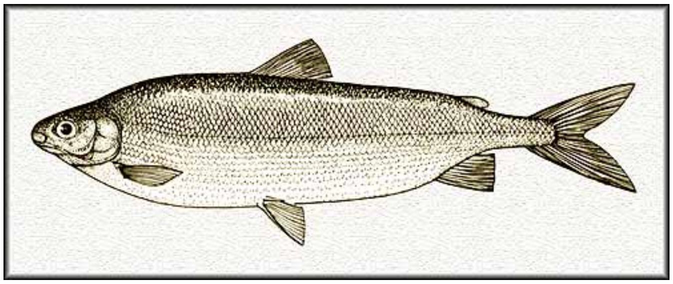
BROAD WHITEFISH

TAXONOMY

Scientific name: *Coregonus nasus* (Pallas, 1776)
Common name: Broad whitefish
Family: Salmonidae
Taxonomic comments:
Various, unrelated fishes around the world are called whitefishes. In North America, the name applies to species in the subfamily Coregoninae. Confused nomenclatural history; formerly synonymized with *C. kennicotti* by some authors (Scott and Crossman 1973).



Using microsatellite and mitochondrial DNA markers to compare genetic variation, Patton et al. (1997) reported limited gene flow between populations in the Colville and Sagavanirktok rivers, and suggest they represent semi-isolated spawning populations.

DESCRIPTION

Basic description: A true whitefish.

General description:
Dorsal profile of head rounded to flat with an elongate and compressed body. Coloration is olive-brown to nearly black on back; silvery sides, often with a gray cast; belly white to yellowish and fins are usually gray in adults and pale in young (Morrow 1980). Maxilla broad, length less than twice its width; gill rakers short and blunt (Mecklenburg et al. 2002). The largest of the Alaska whitefishes. Distinguished from closely related humpback whitefish (*C. oidschian*) by its larger size, deeper head, shorter gillrakers, and short, blunt snout.
Length (cm): 71

Reproduction:
Spawns September-October, possibly into November. In the Kuskokwim River, Alaska, spawns as the river freezes (ADFG 1985). Young hatch in spring. In a Siberian population, maturity was attained at about age 7 and maximum lifespan was 15+ years (Scott and Crossman 1973, Morrow 1980). In Alaska, fish reach maturity around 5 to 7 years (Alt 1976). Both nonconsecutive (i.e. in the Kuskokwim and Yukon River systems and Minto flats area) and consecutive (i.e. Innoko River) spawning have been observed in Alaskan river systems (ADFG 1985).

Ecology:
Coregonids are core elements of estuarine and freshwater ecosystems of the Arctic Sea basin and play principal roles in food chains of the tundra zone (Patton et al. 1997, Politov et al. 2000). They also have great economic importance in subsistence fisheries.

Migration:
Adults are more or less anadromous, although those reaching the sea do not venture far from brackish water. Upstream migration begins as early as June and may extend into September or later. Adults apparently return downstream after spawning (Morrow 1980). Migrations up to several hundred miles between summer feeding habitats, spawning areas and over-wintering habitats are reported (ADFG 1985). Salinities greater than 20% may act as isolating barriers between populations (Alt 1976). Upstream migration may be inhibited by stream reaches longer than 100m with velocities greater than 40 cm/sec (Hale 1981).

Food:
Eats chironomids, snails, bivalve mollusks, mosquito larvae, and crustaceans; appears to be mainly a bottom feeder (Morrow 1980).

Habitat:
Primarily a freshwater species, also uses the coastal zone as a migration corridor and an alternate feeding habitat under suitable conditions (Gallaway et al. 1997). Those moving to coastal waters for winter apparently do not venture far from brackish water; over winter in deep parts of rivers. Utilizes ponds, lakes, small streams, sloughs and the main channel of large river systems and near shore brackish estuaries throughout its range. More common in rivers than in lakes. Spawns in streams with gravel bottoms (Morrow 1980). Eggs are broadcast over substrates ranging from mud and sand to gravel and cobble, with small gravel being the most common (Hale 1981). Young move downstream after hatching.

STATUS

Global rank: G5 (1996-09-09)
Global rank reasons:
Global rank reasons currently unavailable.

State rank: S4S5 (2004-07-26)
State rank reasons:
Widely distributed and locally abundant in Arctic Alaska. Overall population status and trends unknown. Few known spawning areas. Threats include localized human harvest and by-catch in commercial fisheries; flow alteration, stochastic or man-made, resulting in restriction of movements between spawning and other habitats; and habitat destruction due to oil development along the North Slope.

DISTRIBUTION AND ABUNDANCE

<u>Range:</u>
Global range:
Primarily in Arctic drainages from Pectoral River, (former) USSR, east to Alaska and northwestern Canada to Perry River, Northwest Territories, and south to Kuskokwim River, Alaska, and Pinching River, Sea of Knots (Lee et al. 1980, Page and Burr 1991). Two main population centers in the Alaskan/Canadian Beaufort Sea; Alaskan populations typically associated with tundra-draining rivers west of and including the Sagavanirktok River, Canadian populations associated with the Mackenzie River system (Craig and McCart 1975, Craig 1984). No known spawning

populations in mountain-draining rivers between the Sagavanirktok River and the Canadian border (B. Fechhelm, pers. comm.).

State range:
Found throughout Alaska from the Kuskokwim River north to the Arctic Coast. Found in most rivers draining into the Bering, Chukchi and Beaufort Seas. Major arctic systems include: Sagavanirktok, Colville, and Kobuk Rivers (Morrow 1980, Hale 1981, ADFG 1985). Present throughout the Yukon River drainage from the mouth to the headwaters in British Columbia, including the Innoko, Koyukuk, Porcupine River tributaries. In the Tanana River drainage, widespread in the Minto flats area and the lower Tolovana, Chatanika, and Tatalina rivers. The southern limit inland is approximately 60° North (Hale 1981). Fishery surveys (Fechhelm et al. 1984) and patterns in subsistence harvest (Craig 1989) suggest broad whitefish are absent along much of the northeast Chukchi Sea coast from Cape Lisburne to Wainwright.

Abundance:
Global abundance:
Unknown.

State abundance:
Unknown, but presumed common to abundant throughout its range. Widely distributed throughout the Arctic region and frequently caught in near shore waters of the Beaufort Sea, also widely distributed in the Yukon River drainage (Alt 1983). Reported as abundant in the Innoko River system; also abundant in the Minto Flats area of the Tanana River, but rare farther upstream (Alt 1983). Common in the entire Kuskokwim River system (Alt 1971, Baxter 1973).

Population estimates from the Sagavanirktok River subregion (North Slope - Prudhoe Bay), 1982-1992, ranged from 172,298 at the beginning of the study to 133,227 at its completion, with a low count of 25,800 in 1984 and a high of over 432,000 in 1990 (Gallaway et al. 1997). At Teshekpuk Lake, 542 fish were collected in 1990, 707 in 1991 and 555 in 1992 (Philo et al. 1993).

Trends:
Global trend:
Unknown.

State trend:
Unknown but presumed stable. Gallaway et al. (1997) observed fluctuations in abundance and size/age population structure in the Prudhoe Bay Region between 1982 and 1992, with peak levels of abundance in 1990 and 1991 but no marked decline or increase over the 10-year period. This trend may be indicative of a 10-year population cycle in which fish compete for freshwater wintering habitat with poor juvenile survival resulting from displacement by adults (Thorsteinson and Wilson 1995). Lower harvest rates were recently noted by subsistence users in the Yukon Flats area (Andersen and Fleener 2001).

EXISTING PROTECTION

Global protection:
Unknown.

State protection:
The Alaska Board of Fisheries develops regulations governing the harvest of broad whitefish throughout its freshwater and coastal marine range. Because only localized harvesting by commercial, subsistence and sport fisherman occurs, no statewide management plan has been formulated (ADFG 1985).

CHALLENGES

Global challenges:
See State challenges.

State challenges:
Reduced access to and from freshwater wintering and spawning habitat due to flow alteration or water diversion may be a limiting factor (Gallaway et al. 1997, ADFG 1985, Morris 2003). Floods and high water events are needed to access and leave important summer feeding sites such as shallow water lakes (Andersen and Fleener 2001, Morris 2003); drier climatic trends in Interior Alaska could result in reduced access to feeding habitats. Warmer temperatures and less precipitation in the last 50-60 years may have adversely impacted whitefish in the Yukon Flats area, where local Alaskans noted decreased flooding and increased abundance of beaver dams in lake-access streams (Andersen and Fleener 2001). Large scale gravel mining in river deltas can also disrupt the hydrologic regime, affecting availability of spawning and over wintering habitat (ADFG 1985).

Species is particularly susceptible to mortality during winter due to concentrated numbers restricted to small pockets of under-water ice. Morris (2003) found that when broad whitefish wintered in shallow lakes they failed to survive the winter. Possible causes of mortality in wintering pools include low dissolved oxygen levels and freezing (ADFG 1985).

Whitefish are an important food source throughout most of their range, and localized subsistence or commercial harvest may threaten to reduce resident populations. This species is captured as by-catch in both commercial and subsistence salmon fisheries (particularly on the Yukon and Kuskokwim Rivers). It is the most frequently targeted whitefish species in the Yukon Flats Region (Andersen and Fleener 2001). Subsistence harvest of whitefish and sheefish in Fort Yukon is greater than 52,000 lb per year (Sumida and Andersen 1990, Andersen and Fleener 2001). For six communities on the Kobuk and Noatak Rivers, whitefish harvests ranged from 40,000-85,000 fish during the years 1997-2000 (Georgette et al. 2003). Harvest of broad whitefish in the Colville River and delta range from 3,100 to 4,500 fish (Moulton et al. 1986, Nelson et al. 1987). An average of 17,300 broad whitefish were harvested annually in Barrow between 1987 and 1989 (Braund and Associates 1993).

Oil and gas exploration and development in the arctic region could impact species nearshore habitat. Causeway construction can alter coastal hydrography causing gradient barriers in nearshore waters that become colder and more saline, conditions less tolerated by this species (Gallaway et al. 1997). Griffiths et al. (1992) found that broad whitefish avoided causeway-affected areas in the Sagavanirktok delta and that juvenile fish growth showed a negative relationship to temperature and salinity. However, a study of the Endicott Causeway in Prudhoe Bay found population fluctuation independent of causeway effects (Gallaway et al. 1997).

RESEARCH AND INVENTORY NEEDS

Global research needs:
See State research needs.

State research needs:
Research needed on early life history, population dynamics, population genetics, migrations, and important seasonal habitats and migration corridors. An arctic species, the potential affects of global warming on population dynamics warrants further study.

Global inventory needs:
See State inventory needs.

State inventory needs:
Current needs include estimates of localized populations. Documentation of subsistence and commercial harvest for each region needed. Spawning and wintering habitats should be located and mapped. Identification of trends in abundance and changes in distribution needed.

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
See State conservation and management needs.

State conservation and management needs:
Identify critical spawning and wintering habitat, and protect when necessary. Management and, if necessary, regulation of subsistence harvest should be continued and better documented. By-catch in salmon subsistence and commercial fisheries should also be monitored and regulated.

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Acknowledgements

State Conservation Status, Element Ecology & Life History Author(s): Gotthardt, T.A. and M. Booz
State Conservation Status, Element Ecology & Life History Edition Date: 23Mar2005

Reviewer: Robert G. Fechhelm, LGL Ecological Research Associates, Inc.

Life history and Global level information were obtained from the on-line database, NatureServe Explorer (www.natureserve.org/explorer). In many cases, life history and Global information were updated for this species account by Alaska Natural Heritage Program zoologist, Tracey Gotthardt. All Global level modifications will be sent to NatureServe to update the on-line version.
Global Element Ecology & Life History Edition Date: 04May1993
Global Element Ecology & Life History Author(s): Hammerson, G.
