request.) Samples of *Pyrgulopsis* from two sites along the Owyhee River up flow of Three Forks that were given to the Smithsonian Institution by the USFWS in 2006 were also studied.

Samples were identified based on my long experience with the genus and were aided by inspection of relevant literature. The nine samples which were collected during the kayak survey earlier this month (*Pyrgulopsis* sp. indet., Fig. 1) are still being studied and thus are not reported on herein. (These results will be detailed in an “addendum” to this report that will be prepared during October, 2007). DNA sequences of the mitochondrial cytochrome-*c* oxidase subunit I (COI) gene were obtained and analyzed by Hsiu-Ping Liu (University of Denver) using methods outlined in our previous collaborative publications (e.g., Liu *et al.*, 2003). (Dr. Liu’s work was performed under a sub-contract administered by the Smithsonian Institution.)

## **RESULTS**

Most of the springs that were accessed by vehicle were in poor condition (owing to disturbance from grazing cows and horses) and did not contain springsnails. The decision to devote the last trip to a survey of springs along the Owyhee River was prompted by this finding and based on an assumption that these (relatively inaccessible)

sites would be less likely to be impacted by large animals and thus might provide more suitable springsnail habitat.

Prior to this survey only a single member of this genus, *P. intermedia*, had been previously recorded (in the published literature) from the Vale District. During the course of this survey one new locality for this species was discovered in the lower portion of the Owyhee River basin. In addition, two species which do not conform morphologically to any previously described regional members of the genus (either in terms of shell or male anatomical features) were found at several (other) sites in the Owyhee River basin. The phylogenetic analysis of mtCOI sequences indicates that these two snails are also evolutionarily distinctive (Fig. 2). (These two snails were also found to be well differentiated based on sequence divergence data.) Based on these findings we conclude that these snails represent two species that are new to science. Note that these snails were first collected (at Three Forks) by the USFWS during a 1987 helicopter survey, but have never been treated in the open literature. We will prepare a taxonomic paper describing these new species and submit it for publication in early 2008. Below I provide additional information regarding these new findings.

*Pyrgulopsis intermedia* (Tryon, 1865)

This large species was originally described from Crooked Creek, a tributary of the Owyhee River. The snail was also previously collected from one or more sites in Barren Valley (Taylor, 1985). Populations from the Pit River basin formerly assigned to this species were recently transferred to *P. archimedis* (Hershler *et al.*, 2003). During the current survey a previously unrecorded population of *P. intermedia* was found in springs

along Birch Creek (T 27S, R 43E, NE ¼ section 30), which considerably extends the distribution of this species down the Owyhee River drainage (Fig. 1). The Birch Creek site consists of a series of fairly large springs in good condition that discharge along a hillside and run but a short distance before entering the creek.

*Pyrgulopsis* n. sp. 1

This tiny, globose-shelled species was collected from numerous thermal springs at the mouth of Warm Spring Canyon (just west of the Three Forks Dome) on both sides of the Owyhee River (T 35S, R 45 E, section 3) (Fig. 1). The springs are in good condition as the area is little disturbed aside from occasional visits by hot spring enthusiasts (one of the springs on the west side of the river is used as a bathing area.) This snail was also found in one of the samples collected by the USFWS from seeps along the Owyhee River a few km up flow from Three Forks.

*Pyrgulopsis* n. sp. 2

This tiny, elongate-shelled species was also collected at the Three Forks warm spring complex, although it appears to be far less common there than the other new species. (Thus far I have found it [rarely] only in the northern-most springs on the east side of the river.) Populations of this species were also found in Tree Spring (T 35S, R 41E, SE ¼ section 36), Owyhee Spring (T 32S, R 42E, SE ¼ section 6) and Kane Springs (T 21S, R 43E, NW ¼ section 4) (Fig. 1). Tree Spring is an uphill site that is in fairly good condition, although its riparian zone is subject to some grazing. Owyhee Spring consists

of a small complex of thermal springs that is disturbed by grazing activities. Kane Springs is fairly remote and little disturbed.

This snail was also collected in 1993 by former collaborator Gary Vinyard (now deceased) from Cherry Spring (T 36S, R 43E, SW ¼ section 15), a few km south of Tree Spring (both are in the Battle Creek watershed). The surface flow of this spring has since been diverted and I could not find any snails when I visited the site in 2006.

## **DISCUSSION**

Although this field survey was far from exhaustive, the results nonetheless suggest that relatively few springs in the Vale District contain snails of the genus *Pyrgulopsis*. Given the paucity of regional snail populations it would seem appropriate to conserve and manage as many of these as possible in order to protect these species. Reasonable guidelines for western spring management were recently provided by Sada *et al.* (2001). I recommend that these be followed and BLM activities focus on maintaining ample spring flow and habitat near spring sources with the aid of fencing and other means of excluding cattle and horses.

The results of this study also suggest that springsnails may be concentrated in sites along the Owyhee River which are relatively free from pastoral disturbance owing to the rugged canyon land topography. Although the (forthcoming) results of the survey that was conducted between Rome and Hole in the Ground will help “fill in the picture” of snail distributions along the river, this study has obviously only scratched the surface in this regard as many river miles (above and below this reach) have yet to be explored for

springsnails. Additional surveys along the Owyhee River will surely be fruitful and I hope that I can continue to work with the BLM along these lines.

## LITERATURE CITED

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## FIGURE CAPTIONS

Figure 1. Map of southeastern Oregon showing the distributions of regional springsnails.

Figure 2. Phylogenetic tree, based on Bayesian analysis of mtCOI sequences, depicting relationships among Vale District springsnails and other *Pyrgulopsis* species from the Pacific Northwest region. Terminals represent individual specimens (identified by locality codes). Posterior probabilities associated with branch nodes are given when  $\geq 90\%$ . The tree is rooted with a member of the eastern North American genus *Marstonia*, based on its close relationship with *Pyrgulopsis* (Liu & Hershler, 2005). Scanning electron micrographs of the three Vale District species are printed to the same scale.

Figure 1

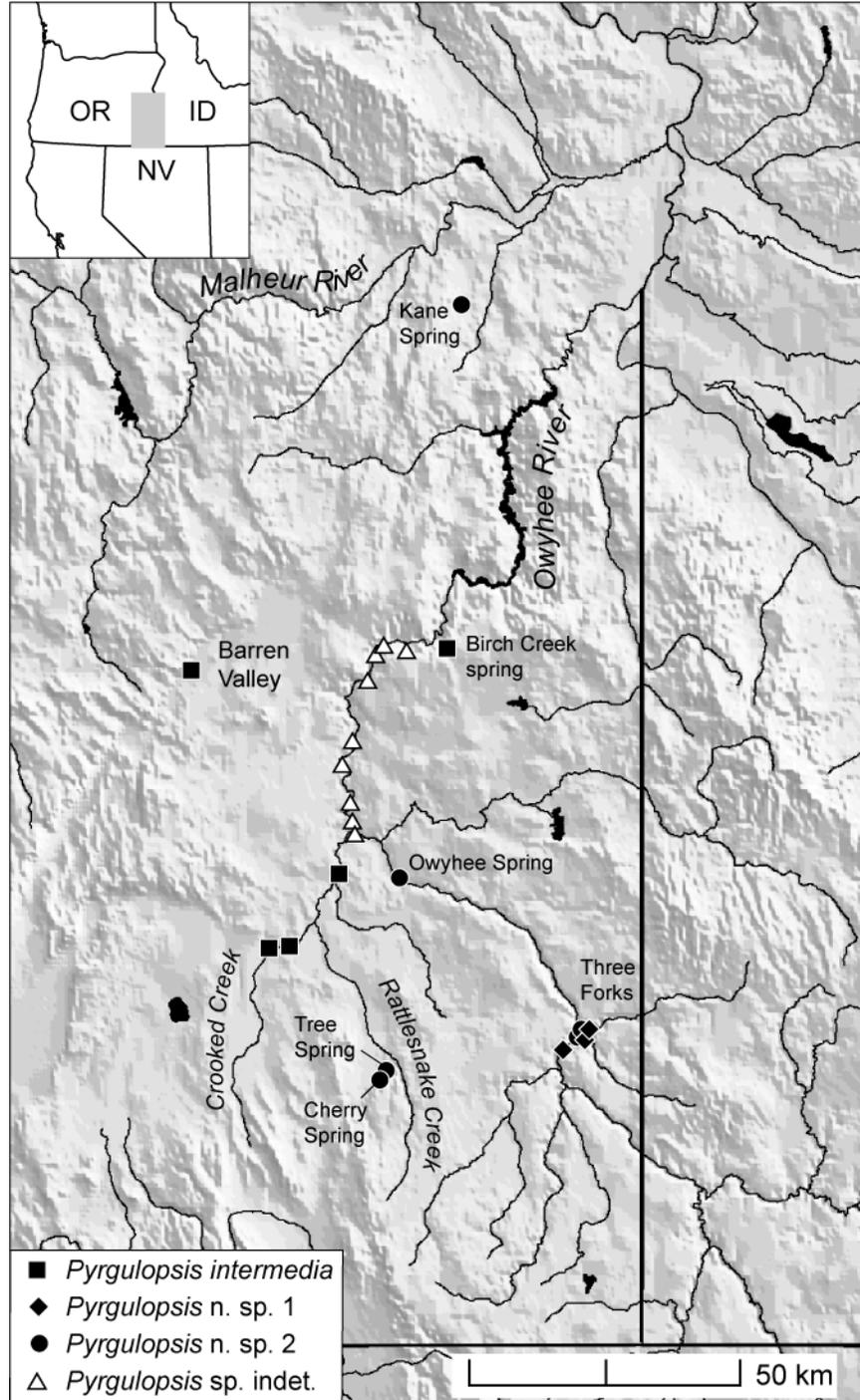
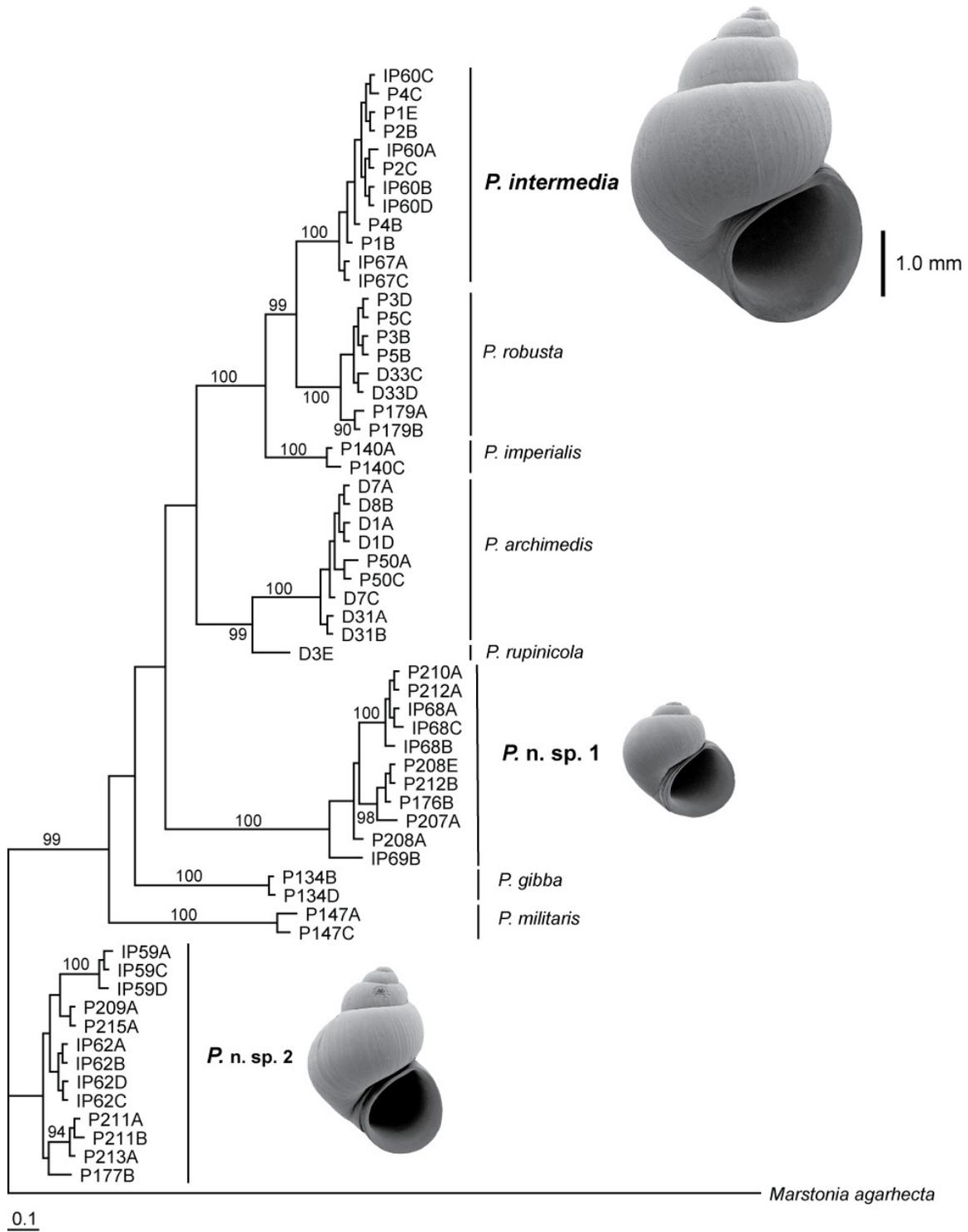


Figure 2



## Final report addendum

UTM coordinates NAD83, Zone 11. All collections made by RH & Shaney Rockefeller.

Pyrgulopsis n. sp. 2, Potamopyrgus antipodarum	Seep wall on west bank of Owyhee River, just above mouth of Crooked Creek, Malheur Co., OR, 0443352 E, 4747342 N, 9/5/2007
Pyrgulopsis n. sp. 2	Spring along east side of Owyhee River below mouth of Crooked Creek, Malheur Co., OR, 0443026 E, 4749973 N, 9/5/2007
Pyrgulopsis robusta, Fluminicola sp.	Spring along east side Owyhee River, above Long Sweetwater rapids, Malheur Co., OR, 0442355 E, 4753770 N, 9/6/2007
Pyrgulopsis n. sp. 2	Weeping Wall springs, west side of Owyhee River, just below mouth of Granite Creek, Malheur Co., OR, 0440473 E, 4760771 N, 9/6/2007
Pyrgulopsis n. sp. 2	Spring, east side of Owyhee River, above Artillery rapids, Malheur Co., OR, 0443011 E, 4765226 N, 9/7/2007
Fluminicola sp.	Owyhee River, just above Montgomery rapids (east of Iron Point), Malheur Co., OR, 0446083 E, 4776886 N, 9/8/2007
Pyrgulopsis robusta	Spring on hillside, Jackson Hole, Malheur Co., OR, 0447566 E, 4781838 N, 9/8/2007
Pyrgulopsis robusta, Potamopyrgus antipodarum	Mouth of Rinehart Creek, west side of Owyhee River, Malheur Co., OR, 0449007 E, 4783611 N, 9/9/2007
Pyrgulopsis n. sp. 2	Spring west of Two Mile Spring, Hole in the Ground, Malheur Co., OR, 0453320 E, 4782496 N, 9/9/2007

Pyrgulopsis n. sp. 2" refers to one of the new species discussed in the "original" report that I sent to BLM. In case you didn't recognize the scientific name, *Potamopyrgus antipodarum* refers to the New Zealand Mudsail. Also note that the taxonomic status of the *Fluminicola* (pebblesnails) that we saw on rocks in the Owyhee River has yet to be addressed in the literature.

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