Timing of Population Fragmentation in a Vulnerable Minnow, the Umpqua Chub, and the Role of Nonnative Predators

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Sites sampled in 1987 and 1998

Present both surveys

Present 1987 only
2006

Cow Creek
Student project
2008 Distribution

Umpqua Chub

Smallmouth Bass

141 sites
Frequency of encounters for Umpqua Chub and Smallmouth Bass by stream order.
Is the fragmentation seen in genes and is it recent?

1. Rising sea level - 2500 yr
2. Tsunami - 330 yr
3. Striped Bass - 75 yr
4. Smallmouth Bass – 45 yr
5. Cunningham Dam - 45 yr

2008 survey: 141 sites
Ten microsatellite loci

K = 2

K = 3

K = 4

Elk Creek
Calapooya Creek
Olalla Creek
Cow Creek
S. Umpqua River
Smith River

Umpqua
Sisual
Coos
Cow Creek
Calapooya Creek
Elk Creek
North Umpqua River
South Umpqua River
Rogue
Smith River residuals 2.1 – 4.6 greater than others
IMA model of Splitting Time

Smith River versus Umpqua River

Assume no migration: 196 yr (44 – 340 yr)

Assume migration: 188 yr (20 – 396 yr)

If Smith R. separation is 2.1 – 4.6 times greater than others, all other populations separated 41 - 89 yr ago
Conclusions

1. Umpqua Chub populations formed by peripheral isolation from a larger population, the remnants of which are Calapooya-Olalla.

2. Smith R has been isolated ca. 200 yr (20 – 396 yr), and might have been associated with the last tsunami, 330 yr.

3. All others were isolated ca. 40 – 90 yr.

3. Elk Cr has been isolated by a dam, while isolation of all others correlates with the arrival of Smallmouth Bass.