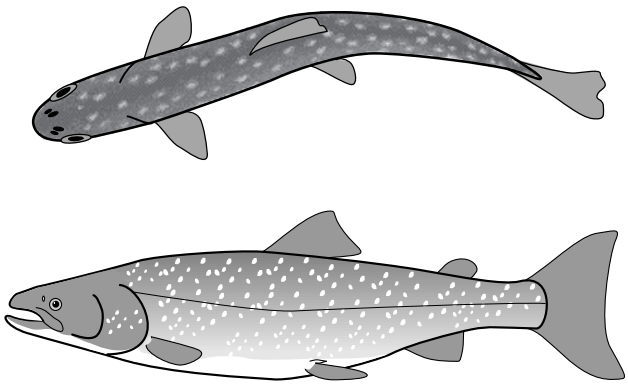
Cannings, S.G., and J. Ptolemy. 1998. Rare Freshwater Fish of British Columbia. B.C. Minist. Environ., Lands and Parks, Victoria, BC. 214pp.

Bull Trout

***Salvelinus confluentus* Suckley**
Family Salmonidae



Taxonomy

Salvelinus confluentus is endemic to western North America (Haas and McPhail, 1991). *S. confluentus* and *S. malma* have a confused taxonomic history. Cytological and genetic studies suggest that a) these two char species are not sister taxa and b) that Dolly Varden are more closely related to Arctic char (*S. alpinus*) while bull trout are more closely related to the white spotted char (*S. leucomaenis*) of Asia. However, specific distinction between the two is still in doubt (McPhail and Baxter 1996) based on evidence of extensive hybridization and introgression in the geographic areas where the two species overlap.

Status

Global rank: G3
Provincial rank: S3
COSEWIC designation: No status assigned
Provincial listing: BLUE

Range

Known to have occurred from approximately 41°N (northern California) to 60°N (the Yukon River) and 133°W (northwestern B.C.) to 114°W (western Alberta and Montana).

Range in B.C.

In B.C., the bull trout is an interior species. They reach the coast only in the Fraser and Squamish river systems (McPhail and Baxter 1996). They are widely distributed, but are absent from the western tributaries of the Columbia, such as the Similkameen, Okanagan and Kettle systems.

Ecosections

Northwestern Cascade Ranges
Kitimat Ranges
Nass Basin
Nass Ranges
Boundary Ranges
Eastern Pacific Ranges
Southern Pacific Ranges
Fraser Lowland
Bulkley Ranges
Central Chilcotin Ranges
Bulkley Basin
Western Chilcotin Ranges
Nazko Upland
Chilcotin Plateau
Nechako Upland
Quesnel Lowland
Western Chilcotin Upland
Hart Foothills
Hart Ranges
Peace Foothills
Babine Upland
McGregor Plateau
Nechako Lowland
Manson Plateau
Southern Omineca Mountains
Southern Skeena Mountains
Bowron Valley
Central Columbia Mountains
Eastern Purcell Mountains
McGillivray Ranges
Northern Kootenay Mountains
Quesnel Highland
Southern Columbia Mountains
Shuswap Highlands
Border Ranges
Crown of the Continent
East Kootenay Trench

Northern Park Ranges
Leeward Pacific Ranges
Southern Chilcotin Ranges
Southern Thompson Upland
Thompson Basin
Halfway Plateau
Kiskatinaw Plateau
Peace Lowland
Western Muskwa Ranges
Cassiar Ranges
Teslin Plateau
Tuya Range

Major Watersheds

South Coast Rivers
Fraser River
Harrison River
Thompson River
South Thompson River
North Thompson River
Chilcotin River
Quesnel River
Stuart River
Columbia River
Pend D'Oreille
Lower Kootenay River
Upper Kootenay River
Kicking Horse River
Illecillewaet River
Nass River
Kitsumkalum River
Bulkley River
Zymoetz River
Bell-Irving River
Peace River
Parsnip River
Finlay River
Omineca River
Nation River
Beatton River
Pine River
Halfway River
Liard River
Fort Nelson River
Swift River
Gladys River

Elevation

00 - 1700? m

Habitat

Habitat requirements vary with the life-history pattern displayed by the individual stock. Distribution and abundance are atrongly influenced by channel and hydrologic stability, substrate composition, cover, temperature, and the maintenance of migration corridors. Riverine habitat requires deep pools associated with an array of instream and overstream cover elements. The presence of large woody debris is important. Changes in pool volume and depth as a result of channel destabilization have been shown to be detrimental (Cross and Everest 1994).

Spawning habitat is often located at some distance from other seasonal holding water. Bull trout can be extremely selective about spawning sites; some populations have been observed choosing one small area and ignoring other apparently suitable habitat (J.D. McPhail, pers. comm.). The presence of ground water may be critical. Clean gravel and cobble substrates are required for spawning and juvenile cover. The location of large deep pools or other cover, such as cutbanks, logjams and overhanging bushes, adjacent to appropriate spawning habitat is important. Spawners appear to favour pools with bedrock controls (P. Bech, pers. comm.) Small, very high gradient tributary streams and groundwater seepage channels are often utilized for spawning and rearing. In high gradient streams, area and location of suitable gravel pockets may be limiting.

Emergence occurs in the spring. Fry do not fill their swim bladder until three weeks after emergence (McPhail and Murray 1979). During this period they are relatively inactive and remain in the gravel or clustered on the bottom in areas of low velocity. Once they achieve neutral buoyancy they can be found in low velocity areas such as backwaters along the stream edge or in sidechannels and small pools, where they remain until late fall. Larger juveniles tend to aggregate in larger pools but are also found in runs, riffles and pocket water. McPhail and Baxter (1996) stress the importance of overhead cover to juvenile bull trout.

Overwintering habitat can be critical, especially for stream resident populations in colder regions. Many populations survive the winter by migrating downstream to larger streams, probably to larger pool habitat or areas with upwelling ground water.

Feeding Habits

The diet of small fish and juveniles is mostly made up of aquatic insects taken either from the bottom or as drift. After reaching 100-200 mm in length, bull trout become piscivorous wherever other fish species are available. Sculpins, whitefish, and kokanee are the preferred prey species.

Ecology

Bull trout are extremely sensitive to habitat degradation and are considered to be an indicator species of ecosystem health. This is a cold water species, uncommon where temperatures exceed 15°C. Conditions that increase water temperatures can foster competition with other salmonids. Bull trout can be found in high gradient areas (up to 30%) where you would not expect to find other game fish species (P. Bech, pers. comm.).

There are four possible life history patterns: 1) a stream resident form that lives its life in small headwater streams; 2) a fluvial-adfluvial form resides as an adult in large rivers but migrates long distances to spawn in small tributaries; 3) a lacustrine-adfluvial form lives as an adult in lakes and spawns in tributaries; and 4) anadromous bull trout may occur in some systems entering the Strait of Georgia (e.g., Squamish) - this has yet to be confirmed. The stream resident form reaches sexual maturity at a young age and remains small in size. Both the fluvial-adfluvial and lacustrine-adfluvial forms often mature later in life and reach large size. Migrant and resident forms can occur together.

Reproduction

Spawning occurs during September and October, in running water. Spawning migrations can begin as early as August, but vary over the geographic distribution of the species. In some systems not all mature bull trout spawn every year. The proportion of adult fish that do not spawn in a given year varies from system to system, but can be significant (McPhail and Baxter 1996). The threshold water temperature for spawning is about 9°C. Optimal incubation temperature is from 2°C to 4°C. Fecundity varies with body size.

Global Ranking

Known occurrences: D
Abundance: D
Range: C
Trend: B — Declining, particularly in the southern and eastern parts of its range.

Protected occurrences: C — Some populations occur within parks. These occurrences may not be protected from park development or over exploitation.
Threats: B —Threatened by competition and genetic swamping from introduced trout and char (particularly brook trout); habitat degradation and loss of habitat connectivity brought about by logging, mining, hydro development, grazing, and urban expansion; increased access and over-exploitation (including poaching).
Fragility: C

Rank: G3
Comments: Now considered a category 1 species; listing has been upgraded to "warrented" by the U.S. Fish and Wildlife Service. Species is extirpated in California and probably also in Nevada. It has disappeared from most of its natural range in Alberta and is designated a species of special concern. Several populations have disappeared from the Willamette, Klamath and Deschutes systems in Oregon. The native range is greatly reduced in Montana. Declining populations have been reported from Washington, Idaho, Montana, and B.C. In British Columbia, major declines have occurred in the Columbia and lower Fraser systems, as well as others.

Provincial Ranking

Known occurrences: D — Fairly widespread.
Abundance: D
Range: D — Although the range is relatively large, occurrence is dependent on critical habitat characteristics such as water temperature.
Trend: B — Declines noted as a result of habitat alteration or where stream access has been provided.
Protected occurrences: C — Some watersheds protected but fish themselves not protected.
Threats: B — Threatened by habitat loss or degradation, over-exploitation and competition from other salmonids.
Fragility: C

Rank: S3

Future Needs

Research: Factors limiting juvenile recruitment are poorly understood. Knowledge of migratory patterns and habitat use is limited. The range of conditions that can be tolerated by stable populations is unknown. Studies of bull trout and Dolly Varden taxonomy, habitat and life history patterns where they coexist are needed.

Dispersal mechanisms and rates have not been studied. Studies to confirm the presence of the anadromous form and its specific requirements are needed. Restoration techniques have not been adequately studied and evaluated.

Inventory: Knowledge of species distribution and stock status are inadequate in most areas of the province. Surveys should be conducted using methods that will develop our understanding of the habitat requirements for each life history stage and specific life history information. Surveys are required to identify those habitats and populations remaining in good condition in order to determine actions required to maintain existing diversity. Monitoring programs are needed to assess trends in habitat productivity and population size. Rieman and McIntyre (1993) favour the use of weirs or redd counts as population monitoring tools and make several suggestions for developing monitoring programs.

Management and Stewardship

The genetic structuring of bull trout populations suggests that many populations have been through genetic bottlenecks (McPhail and Baxter 1996). Variability within populations is low while differences between populations is often high, suggesting the existance of distinct stocks.

Bull trout populations are sensitive to environmental degradation and over-exploitation. Human activities that lead to changes in temperature, substrate composition, habitat complexity, channel stability, and create migration barriers (including movement between populations) increase the risk of extirpation (Rieman and McIntyre 1993). Watershed entry, with attendant road construction, leads to changes in stream characteristics (Cross and Everest 1994) and angler access that can reduce habitat capability and increase exploitation. A species account has been completed for the Managing Identified Wildlife Guidebook (in prep.) which identifies measures to improve species protection on forest lands.

Bull trout do not compete favourably with introduced salmonids. Hybridization and competition with brook trout can threaten bull trout populations (Buktenica 1994).

Rieman and McIntyre (1993) recommend a conservation approach based on the use of core areas that are managed to maintain or restore ecological processes throughout the species range. Networks of core areas should be designed to include: 1) all critical habitat elements; 2) the best habitat or the habitat with the best potential for restoration to high quality; 3) a network of healthy

subpopulations incorporating existing genetic and phenotypic diversity; 4) sufficient distance between core subpopulations to minimize threat from a single catastrophic event yet located close enough to maintain linkages through dispersal mechanisms and to enable refounding of lost subpopulations; 5) subpopulations throughout the species historic range; and 6) a monitoring program.

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Personal Communications

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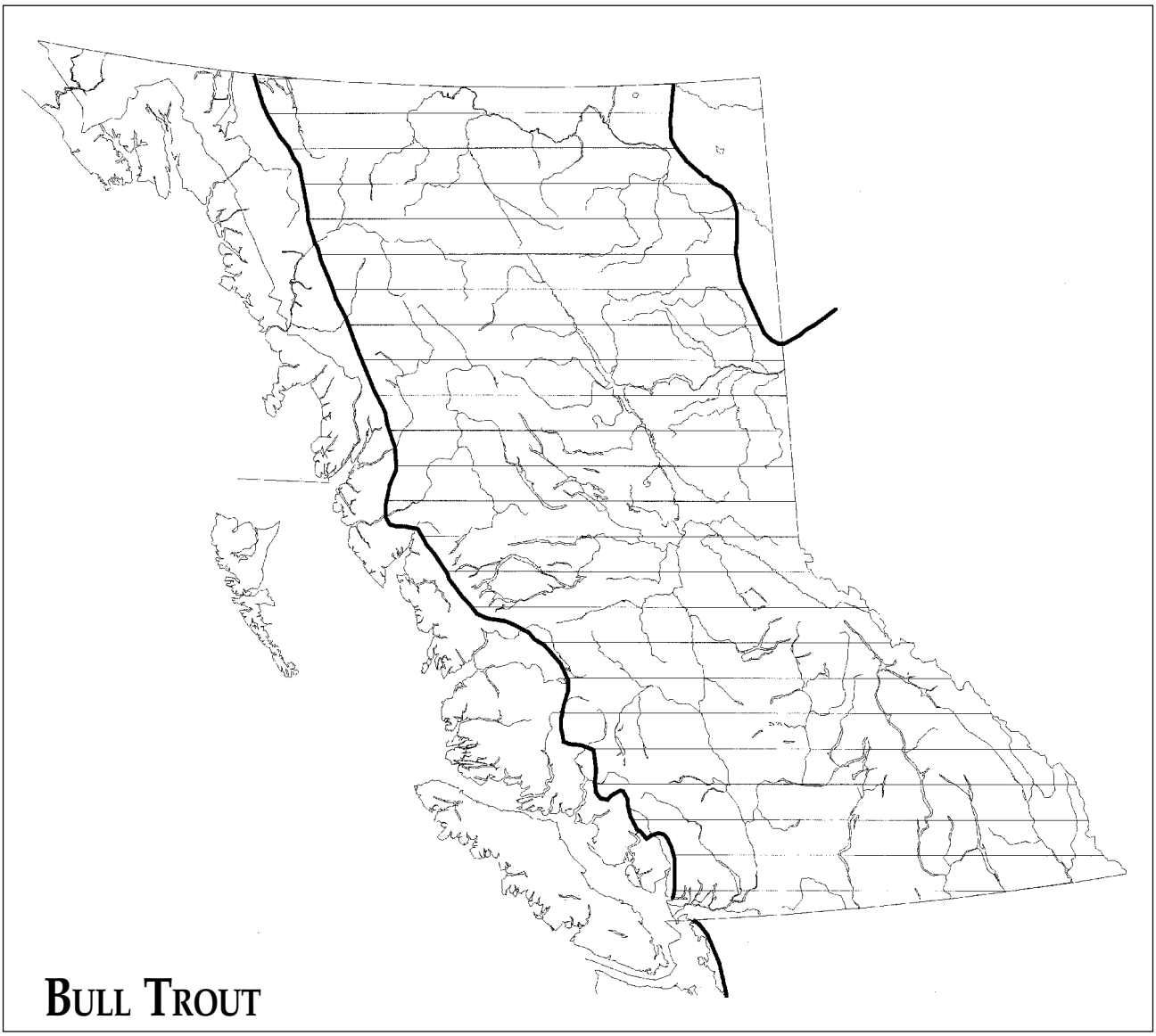
BULL TROUT