



RECOVERY POTENTIAL ASSESSMENT OF THE CULTUS PYGMY SCULPIN (*Cottus* sp.)



Cultus pygmy sculpin.

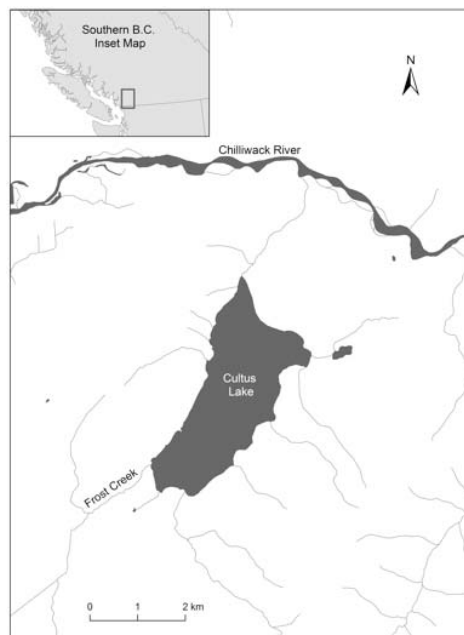


Figure 1: Geographic range of *Cultus pygmy sculpin*

Context :

The Cultus pygmy sculpin is listed as Threatened in Schedule 1 of SARA, and a Proposed Recovery Strategy for Cultus Pygmy Sculpin has been prepared. The population was first designated by COSEWIC as Special Concern in April 1997; it was re-examined and designated Threatened in November 2000. A new draft status report has been submitted to COSEWIC. The population is also listed as Critically Imperiled by the Nature Conservancy of Canada, and red-listed by the British Columbia Conservation Data Centre.

Key issues for Cultus pygmy sculpin include its being confined to a single lake in a popular recreation area in the Fraser Valley, and the almost complete lack of knowledge of its natural history and abundance.

SUMMARY

- The Cultus pygmy sculpin is confined to Cultus Lake in the Fraser Valley. We know almost nothing about its natural history, abundance, habitat requirements, causes of mortality, or environmental factors that affect abundance. Its habitat has been inferred through incidental observations made during sampling for other species, and is assumed

to include the greater part of Cultus Lake from surface to near-bottom, excluding only a poorly defined littoral (shoreline) fringe where it has not so far been observed.

- In the absence of further information, critical habitat for Cultus pygmy sculpin is synonymous with its known distribution.
- The main threat is introduction of an exotic species such as yellow perch, bass, bullhead and pumpkinseed. Other threats include interaction with salmonids and alterations to habitat.
- It is impossible to say whether critical habitat or ecosystem relationships in the lake limit the population's long term viability. Holes in our knowledge of the natural history of the Cultus pygmy sculpin need to be urgently filled.
- For a population of unknown abundance that cannot be shown to have declined or to be declining, population targets cannot be established, nor can the time frame for recovery be predicted. The target must remain a healthy, self-sustaining population.
- Because the COSEWIC designation of Threatened is related to the extreme endemic distribution, clarification of taxonomic status is important for determining the uniqueness of the species.

BACKGROUND

Sculpins are bottom fish common in marine and fresh waters of North America, Northern Asia and Japan. Cultus pygmy sculpin is a landlocked form of the coast-range sculpin *Cottus aleuticus* and generally grows no bigger than 52 mm. The two forms also differ in several anatomical and meristic (repeated and countable) characters, and the pygmy sculpin also appears to retain the pelagic habit that's normally replaced, after the larval stage, by a life spent on the bottom. Cultus pygmy sculpin are prey for several fish species in the lake; char (several species of *Salvelinus*) is the leading predator.

The Cultus pygmy sculpin is confined to Cultus Lake, a productive sockeye nursery lake 10 km south of the town of Chilliwack in the Fraser Valley. To the best of our knowledge, the Cultus pygmy sculpin is unique, but this needs confirming through taxonomic research. We know almost nothing about its natural history, habitat requirements (and which habitats may be limiting), causes of mortality, or environmental factors that affect abundance. Reproduction has never been observed. Cultus pygmy sculpin have never been caught along the lake shoreline and are not presumed to live on the bottom in deeper parts of the lake – although that habitat has never been sampled for them.

Threats to Cultus pygmy sculpin

The only incontrovertible human-caused threat to the population is its occasional bycatch in the midwater trawls performed to enumerate juvenile sockeye salmon in the lake. Other threats include:

Exotic species. Introduction of an exotic species such as yellow perch, bass, bullhead and pumpkinseed could increase predation on Cultus pygmy sculpin, introduce diseases, or cause changes in habitat and food supply that are detrimental to survival. The difficulty of eradicating alien species makes this threat the primary human-caused one, but it is impossible to quantify.

Interaction with salmonids. Stocking or supplementation of Cultus Lake with salmonid species that prey on Cultus pygmy sculpin larvae and adults could affect Cultus pygmy sculpin

population size. Since current sockeye supplementation does not contemplate creating sockeye populations in the lake that approach historic levels, the threat of interaction with salmonids is small. It cannot currently be quantified.

Threats to Critical Habitat and Food Chains. As an extreme endemic, the population is vulnerable to habitat changes. Given the current degree of protection of Cultus Lake foreshore and assuming that critical habitat of the Cultus pygmy sculpin does *not* turn out to include tributary streams or littoral benthic areas, the likelihood of critical habitat becoming limiting appears to be low. Pending clarification of the Cultus pygmy sculpin's use of nearshore bottom areas for spawning and egg incubation, and its potential use of milfoil as cover, water milfoil colonization may be a threat or a benefit. Although recreational use of the lake also alters habitat, we cannot judge whether it poses a significant threat to Cultus pygmy sculpin habitat without more knowledge about habitat use. Water quality and zooplankton abundance in Cultus Lake appear to have changed very little over the last sixty years, so the associated threats to Cultus pygmy sculpin should be considered low and difficult to quantify.

ANALYSIS

It is presently impossible to say whether critical habitat or ecosystem relationships in the lake limit the population's long term viability. For this situation to change, holes in our knowledge of the natural history of the Cultus pygmy sculpin – especially its reproductive behaviour, feeding behaviour and movements within the water column—need urgently to be filled. It is entirely possible that this learning process will uncover uses of habitat that we now know nothing about. Because existing analysis of trends in the limnetic habitat of Cultus Lake indicate little change over the past six decades, the amount of limnetic habitat currently available can thus be considered stable. Benthic habitat, however, has not been stable in Cultus Lake since the introduction of Eurasian water milfoil (*Myriophyllum spicatum*) in the late 1970s. If Cultus pygmy sculpin in fact reproduce at depths that are colonized by water milfoil, an increase in milfoil colonization could represent a negative trend in critical habitat (if the plant inhibits spawning) or a positive one (if milfoil provides increased spawning habitat as it appears to do for other sculpin species in the lake. Speculation about the plant's role as habitat for pygmy sculpin is pointless without better knowledge of the population's natural history.

For a population of unknown abundance that cannot be shown to have declined or to be declining, population targets cannot be established, nor can the time frame for recovery be predicted because the term is not appropriate for what may in fact be a healthy population. Until a directed enumeration program for Cultus pygmy sculpin is designed and mounted, the target must remain a healthy, self-sustaining population.

Sources of uncertainties

We know so little about Cultus pygmy sculpin that the key issue in its recovery is this lack of knowledge. Fortunately, Cultus Lake has been the subject of much scientific enquiry over recent decades: the existence of a sockeye population adapted to local conditions has resulted in the longest historical series of physical and biological observations of any sockeye population in B.C. Much of the limnological knowledge gleaned from studying sockeye can be applied to the Cultus pygmy sculpin.

Listing of the Cultus pygmy sculpin is not based on population trends or absolute abundance because there are not enough data to assess either. We know neither the current abundance of Cultus pygmy sculpin in Cultus Lake nor any historic trends. Nor do we know if there are natural population fluctuations and, if so, how big they are and what causes them. Estimates of

abundance have relied on historic (pre-1960) trapping and analysis of predator stomach contents, and the numbers caught in mid-water trawls designed to estimate juvenile populations of sockeye salmon. There is a slight but statistically insignificant annual decline in the number of sculpins caught in sockeye trawls. The long-term accumulation of data on sockeye fry does represent a valuable baseline of Cultus pygmy sculpin abundance, although this baseline is relative, not absolute. The statistically insignificant decline in sculpin bycatch in these trawls is not enough to allow us to identify any trajectory of Cultus pygmy sculpin abundance.

While it is relatively easy to define the range of the Cultus pygmy sculpin, its critical habitat within Cultus Lake is much more difficult to describe, let alone quantify. Because its habitat has been inferred through incidental observations made during sampling for other species (salmonids, pikeminnow), there are conspicuous gaps for all life stages, especially concerning habitat used for reproduction. All we can say now with confidence is that the Cultus pygmy sculpin occupies the greater part of Cultus Lake from surface to near-bottom, excluding only a poorly defined littoral (shoreline) fringe where it has not so far been observed. Ignorance about its reproductive and feeding behaviour means we cannot quantify the relative importance of limnetic and benthic (bottom) habitats, and the sampling regimes used to date tell us nothing about any possible diurnal variations in depth distribution.

CONCLUSION AND ADVICE

Because the COSEWIC designation of Cultus pygmy sculpin as *Threatened* is related to its extreme endemic distribution, clarification of taxonomic status is important for determining the uniqueness of the species.

Habitat requirements have been inferred through incidental observations and there are conspicuous knowledge gaps in all life stages, especially concerning habitat used for reproduction. In the absence of further information, critical habitat for Cultus pygmy sculpin is synonymous with its known distribution.

The lack of any direct census data to assess population abundance and trends precludes recommending numerical recovery targets or using Population Viability Assessment methods. In the absence of hard data on abundance, long-term viability of the population should be the goal.

The major threat is likely the potential for the introduction of aquatic invasive species.

SOURCES OF INFORMATION

COSEWIC. 2006. Assessment and Status Report on the Cultus Pygmy Sculpin *Cottus sp.* in Canada. Draft Report. 31 pp.

DFO, 2007. Proceedings of the PSARC review on the recovery potential assessments on Speckled Dace, Cultus Pygmy Sculpin, and Okanagan Chinook, June 19-20, 2007. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2007/038.

Environment Canada. 2006. Proposed Recovery Strategy for the Cultus Pygmy Sculpin (*Cottus sp.*). Prepared for British Columbia Ministry of Environment and Fisheries and Oceans Canada by Solander Ecological research, Victoria, B.C. 19 pp.

Harvey, B. 2007. Recovery Potential Assessment for the Cultus Pygmy Sculpin (*Cottus sp.*). Canadian Science Advisory Secretariat Research Document 2007/039.

FOR MORE INFORMATION

Contact: Neil Schubert
Fisheries and Oceans Canada
Burnaby, B.C.

Tel: (604) 666-8452

Fax: (604) 666-1995

E-Mail: Neil.Schubert@dfo-mpo.gc.ca

Or

Contact: Alan Cass
Fisheries and Oceans Canada
3190 Hammond Bay Rd.,
Nanaimo, B.C. V9R 5K6

Tel: (250) 756-7142

Fax: (250) 756-7209

E-Mail: Alan.Cass@dfo-mpo.gc.ca

This report is available from the:

Centre for Science Advice (CSA)
Pacific Region
Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Road
Nanaimo, BC V9T 6N7

Telephone: (250) 756-7208

Fax: (250) 756-7209

E-Mail: psarc@dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1480-4913 (Printed)

© Her Majesty the Queen in Right of Canada, 2008

La version française est disponible à l'adresse ci-dessus.

**CORRECT CITATION FOR THIS PUBLICATION**

DFO. 2008. Science Advisory report on Recovery potential of the Cultus Pygmy Sculpin (*Cottus sp.*). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/033.