PUGNOSE MINNOW PUZZLE

Konrad Schmidt

Saint Paul, Minnesota

Skyler Wigen is a Minnesota Department of Natural Resources (MDNR) fisheries biologist stationed in Waterville, MN. He emailed me in June 2018 to report that he had found Pugnose Minnows *Opsopoeodus emiliae* in East Jefferson Lake in Le Sueur County, which is located in the headwaters of the Cannon River, a tributary to the Mississippi River (Figure 1). He noted that they were fairly common lake-wide, and he also found them in Middle Jefferson Lake the same day. These occurrences capped a string of records from Cannon River headwater lakes beginning in 2012. These lakes are 65 air miles disjunct from the nearest population of Pugnose Minnows in the mainstem Mississippi River.

The MDNR has designated the Pugnose Minnow a Species of Greatest Conservation Need (SGCN) due to its peripheral distribution in Minnesota and its wide fluctuations in abundance. The species' historical distribution was restricted to Mississippi River backwaters from Hastings, MN, to the Iowa border and the lower St. Croix River downstream of St. Croix Falls, WI (Figure 2). Ironically, there are no records for the species in the two natural lakes within its overall distribution (i.e., lakes St. Croix and Pepin). There are also only three records that are more than a short distance upstream of Mississippi River tributary mouths. These records are from the Root River in Fillmore County from 1946 and 1964 (Figure 2). No specific localities were noted for these records, but there are extant specimens from the 1946 collections (i.e., JFBM 16657 and 16569).

I had queried the data for the distribution map (Figure 2) in early 2013 but had not received all of the MDNR 2012 lake survey records, which reported Pugnose Minnows in Mazaska Lake in Rice County (Figure 3, number 2). This lake is near Shieldsville and drains to the Cannon River via Wolf Creek. Specimens were cataloged in the James Ford Bell Museum of Natural History fish collection (JFBM 47409-474911). Initially, when learning of this occurrence, I suspected it was a misidentification, but fortunately there were extant specimens available for verification. They were indeed Pugnose Minnows! When new and isolated occurrences of species are found, the most likely explanation is a bait bucket release. However, Pugnose Minnows do not have a verifiable history as a bait species. Perhaps the reason is their sensitivity to warm water and/or low dissolved oxygen. I have found that Pugnose Minnows have incurred very high mortality when I've transported small numbers of them during warm summer months to photograph in my aquariums.

In 2016, Skyler "threw a wrench" into the easy explanation that the new occurrence in Mazaska Lake was a non-indigenous (bait pail) population. He had found Pugnose Minnows in Tetonka Lake's Antl Bay near Waterville (Figure 3, number 3). This locality is approximately 49 stream miles from Mazaska and Tetonka is upstream of four Cannon River mainstem dams. With the help of NANFA member Greenwood Champ, I collected tissues from both localities in the event that funding could be found for ge-

Photos by the author unless otherwise indicated.

Figure 1. Pugnose Minnow from East Jefferson Lake on May 31, 2018. (Photo by Skyler Wigen, MDNR)

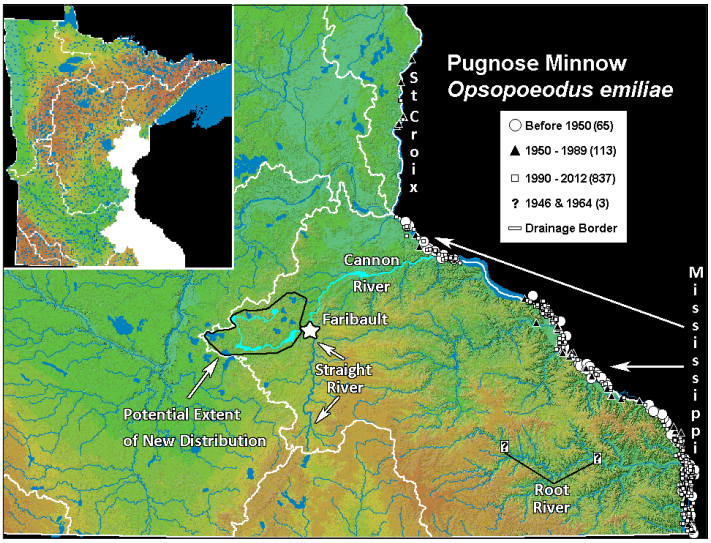

Figure 2. Pugnose Minnow historical distribution and potential extent of new distribution in Minnesota. Question marks (?) delineate the reach of the Root River within Fillmore County with records lacking specific locality data.

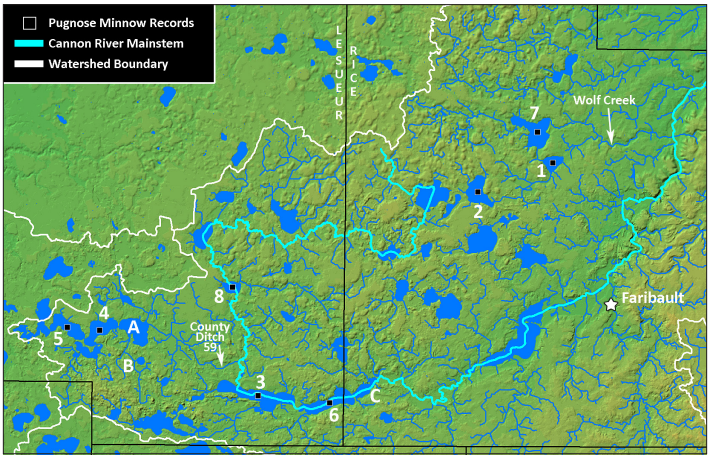

Figure 3. Numbers 1–8: Pugnose Minnow localities 2012–2018. Letters A-C: additional lakes surveyed in 2018.

Figure 4. Pugnose Minnow Habitat in Circle Lake (Rice County). Notice the eutrophic (green) water.

netic analysis. Analysis of nuclear DNA (aka the molecular clock) might reveal roughly when this population diverged from the Mississippi population. A long divergence would suggest that the Cannon River population is indigenous and not a bait pail introduction. The specimens and tissues are cataloged at the University of Tennessee's Etnier Ichthyological Collection (UT 44.13251 and 44.13252). In 2017, Skyler again "muddied the waters" finding Pugnose Minnows in Fox Lake (No. 1)

Soon after receiving Skyler's most recent news of Pugnose Minnows in East Jefferson and Middle Jefferson lakes (Figure 3, numbers 4 and 5), I felt that other Cannon River headwater lakes should be surveyed as well. This could not have been achieved without help from NANFA members Bryan Stefansky, Jenny Kruckenberg, and Jay Hatch. Our efforts produced new records for Pugnose Minnows in Circle (7), Sabre (8), and Sakatah (6) lakes. We also surveyed German (A), Roemhildts (B), and Lower Sakatah (C) lakes without success. However, I suspect Pugnose Minnows are very likely in German and Lower Sakatah.

All the lakes where the species has been found since 2012 are very eutrophic (Figure 4). We typically found Pugnose Minnows in shallow water with sparse vegetation such as Sago Pondweed *Stuckenia pectinata* and Wild Celery *Vallisneria americana*. German and Lower Sakatah lakes should be surveyed again for Pugnose Minnows. Additional surveys should be conducted in other Cannon River headwater lakes targeting Pugnose Minnow habitats. These efforts would reveal the full extent of this SGCN's distribution. Candidate lakes include Cannon, Caron, Cedar, Dora, Dudley, French, Gorman, Horseshoe, Hunt, Robards, Shields, Sunfish, Volney, Wells, and Union. Some of these lakes have had recent MDNR near-shore surveys using seines and backpack electroshockers, which targeted smaller species. However, I found in 2018 that both Circle and Sabre lakes required two separate surveys before successfully collecting Pugnose Minnows, thus suggesting that follow-up surveys on these lakes should be conducted.

ADDENDUM

Ryland Corchis-Scott (University of Windsor in Toronto) is conducting Species at Risk research to determine and characterize the genetic diversity and structure of North American populations of the Pugnose Minnow using microsatellite and mitochondrial data. The information gained through this study can be implemented in future efforts to conserve these at-risk species, especially in establishing evolutionarily significant units. The scope of his research includes the Pugnose Minnow, and he has been informed about the tissues collected in this article.