



Photo credit: NOAA

KEY INFORMATION

Area(s) of Concern

“Salish Sea” (i.e., Puget Sound, Strait of Georgia, Strait of Juan de Fuca)

Year Identified as “Species of Concern”
2010

Factors for Decline

- Historic overfishing
- Climate change

Conservation Designations

IUCN: Not Evaluated

American Fisheries Society: Vulnerable

Washington State: Species of Concern and Priority Species

Current Status:

New genetic information indicates that cod in the Salish Sea represent a unique lineage and are genetically different from coastal Pacific cod (Cunningham *et al.* 2009, Canino *et al.* 2010). This information, in concert with the unique environment of the inland waters of the Salish Sea, suggests there is a separate population of Pacific cod inhabiting the Salish Sea the Strait of Juan de Fuca, Strait of Georgia and Puget Sound.

Small population size due to past overfishing is the primary threat to Salish Sea Pacific cod. Pacific cod were once abundant and an important component of the sport and commercial fisheries in the Salish Sea (Palsson 1990). Participation in this fishery increased in the 1970s and peak harvests occurred in the late 1970s and early 1980s. Declining recreational and commercial catches led the Washington Department of Fish and Wildlife to enact fishery management changes in the early 1990s. Although commercial and recreational harvest have been greatly reduced in the

U.S. portion of the Salish Sea, cod abundance has not recovered to historic levels giving cause for concern about the species status. In the Canadian portion of the Salish Sea, recreational fishing regulations allow a year-round harvest of 8 cod daily with no size limit. There is no approved commercial fishery for Pacific cod in the Canadian portion of the Salish Sea.

Additional threats to the Salish Sea population of cod include climate change and predation (Gustafson *et al.* 2000, Beamish 2008). This population is near the southern limit of the species' range and is likely to be adversely affected by a warming climate. Other potential threats include bycatch in non-targeted fisheries (e.g., the lingcod fishery) and loss of near shore nursery habitats such as eel grass (West 1997). More research is needed to determine what factors may be limiting this population's ability to recover.



Species of Concern

NOAA National Marine Fisheries Service

Existing Protections and Conservation Actions:

Recognizing the weak condition of Pacific cod stocks in the Salish Sea, WDFW has implemented a number of measures to reduce the impact of fishing. During the 1990s, WDFW progressively closed or limited the harvest of cod by commercial fisheries. They have prohibited the harvest of cod by recreational fishers south of Port Townsend and limited the daily recreational take to two fish per day in waters north of Port Townsend. WDFW also implemented a winter closure for all recreational fisheries in the waters once supporting spawning Pacific cod in Agate Passage in Puget Sound.

Data Deficiencies:

There is limited fishery independent data from recent time periods on Pacific cod in the Salish Sea. Since fishery harvest was significantly reduced in the early 1990s, even less information on population status is available. Additional research into population-specific limiting factors and threats would increase our understanding of why certain spawning aggregations have disappeared and of possible effects of climate change on this population.

Brief Species Description:

Pacific cod are brown or gray fish with brown spots on their backs and sides. They have 3 dorsal fins, 2 anal fins, and a distinctive chin barbell. Adults average approximately 20–25 inches (50–60 cm) and reach a maximum size of approximately 45 inches (114 cm). Pacific cod inhabit the North Pacific Rim from the coast of northern China east into the Bering Sea and south along the Canada and U.S. west coasts to southern California.

Pacific cod are schooling fish living near the ocean bottom. In the Salish Sea, cod can be found over sand and mixed coarse bottom substrates (Palsson 1990). There is some evidence to indicate that eel grass (*Zostera marina*) may be an important habitat feature for juvenile Pacific cod (Johnson *et al.* 2003). Cod are nocturnal and opportunistic predators, feeding on krill, shrimp, sand lance, and crabs. They provide prey for seals, halibut, and other fishes.

Cod reach sexual maturity at approximately 16 to 22 inches (40–56 cm) in length at approximately 2 years of age. Females produce from 225,000 to 5 million eggs per year. In the Salish Sea, cod migrate between shallow winter spawning areas and deeper summer feeding areas (Palsson 1990). Aggregations of cod in Agate Passage and Port Townsend Bay (both in Puget Sound) were historically subject to heavy sport and commercial fisheries.

Contact Information

For Salish Sea cod, contact:

Eric Murray
NOAA Fisheries, Northwest Region
Protected Resources Division
1201 NE Lloyd Blvd., #1100
Portland, OR 97232
(503) 231-2378

Eric.Murray@noaa.gov

<http://www.nmfs.noaa.gov/pr/species/concern>

For Species of Concern, contact

NOAA Fisheries
Office of Protected Resources
1315 East West Highway
Silver Spring, MD 20910
(301) 713-1401

soc.list@noaa.gov

References

- Beamish, R.J. 2008. PICES Scientific Report No. 35. 217 p. http://www.pices.int/publications/scientific_reports/Report35/Sci_Rep_35.pdf.
- Canino, M.F., et al. 2010. Molecular Ecology 19, 4339–4351.
- Cunningham, K.M., et al. 2009. Canadian Journal of Fisheries and Aquatic Sciences. 66: 153-166.
- Gustafson, R.G., et al. 2000. U.S. Dept. of Commer., NOAA Tech. Memo. NMFS-NWFSC-44, 275 p.
- Johnson, S.W., et al. 2003. NOAA Technical Memorandum NMFS-AFSC-139, 48 p. <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-139.pdf>
- Palsson, W.A. 1990. Washington Department of Fisheries. Technical Report No. 112. 137 p.
- West, J.E. 1997. Protection and restoration of marine life in the inland waters of Washington state. Puget Sound Water Quality Action Team, Puget Sound/Georgia Basin Environ. Rep. Ser. No. 6, 144 p.