
Piscivorous Impacts on Chinook (*Oncorhynchus tshawytscha*) in the Salmon Bay Estuary, the Lake Washington Ship Canal and Lake Sammamish

Brian Footen
Muckleshoot Indian Tribe Fisheries Division
39015 172nd Ave. 98302
Brian.Footen@muckleshoot.nsn.com

Lake Washington has been sampled extensively for piscivores in recent years. The diets of these piscivores have been studied to assess predatory impacts on salmonid fry and smolts (*Oncorhynchus sp.*). From 1997 to 1999 the Muckleshoot Fisheries Division (MITFD) in cooperation with United States Fish and Wildlife Service (USFWS), the Washington Department of Fish and Wildlife and the University of Washington sampled for piscivores in Lake Washington and the Ship Canal to assess the relationship between piscivore diets and the poor survival of sockeye (*Oncorhynchus nerka*) in the lake. This work was expanded in 1999, 2000, and 2001 by the USFWS and MITFD. In 1999 the Lake Washington Ship Canal was sampled to further investigate predatory impacts on chinook (*Oncorhynchus tshawytscha*) by smallmouth bass (*Micropterus dolomieu*). During the spring of 2000 the Salmon Bay Estuary west of the Ballard Locks was sampled to assess possible predatory impacts on chinook. In 2001 Lake Sammamish was sampled for piscivores after a pilot study in 2000 found that up to forty percent of yellow perch (*Perca flavescens*) contained chinook smolts during one sampling period in the spring.

The purpose of this study is to assess the overall impacts piscivores have on chinook in three areas of the Lake Washington basin by reviewing results from the 2000 Salmon Bay Estuary study and the 1999 Ship Canal study, and to look at the results from the 2001 Lake Sammamish study.

Salmon Bay Estuary

The nearshore area of Salmon Bay directly west of the Ballard Locks was sampled for piscivores from April to September 2000 using a beach seine. Six study areas were sampled once a week in the Inner Bay area starting at the first high slack tide of the day. Sea run cutthroat (*Oncorhynchus clarki*), char (*Salvelinus sp.*) and staghorn sculpin (*Leptocottus armatus*) were the primary predators in Salmon bay. In general consumption of chinook was low. Predation rates on chinook may have been low due to the high density of smaller prey such as sandlance (*Ammodytes hexapterus*) and juvenile chum (*Oncorhynchus keta*). Further study should concentrate on the pelagic zone where larger predators are foraging.

The Ship Canal

The nearshore area of the Lake Washington Ship Canal was sampled for piscivores using electrofishing by boat from April to August 1999. Results from this study indicate smallmouth bass ranging in size from 150-250 mm are the primary predators on salmonid smolts migrating through the study area. Forty percent of smolts were identified to species; of these, over half were chinook. The USGS is conducting additional work to determine the species composition of the remaining unidentified smolts. Northern pikeminnow (*Ptychocheilus oregonensis*) were also found to consume chinook smolts in the nearshore of the Ship Canal. These results should be

further investigated using a pikeminnow-specific study design, as electrofishing is not the preferred method for catching these predators.

Lake Sammamish

Lake Sammamish was sampled for piscivores using gillnets in three areas of the lake from April 2001 to the first week of June 2001. Gillnets 46 meters long by 4.6 meters deep with varying mesh size from 1 to 4.5 inch were set on the bottom, in the midwater and on the surface once a week at the mouth of Issaquah creek, the mid-area of the lake on the east and west side, and at the north end of the lake on the east and west side. Yellow perch and cutthroat trout were the most abundant piscivores caught. Yellow perch have not previously been considered to have impacts on smolt populations because of their size in relation to salmonid smolts. These data however indicate that as much as fifty percent of the yellow perch diet in late May consists of chinook smolts and other unidentified salmonid smolts. Yellow perch have the ability to have significant impacts on chinook smolt populations in Lake Sammamish because of their large population. Smallmouth bass were also found to be consuming chinook smolts in Lake Sammamish at a frequency of over one fish per stomach. Additional work using electrofishing should be done to further quantify smallmouth bass impacts in Lake Sammamish, as gillnets are ineffective at capturing these piscivores. Cutthroat trout are also major consumers of chinook in Lake Sammamish.

Conclusions

- Piscivores in the Salmon Bay nearshore have a low impact on chinook. However the pelagic zone should be studied to assess larger predator impacts.
- Smallmouth bass in the Ship Canal are impacting chinook smolts migrating to Salmon Bay. Northern pikeminnow impacts should be further investigated.
- In Lake Sammamish yellow perch and cutthroat trout appear to be having a significant impact on chinook smolt survival. Population and consumption estimates will further refine the magnitude of this impact. Additional work should be done to quantify the impact of smallmouth bass predation on chinook in Lake Sammamish.