

STREAM ECOLOGY

FISHES

- BC has 65 or 66 freshwater fish species.
- Relatively high diversity for this latitude.
- Lots of endemic species.
- Lots of diversity within each species
 - E.g., Salmon populations are often locally adapted
 - E.g., Sticklebacks

Aquatic ecoregions.—The fish communities are different in different regions. This is due to different sources and also habitat types.

1. North Pacific Coastal—mostly *euryhaline* species.
2. Yukon—some derived from Bering Refugium.
3. Mackenzie—derived mostly from the Great Plains refugia.
4. Interior—mostly consists of interior Fraser drainage.
5. Columbia

Biogeography—distribution of species through geologic time

Fish distributions in BC have been strongly by by:

1. Complex topography

BC has a lot of habitat diversity, with enormous differences in temperatures, rainfalls, etc.

2. Recent Glacial history

18,000 before present (BP) British Columbia was almost entirely covered with ice. As the glaciers recovered, fish species recolonized, either through the ocean (for species that can tolerate saltwater) or through river networks. Glacial dynamics change landscape connectivity, providing periodic isolation and then reconnection of populations. This drives local adaptation. The diversity of fish we currently see in BC is reflects these glacial dynamics.

BC freshwater fish recolonized from three main refugia:

1. Bering Refugium—(NW Alaska)--7.8% species.
2. Pacific Refugium—(WA, OR, ID, CA)--30.7% of native BC freshwater fish from this region
3. Great Plains Refugium—(ID, WY, MONTANA)--24.6% of native BC freshwater fish.

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- Many species (36%) seem to have recolonized from multiple regions. This can reconnect populations that diverged during the glaciation. For example, in some regions there is a mix of more northern-origin and southern-origin Chinook salmon. Genetic tools are increasing shedding insights into how diverged populations are now sometimes in the same watershed.
- There were some little regions that seem to have escaped glaciations. For example, Brooks Peninsula on Vancouver Island is thought to have been a tiny glacial refuge. There is a lineage of stickleback that seems unique from there.
- **Interdrainage faunal transfer.** As glaciers retreated, they would form ice dams that could create large glacial lakes. These lakes could spill water and fish into adjacent watersheds. For example, it is thought the Fraser used to connect with the Peace.
- **Isostatic rebound.** Released from the weight of the glaciers, the earth can rise. This can isolate once migratory populations when fjords turn in lakes, driving divergence (e.g., Vancouver lamprey).

CONSERVATION AND MANAGEMENT

- Compared to many regions, BC fishes are doing relatively well. However:
 - 2 – 4 native fish species have gone extinct in BC
 - Benthic limnetic stickleback pair
 - Hundreds of locally adapted populations have been extirpated.
- Major threats
 - Habitat degradation
 - Invasive species?—increasing dramatically
 - Climate change?
- **Fisheries Act has been severely weakened**
 - Historically: “No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat”
 - There was still considerable power for the Minister to approve developments and projects were rarely turned down. But, fish habitat was recognized as being important.
 - Harper government revised the Fisheries Act with Bill 38C (2012): “No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery”.
 - It isn’t clear exactly how this will be enforced. However,
 - Habitat is now not protected.
 - Fish that aren’t fished for aren’t protected.