Distributional surveys of Umpqua chub *Oregonichthys kalawatseti* and smallmouth bass *Micropterus dolomeiu* the Umpqua Basin, Oregon.

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Summary

- One hundred and forty one sites in 14 water bodies were sampled to examine Umpqua chub and smallmouth bass distribution and abundance patterns.
- Umpqua chub was not widespread in any of the water bodies sampled, but was primarily restricted to middle to upper reaches of tributaries.
- Smallmouth bass was abundant throughout the main stem of the Umpqua River and the lower portions of tributaries.

Introduction

Umpqua chub *Oregonichthys kalawatseti* is a small (max. length about 65mm) cyprinid endemic to the rivers and streams of the Umpqua Basin, Oregon. Formerly considered Oregon chub *Oregonichthys crameri*, it was described as a new species (Markle *et al.* 1991) based on morphology and life history traits. It lives in moderate- to no-flow habitats typically associated with vegetation. It was formerly a U. S. Fish and Wildlife Service “Category 2” candidate, meaning further research on its abundance was needed prior to decisions on federal listing. The U.S. Fish and Wildlife Service subsequently discontinued this category. Due to its restricted distribution and threats from non-native fishes (primarily smallmouth bass *Micropterus dolomeiu*), Umpqua chub is currently a State of Oregon “sensitive – vulnerable” species (ODFW 1995). Smallmouth bass is a piscivorous centrarchid native to eastern North America (Scott and Crossman 1973) and appears to have been introduced into Oregon in 1924 or 1925 (Lampman 1946), and into the South Umpqua River from adjacent farm
ponds after 1964 floods (D. Loomis, district biologist, Oregon Department of Fish and Wildlife, Roseburg, OR).

Recent surveys in 1987 and 1998 suggested Umpqua chub distribution has become more restricted. Markle et al. (1991) surveyed 38 sites in several water bodies throughout the Umpqua basin in 1987 and found chub at 12 sites. A subsequent resurvey of the same sites in 1998 (Simon 1998, Simon and Markle 2000) found chub at only 6 sites, while smallmouth bass increased from 7 sites in 1987 to 19 sites in 1998. Markle et al. (1991), Simon (1998) and Simon and Markle (2000) expressed concerns that bass are negatively affecting Umpqua chub by restricting its distribution resulting in population fragmentation with unknown genetic and/or demographic consequences. In this survey we greatly expanded on the 1987 and 1998 surveys to determine relative abundance and distribution patterns of Umpqua chub and smallmouth bass throughout the Umpqua Basin and report on the status of Umpqua chub.

Methods

We sampled 141 sites in 14 water bodies covering all the larger mainstem rivers and major tributaries throughout the Umpqua Basin during the summers of 2006 and 2007 (Figure 1). The Cow Creek drainage and most of the South Umpqua drainage were sampled in 2006. The downstream-most two sites on the South Umpqua River and the rest of the drainages were sampled in 2007. We used snorkeling as our primary technique to obtain counts of Umpqua chub and smallmouth bass, but used other techniques when necessary including
above water visual walking surveys, a combination of snorkeling and above
ground walking surveys, and beach seine sampling. We used snorkeling in
waters that were large enough and deep enough to snorkel. When snorkeling in
larger waters we used 2 snorkelers; one on each half of the river. In smaller
waters we used one snorkeler to cover the entire stream. Where streams were
shallow and narrow, we used above water visual surveys to obtain counts.
Where streams were turbid we used beach seine sampling. Sometimes multiple
methods were used to best sample the water. In all, we used exclusively
snorkeling at 95 sites, above water visual surveys at 16 sites, a combination of
snorkeling and above water visual surveys at 18 sites, beach seining at 11 sites,
and beach seining and above water visual survey at 1 site. At a typical
snorkeling site we measured a stream reach of 200 meters either with a tape
measure or a hand-held GPS unit and sampled the entire 200 meters.
Considering all gears, the stream reaches sampled ranged from 50 to 400
meters in length. All Umpqua chub and smallmouth bass that were observed or
captured were counted, and all other species were noted. At a beach seine site
we attempted to collect 10 seine hauls, but we had 5, 6, and 7 hauls at three of
the eleven sites. All Umpqua chub captured with beach seines were measured
to fork length.

Results and Discussion

Umpqua chub was found in 11 of the 14 water bodies sampled, but
smallmouth bass was found only in 6 the water bodies (Table 1). A total of 2,859
chub and 5,060 bass were observed or captured. Chub was not broadly distributed anywhere it was found, but was found in isolated clusters (“isolates”) primarily restricted to the middle portions of tributaries and the upper portion of South Umpqua River (Figure 2). It was relatively common in three isolates: Cow Creek (including the lower reaches of its tributaries West Fork Cow Creek and Middle Creek), upper South Umpqua River, and Elk Creek (and its tributary Pass Creek). It was less abundant in three other isolates: Ollala Creek, Calapooya Creek, and Smith River (and its tributary North Fork Smith River). Small numbers of chub were found at three sites outside of these isolates: one site in lower Cow Creek (3 chub) and two sites in the mainstem Umpqua River just upstream of Calapooya Creek (8 chub). Umpqua chub was not observed or captured in Tenmile Creek, Lookingglass Creek, or Stouts Creek. Smallmouth bass, however, was broadly distributed throughout much of the Umpqua Basin (Figure 3). It was found in the mainstem lower reaches of Cow Creek, Elk Creek, Calapooya Creek, and Lookingglass Creek though it was not very abundant in Lookingglass Creek. It was found throughout most of the South Umpqua River and all of the Umpqua River. Smallmouth bass was not found in the Smith River drainage. The lower Umpqua River and lower Smith River are tidally influenced and saline, probably preventing invasion by smallmouth bass. Close-up maps of all the drainages with Umpqua chub and smallmouth bass distribution are shown in Figures 4-9.

Based on our observations, three of the six Umpqua chub isolates have overlapping distributions with smallmouth bass: Cow Creek, South Umpqua
River, and Calapooya Creek. However, bass is less abundant in these chub isolates than it is downstream (Figures 4, 5, and 7), suggesting chub may be able to persist in an environment of lower bass densities. Regardless, the presence of bass within chub isolates poses a continuing threat to chub persistence.

The three other Umpqua chub isolates do not appear to have overlapping distributions with bass: Ollala Creek, Smith River, and Elk Creek (Figures 6, 8, and 9). Ollala Creek is small, turbid, and not likely good habitat for bass. Its connection to the South Umpqua River is Lookingglass Creek, and Lookingglass Creek has relatively low densities of bass. Smith River is isolated from freshwater invasions from the Umpqua River by a saltwater barrier. The Elk Creek isolate appears to be the healthiest population of chub remaining. Our chub counts were highest in Elk Creek (Table 1, Figures 2 and 8), the spatial distribution was amongst the highest, and we found no overlapping distribution with bass. There is a small dam on Elk Creek (Figure 10) (Pete Baki, ODFW Habitat Conservation Biologist, Roseburg OR, pers. comm.) that may be preventing or limiting the spread of bass upstream. No bass were observed upstream of the dam, and no chub were observed downstream of the dam. We found chub to be reproducing in each of the isolates as evidenced by the presence of age-0 chub (Table 2). Length frequency of chub captured with beach seines is shown in Figure 11.

We found some small and isolated groups of chub downstream and outside of isolates in Cow Creek (under bridge at Riddle, 3 individuals), in the mainstem Umpqua River (between Calapooya Creek and the North Umpqua
River, 8 individuals), and to a lesser extent in the South Umpqua River (downstream of Stouts Creek, 20 individuals). These small groups of chub are probably vagrants from the upstream populations, arriving downstream due either to their voluntary downstream movement or involuntary downstream transport in winter/spring runoff. We suspect they are ephemeral groups with little chance of continued existence due to smallmouth bass, but they do show that the system retains the capacity to increase or re-establish Umpqua chub populations—a capacity compromised by the presence of smallmouth bass.

Conclusion

Other than scattered individuals, Umpqua chub remains only in six isolates with little chance of restored connectivity given high abundance of piscivorous, nonnative smallmouth bass throughout most of its range. The apparent patterns of displacement, whereby smallmouth bass appears to have eliminated Umpqua chub in downstream main stem sections of rivers and streams and restricted it to upstream reaches and lower order tributaries has resulted in fragmentation and isolation with unknown demographic and genetic consequences. This population fragmentation, initially suggested by the 1987 and 1998 surveys and more strongly reinforced in this survey, likely restricts gene flow, resulting in inbreeding and loss of fitness and genetic variation similar to the Klamath bull trout situation. (ODFW 1995).
References

Lampman, B. H. 1946. The coming of the pond fishes. Portland OR: Binfornds and Mort. 177 p


Table 1. Water body and number of Umpqua chub and smallmouth bass captured and/or observed, 2006-2007.

<table>
<thead>
<tr>
<th>Water Body</th>
<th>Sites</th>
<th>Sites with chub</th>
<th>Number of chub</th>
<th>Number of bass</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Umpqua</td>
<td>28</td>
<td>9</td>
<td>505</td>
<td>1949</td>
</tr>
<tr>
<td>Umpqua mainstem</td>
<td>22</td>
<td>2</td>
<td>8</td>
<td>2162</td>
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<tr>
<td>Cow Creek</td>
<td>22</td>
<td>9</td>
<td>429</td>
<td>329</td>
</tr>
<tr>
<td>Elk Creek</td>
<td>16</td>
<td>8</td>
<td>1437</td>
<td>308</td>
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<tr>
<td>Calapooya Creek</td>
<td>13</td>
<td>6</td>
<td>87</td>
<td>278</td>
</tr>
<tr>
<td>Smith River</td>
<td>11</td>
<td>4</td>
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<tr>
<td>West Fork Cow Creek</td>
<td>5</td>
<td>3</td>
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<td>Ollala Creek</td>
<td>5</td>
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<td>69</td>
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<td>Lookingglass Creek</td>
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<td>0</td>
<td>34</td>
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<tr>
<td>Pass Creek</td>
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<td>39</td>
<td>0</td>
</tr>
<tr>
<td>North Fork Smith River</td>
<td>4</td>
<td>1</td>
<td>14</td>
<td>0</td>
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<tr>
<td>Tenmile Creek</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Middle Creek</td>
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<td>7</td>
<td>0</td>
</tr>
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<td>Stouts Creek</td>
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<td>0</td>
<td>0</td>
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</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>141</strong></td>
<td><strong>47</strong></td>
<td><strong>2859</strong></td>
<td><strong>5060</strong></td>
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Table 2. Isolate, total number of age-0 chub, and total number of chub, 2006-2007.

<table>
<thead>
<tr>
<th>Isolate</th>
<th>Age-0 chub</th>
<th>Adult chub</th>
<th>Total chub</th>
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<tr>
<td>Elk Creek</td>
<td>377</td>
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<td>1476</td>
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<tr>
<td>Cow Creek</td>
<td>35</td>
<td>516</td>
<td>551</td>
</tr>
<tr>
<td>South Umpqua</td>
<td>214</td>
<td>291</td>
<td>505</td>
</tr>
<tr>
<td>Smith River</td>
<td>11</td>
<td>149</td>
<td>160</td>
</tr>
<tr>
<td>Calapooya Creek</td>
<td>47</td>
<td>40</td>
<td>87</td>
</tr>
<tr>
<td>Ollala Creek</td>
<td>1</td>
<td>68</td>
<td>69</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>685</strong></td>
<td><strong>2163</strong></td>
<td><strong>2848</strong></td>
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</table>
Figure 1. Location of 141 sampling sites the Umpqua Basin, 2006-2007.
Figure 2. Distribution of Umpqua chub in the Umpqua Basin, 2006-2007.
Figure 3. Distribution of smallmouth bass in the Umpqua Basin, 2006-2007.
Figure 4. Distribution of Umpqua chub and smallmouth bass in the Cow Creek drainage, 2006
Figure 5. Distribution of Umpqua chub and smallmouth bass in South Umpqua River drainage, 2006. The two most downstream sites were sampled in 2007.
Figure 6. Distribution of Umpqua chub and smallmouth bass in Ollala Creek drainage, 2007
Figure 7. Distribution of Umpqua chub and smallmouth bass in Calapooya Creek, 2007
Figure 8. Distribution of Umpqua chub and smallmouth bass in Elk and Pass creeks, 2007
Figure 9. Distribution of Umpqua chub in Smith River and North Fork Smith River, 2007. No smallmouth bass were observed in the Smith River drainage.
Figure 10. Location of dam on Elk Creek.
Figure 11. Length frequency distribution of Umpqua chub captured with beach seines in Ollala Creek and Elk/Pass creeks, 2007.