

Two additional western United States freshwater snails named for Terrence Frest

by Edward J. Johannes

As was noted in a previous issue of *The Dredgings* (Holm, 2009), Terrence (Terry) J. Frest was posthumously honored by having a snail he collected from the Owyhee River drainage in Oregon named for him (*Pyrgulopsis fresti* Hershler and Liu, 2009; Owyhee hot springsnail). This snail was discovered by Bureau of Land Management (BLM) personnel during a helicopter survey to search for additional sites for the federally listed (endangered) *Pyrgulopsis bruneauensis* (Bruneau hot springsnail). Just recently two western U.S. freshwater snails, one a limpet, have been named for Terry.

The limpet, in addition to being a new species, is also a new genus and was named *Idaholanx fresti* Campbell, Clark, and Lydeard, 2017 (Banbury Springs lanx; also known as the Banbury Springs limpet) (Figure 1). This species is in the subfamily Lancinae, within Lymnaeidae, that contain two other patelliform genera, *Lanx* and *Fisherola* (Figure 2). *Lanx* currently occurs in northern California and southern Oregon with the species *L. patelloides*

(kneecap lanx) in the Sacramento and Klamath rivers and *L. alta* (highcap lanx) in the Smith, Umpqua and Rogue rivers. *L. subrotunda* and *L. klamathensis* are synonymized with *L. alta* by Campbell *et al.* (2017). Campbell *et al.* (2017) only recognized *Fisherola nuttallii* (shortface lanx) in this genus. It's found confined to the Columbia River system in Washington, Oregon, Montana, Idaho and a small portion of British Columbia, Canada. *Idaholanx*, has the most restricted occurrence, being found only in four nearby large springs in the Thousand Springs area of the Snake River, Gooding County, Idaho (Figure 3).

Campbell *et al.* (2017) compared anatomical and molecular data of *Idaholanx* with the two other lancid genera, finding it is most closely related to *Fisherola*. This is a very interesting finding because the regional fossil record shows *Fisherola* is a recent invader of the Snake River reducing considerably the time speciation of *Idaholanx* from *Fisherola* could have occurred. *Lanx*, not *Fisherola*, is found in the Pliocene (between 2-5 million years BP) Glens Ferry Formation deposited by Lake Idaho, which formerly covered the area *Idaholanx* is found (Taylor, 1985). Since the Pliocene *Lanx* has not

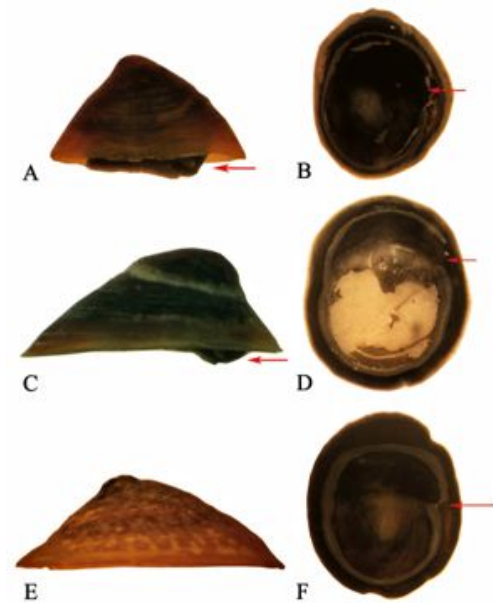


Figure 2. Comparison of shells and animals of *Idaholanx*, *Fisherola* and *Lanx*. The shells are oriented with the head of the animal facing right, while the whole animals without shells are dorsal views with the head up. *Idaholanx fresti*: A shell B whole animal. *Fisherola nuttallii*: C shell D whole animal. *Lanx patelloides*: E shell F whole animal. The red arrows indicate the position of the head in A, C; the position of the gap in the columella muscle in B, D and the narrow connection in F. Images not to scale. From Campbell *et al.*, 2017.

occurred in the Snake River drainage. *Fisherola* appears much later in the early Pleistocene Bruneau Formation following the capture of the Snake River into Hells Canyon allowing the spread of this lancid genus upstream from the Columbia River drainage (Taylor, 1985).

Erroneously, Campbell *et al.* (2007) state that Terry discovered the Banbury Springs lanx in 1988. It was actually discovered, but not recognized as a new species or genus, by the malacologist Dwight Taylor while he conducted a survey for the Bureau of Land Management in the sixth largest spring in the U.S. at Box Canyon (Taylor, 1985). Taylor assumed it was *Fisherola nuttallii* that is found in the adjacent Snake River.

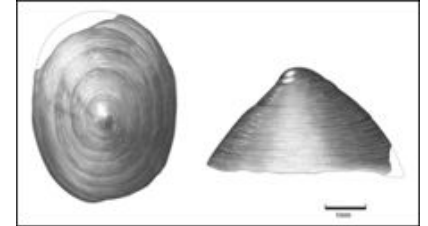


Figure 1 - Holotype of *Idaholanx fresti* From Campbell *et al.*, 2017.

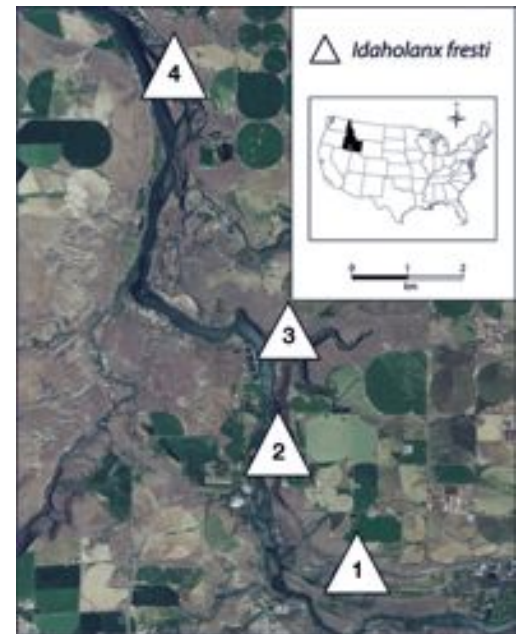


Figure 3. Distribution of *Idaholanx fresti* along a 8 km stretch of the Snake River, Gooding Co., Idaho. 1=Minnie Miller Spring; 2=Banbury Springs; 3=Box Canyon; 4=Briggs Spring. Modified from Campbell *et al.*, 2017.

Terry, having just completed extensive surveys for *Fisherola* for the Department of Energy (Neitzel & Frest, 1989), recognized Taylor's description of the Box Canyon site in his report did not fit the typical large riverine habitat for *Fisherola*. Suspecting this might be something new; he took a trip to Idaho in 1988 to specifically collect this species. Terry's efforts to collect this site were stymied by a local trout farmer, Earl Hardy, who refused to give access permission to the canyon. At the time Mr. Hardy was fighting a federal court case filed to prevent him from further diversions of water from Box Canyon for a proposed trout farm in an adjacent canyon. Terry instead surveyed Banbury Springs, finding the new limpet there. Later, he confirmed that the Banbury Springs lanx occurred in Box Canyon when the BLM had him examine Taylor's specimens from there. The new limpet became a major player in the Box Canyon court case, at which Terry served as an expert witness (Morgan v. Walter 728 F. Supp. 1483, 1989). Hardy's court loss precipitated the federal listing of the Banbury Springs lanx as endangered under the Endangered Species Act (ESA) with four other local snails (U.S. Fish and Wildlife Service, 1992) leading to the eventual protection of Box Canyon upon transfer of Earl Hardy's ownership of his portion of the canyon to the State of Idaho following his death. It was designated a state park in 2006. *Idaholanx fresti* and one of the other Snake River listed snails, *Taylorconcha serpenticola* Hershler *et al.*, 1994 (Bliss Rapids snail), were among a handful of taxa listed under the ESA before being scientifically described. Under the second Bush administration an amendment was added to the ESA disallowing the federal listing of undescribed species.



Figure 4. Shells of *Fluminicola fresti*. **A** Holotype; **B, C** Sympatric ovate-conic and trochiform shell morphs, respectively; **D** Shell. From Hershler *et al.*, 2017.

basin north of Little Butte Creek in spring-fed habitats (**Figure 4**). This small *Fluminicola* species was discovered while Terry and the author conducted surveys for the Oregon Heritage Program in the Umpqua and Rogue river drainages (Frest & Johannes, 1999). Terry and the author collected the holotype in 1994 from a diversion from Big Butte Springs through Butte Falls Hatchery, Jackson County, Oregon. This snail's distribution was cut in two by ash from the eruption of Mt. Mazama (Crater Lake) over 6000 years ago and still shows the impact of this event even now (**Figure 5**).

Hershler *et al.* (2017) honored Terry "...for his many contributions to the documentation of molluscan biodiversity in the northwestern United States."

Another larger *Fluminicola* species that was discovered by Terry with the author in the Umpqua River is also described in this paper and was given the name *Fluminicola umpquaensis* (Jade pabblesnail). Terry and I collected the holotype from the Umpqua River at Bunch Bar Access (County), west of OR38 (Umpqua Highway), Douglas County, Oregon in 1998. This species was found to be genetically close to the Columbia River basin occurring *Fluminicola virens* and *Fluminicola gustafsoni*, indicating, in addition to fish evidence, that there was once a former connection with the Umpqua River basin.

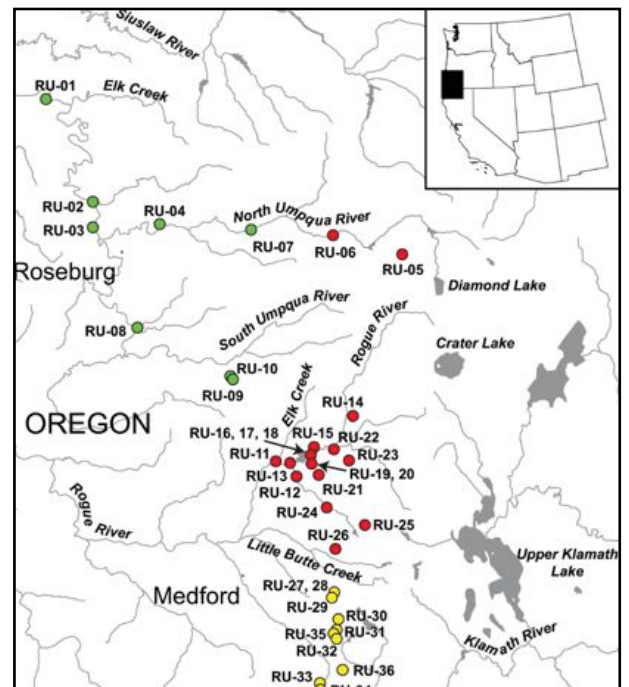
A range extension for *Fluminicola multifarioris*, originally found by Terry and I in the upper Sacramento River drainage, was also revealed by DNA evidence in Hershler *et al.* (2017).

Figure 5. Map of southwest Oregon showing the distribution of *Fluminicola fresti* (red dots), *Fluminicola umpquaensis* (green dots) and *Fluminicola multifarioris* (yellow dots). From Hershler *et al.*, 2017.

In addition to Banbury Springs where Terry and I collected the holotype in 2003, we also discovered *Idaholanx* at Thousand Springs (Minnie Miller Springs) at The Nature Conservancy Thousand Springs Preserve in 1991 (Frest & Johannes, 1992). Later U.S. Geological Survey personnel discovered it at their Briggs Springs gauging station in 1994 (Figure 3; U.S. Fish and Wildlife Service, 2006).

Campbell *et al.* (2017) named this species after Terry "...for his significant contribution to the knowledge of land and freshwater molluscs of North America, especially of the western states and who was also a colleague and friend."

The third snail named for Terry is *Fluminicola fresti* Hershler, Liu & Hubbard, 2017 (Frest's pebblesnail). This snail is distributed on the western slope of the Cascades and eastern portion of the Siskiyou Mountains in the North Umpqua River drainage and in the Rogue River



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