

**FIELD KEY TO THE
FRESHWATER FISHES
OF BRITISH COLUMBIA**

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"Admitted that some degree of obscurity is inseparable from both theology and ichthyology, it is not inconsistent with profound respect for the professors of both sciences to observe that a great deal of it has been created by themselves."

Sir Herbert Maxwell

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INTRODUCTION

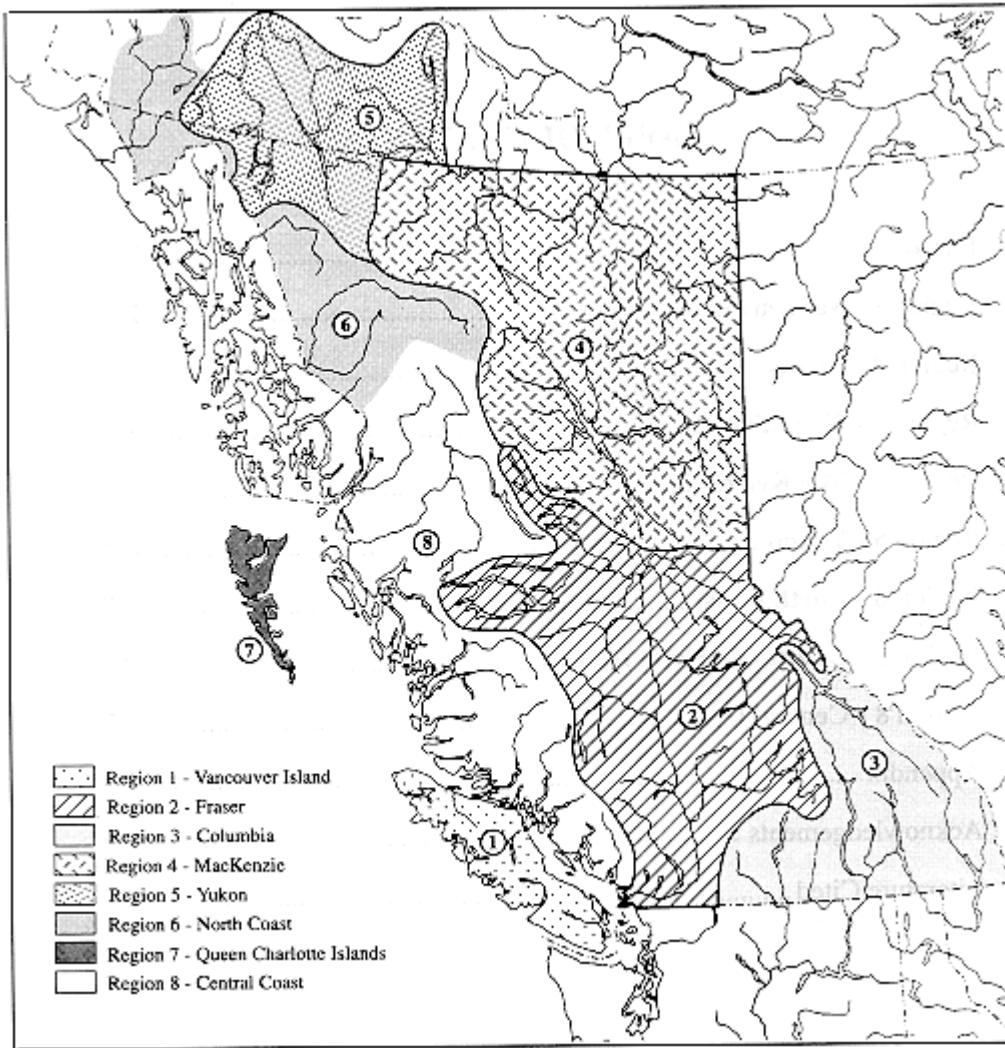


Figure 1
British Columbia's eight zoogeographical regions

Traditionally, keys are constructed by taxonomists to provide identification guides. Unfortunately, these keys usually bristle with obscure jargon and arcane counts and measurements such that non-taxonomists, even those who are professional biologists, give up and guess at identifications based on the pictures. In the past it didn't matter much if identifications made by non-taxonomists were correct or not. They rarely became public and the only consequence of a mistake was a little personal embarrassment. Recently, however, things have changed. With the advent of consultants, word processors, and copy machines even unpublished reports can receive wide circulation, and this "grey" literature often contains lists of species collected at specific sites.

Usually, for important recreational or commercial species these lists are accurate, but for small "unimportant" species, mistakes are common. At one time these misidentifications were a minor nuisance, of concern only to academics and museum personnel. Now, with growing public concern about biodiversity and conservation, sloppy identifications are more serious. Conservation managers need reliable distributional and inventory data on all native species, and the first step in acquiring such data is accurate identification.

This set of keys is an attempt to provide rapid and dependable field identifications of BC freshwater fish. Traditional keys are not very useful in the field, since they are designed for use on preserved specimens - a definite drawback when working with rare or threatened species. Because field identifications are essential in inventory work, we've tried to design keys that work in the field. To this end we have included information that is rarely incorporated in traditional keys. For example, information on where a fish was caught (both the geographic locality and site-specific habitat) and what it looks like when alive, can make the identification of even complex species groups easy. For instance, sculpins ("bullheads" of the genus *Cottus*) are notoriously difficult to identify. In most keys you have to examine chin pores, make judgements about tubular nostrils and the degree of separation of the dorsal fins, as well as count dorsal, anal and pectoral fin rays, and determine if there are palatine teeth, before you can make an identification. In many cases this detail is unnecessary. First, there is no place in BC where all seven of our *Cottus* species coexist. Since there are only two or three species in most drainage systems, as long as you know where you are there is no need to work through a key that includes all seven species. Also, many sculpin species have distinctive life-colours and usually occur in specific habitats. Consequently, geographic locality, together with habitat and colour pattern, often are enough for a reliable field identification.

To simplify our keys we have divided the province into eight zoogeographic regions (Fig. 1): Vancouver Island, Fraser, Columbia, Mackenzie, Yukon, North Coast, Queen Charlotte Islands and Central Coast. Generally, the regions correspond to major drainage basins, but for islands and coastal drainages this was not possible. Thus, the Vancouver Island key includes the Gulf Islands and all other islands in the straits between Vancouver Island and the mainland; while the North and Central Coast keys cover a number of separate drainage systems.

Clearly, field keys that use geography assume that we know enough about the distribution of fishes in BC that we are certain about what species occur in what major drainage systems. Generally, this is true but our confidence isn't absolute. Therefore, we have included a conventional key in the Appendix. This key is designed for use on preserved material and includes all the species known to occur in BC. When in doubt about a field identification, you should preserve a sample and try running the specimen through this key. If still in doubt, send the specimen to the Fish Museum, Department of Zoology, 6270 University Boulevard, University of British Columbia, Vancouver, V6T 1Z4.

A black and white line drawing of a map of Vancouver Island. The map shows the coastline and major water bodies. Overlaid on the map are several illustrations of fish, including salmon, trout, and various species of smaller fish, arranged in a cluster along the western coast of the island. The title 'VANCOUVER ISLAND' is printed in large, bold, black capital letters across the center of the map.

VANCOUVER ISLAND

VANCOUVER ISLAND

For this key, Vancouver Island includes the islands that lie between Vancouver Island and the adjacent mainland (Fig. 2). The entire island is mountainous, except for narrow lowland strips on the east, west and north coasts. These ranges effectively divide the island's waters into east and west-flowing drainage systems. The climate is mild but very wet. Consequently, most island rivers are short with steep gradients and the lakes have high flushing rates. Usually, the water is clear but in some lowland areas, particularly the Nahwitti Lowland at the north end of the island, there are blackwater regions.

Not surprisingly, Vancouver Island supports relatively few freshwater fish. There are 16 native and ten introduced species (Table 1). With the exception of one small population of brown trout in the Eve River and sporadic records of Atlantic salmon, *Salmo salar*, near Port Hardy, the introduced species (brook trout, *Salvelinus fontinalis*; brown trout, *Salmo trutta*; goldfish, *Carassius auratus*; carp, *Cyprinus carpio*; fathead minnow, *Pimephales promelas*; brown catfish, *Ameiurus nebulosus*; pumpkinseed, *Lepomis gibbosus*; and smallmouth bass, *Micropterus dolomieu*) are confined to the southern half of the island (from Campbell River south).

We have also included in the key seven euryhaline species that are known from the seas around Vancouver Island but are not recorded from fresh water in this area. These include common estuarine species (starry flounder, *Platichthys stellatus*; and staghorn sculpin, *Leptocottus armatus*) that frequently enter the lower reaches of rivers, as well as anadromous species known from coastal waters but not recorded from fresh water on the island (green sturgeon, *Acipenser medirostris*; white sturgeon, *Acipenser transmontanus*; longfin smelt, *Spirinchus thaleichthys*; and eulachon, *Thaleichthys pacificus*). At low tide, especially where small streams cross shingle beaches, many marine species (usually cottids and stichaeids) temporarily occur in fresh water. Since such species are not regular components of the freshwater fauna, we've not included them in the keys.

The main reason for the sparse freshwater fauna on Vancouver Island is the difficulty that freshwater fish have in dispersing through the sea. To "pure" freshwater species, salt water presents an almost impassable barrier. Indeed, only one primary freshwater fish, the peamouth (*Mylocheilus caurinus*), is native to Vancouver Island. It occurs near Nanaimo and in the Kennedy and Cecilia lake drainages on the west side of Vancouver Island. The peamouth is one of the few minnows (Cyprinidae) that can tolerate saltwater, and it is thought to have reached Vancouver Island and other isolated areas (e. g. Sechart Peninsula and Nelson Island) by way of the Fraser River "plume". Apparently, the peamouth's salt tolerance is such that it could ride the brackish Fraser plume across the Strait of Georgia and survive the trip (Clark and McInerney 1974); however, how the peamouth reached the west coast of Vancouver Island is a mystery. It occurs as far north as Ozette Lake on the Olympic Peninsula, and perhaps crossed from there to the west coast of Vancouver Island during some low salinity period associated with melting ice-sheets after the last glaciation. All of the other native species on the island are salt tolerant and probably dispersed directly through the sea.

Although there are relatively few species on Vancouver Island, the low biodiversity may be an illusion. It is a region where postglacial conditions have favoured rapid evolution. For example, on southern Vancouver Island biological species of sticklebacks and lampreys have evolved since the last glaciation, and on northern Vancouver Island a

pair of distinctive lake and stream sticklebacks that may warrant specific recognition (Lavin and McPhail 1993). Also, there is no reason to expect that the postglacial divergences of lampreys and sticklebacks are unique; isolated populations of trout, char and sculpins on the island probably were subject to the same evolutionary opportunities as sticklebacks and lampreys. Consequently, when these recent divergences are better studied, more diversity maybe apparent in the Vancouver Island region.

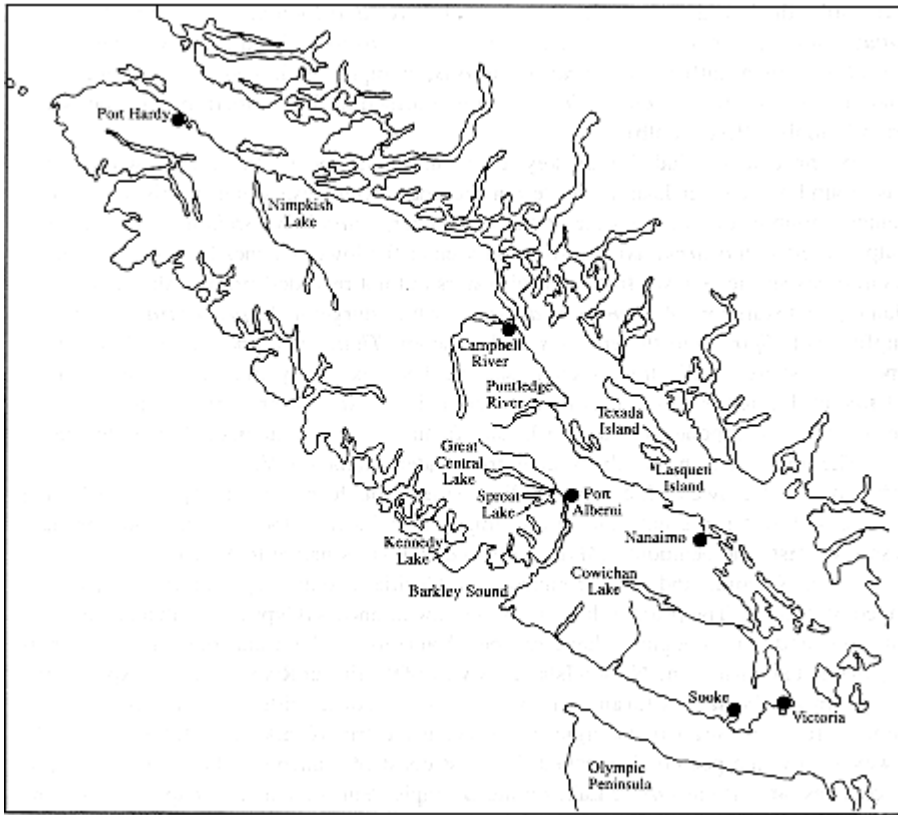


Figure 2
Vancouver Island river systems.

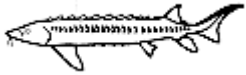
Species	Status
<i>Lampetra ayresi</i>	+
<i>L. richardsoni</i>	+
<i>L. tridentata</i>	+
<i>Acipenser medirostris</i>	+
<i>A. transmontanus</i>	*
<i>Alosa sapidissima</i>	*
<i>Carassius auratus</i>	*
<i>Cyprinus carpio</i>	I
<i>Mylocheilus caurinus</i>	I
<i>Pimephales promelas</i>	+
<i>Ameiurus nebulosus</i>	I
<i>Osmerus dentex</i>	I
<i>Spirinchus thaleichthys</i>	*
<i>Thaleichthys pacificus</i>	*
<i>Oncorhynchus clarki clarki</i>	*
<i>O. gorbuscha</i>	+
<i>O. keta</i>	+
<i>O. kisutch</i>	+
<i>O. mykiss</i>	+
<i>O. nerka</i>	+
<i>O. tshawytscha</i>	+
<i>Salmo salar</i>	+
<i>S. trutta</i>	I
<i>Salvelinus fontinalis</i>	I
<i>S. malma</i>	I
<i>Gasterosteus aculeatus</i>	+
<i>Cottus aleuticus</i>	+
<i>Cottus aleuticus</i>	+
<i>C. asper</i>	+
<i>Leptocottus armatus</i>	E
<i>Lepomis gibbosus</i>	I
<i>Micropterus dolomieu</i>	I
<i>Platichthys stellatus</i>	E
Table 1 Fishes of Vancouver Island	
+ = present E = estuarine	I = introduced * = inshore marine record

Pictorial Key To Families



LAMPREYS (PETROMYZONTIDAE)

5



STURGEONS (ACIPENSERIDAE)

8



HERRINGS (CLUPEIDAE)

9



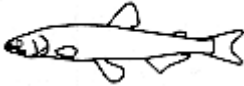
MINNOWS (CYPRINIDAE)

9



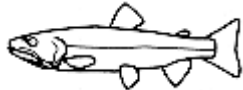
CATFISH (ICTALURIDAE)

11



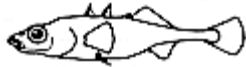
SMELTS (OSMERIDAE)

11



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

12



STICKLEBACKS (GASTEROSTEIDAE)

20



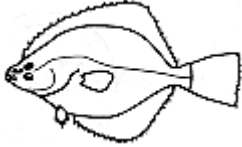
SCULPINS (COTTIDAE)

21



SUNFISH, BASS (CENTRARCHIDAE)

22



FLOUNDERS (PLEURONECTIDAE)

23

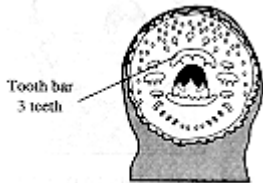
LAMPREYS **FAMILY PETROMYZONTIDAE**

Lampreys are not easy to identify. Their morphology changes with each of three distinctive life-history stages: filter-feeding ammocoetes, newly transformed "macrophthalmic" juveniles, and adults. For adults, tooth patterns and body size provide reliable field guides (a handlens is useful here), but for ammocoetes and newly transformed juveniles positive identifications require morphometric and meristic comparisons. Ammocoetes usually are associated with slow currents and soft, mud bottoms. Transformation takes place from late summer through early autumn, and the macrophthalmic juveniles move into faster water over gravel substrates. In anadromous species (Pacific and river lampreys), migration of young adults to the sea occurs in the spring. Spawning usually occurs in the spring, but in the non-parasitic brook lamprey the spawning period can extend into the summer. The adults of some populations of Pacific and river lampreys return from the sea in the fall and over-winter in fresh water before spawning the next spring (Beamish 1980.)



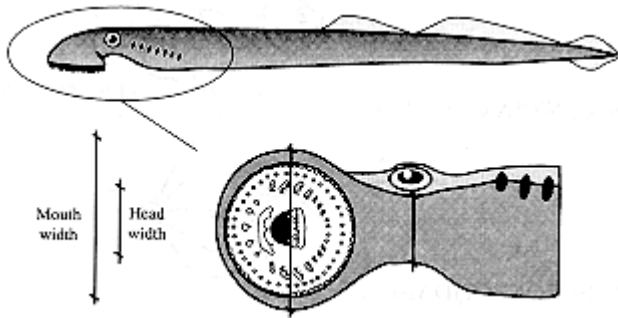
1 (8) Mouth a sucking disk; teeth and eyes present

adult or transforming lampreys
2



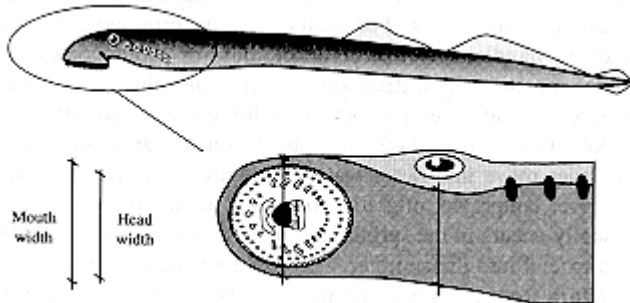
2 (5) Tooth bar immediately above mouth has three teeth

3



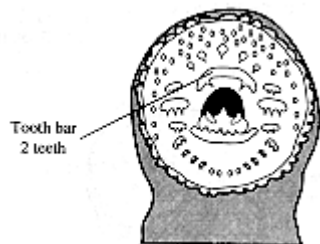
3 (4) From above, diameter of mouth noticeably wider than head; Cowichan and Mesachie lakes

Cowichan lamprey
Lampetra macrostoma

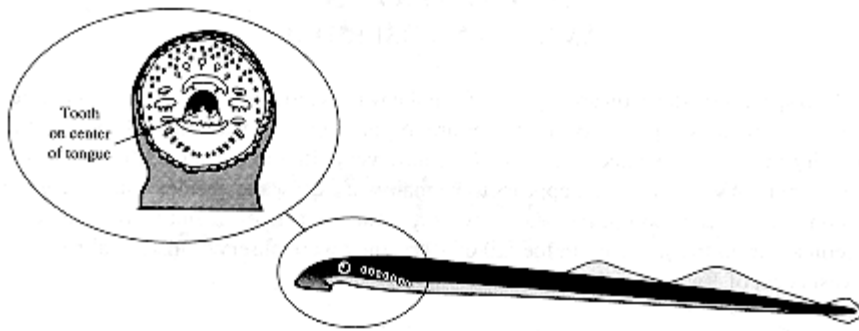


4 (3) From above, diameter of mouth not wider than head or body; most of the larger rivers on Vancouver Island

Pacific lamprey
Lampetra tridentata

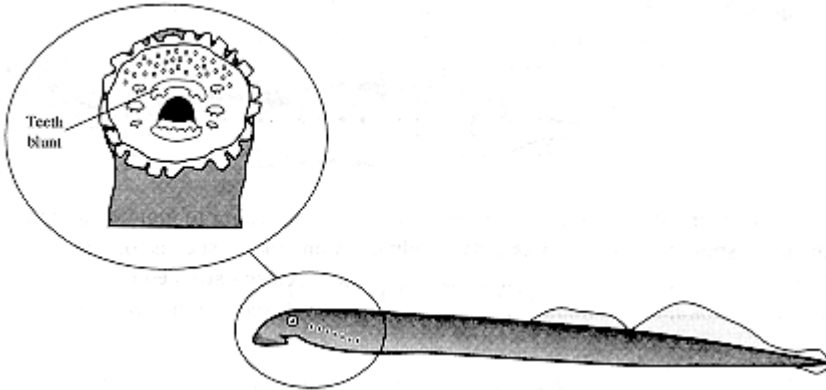


5(2) Tooth bar immediately above mouth has two teeth



6 (7) Teeth sharp, well developed; center pair of lateral teeth with three points; sharp tooth on center of tongue; adults usually longer than 200 mm

River lamprey
*Lampetra ayresi**



7 (6) Teeth blunt, poorly developed; center pair of side teeth with two points; no sharp tooth on tongue; adults usually less than 160 mm in length

Western brook lamprey
*Lampetra richardsoni**

8 (1) Eyes absent or poorly developed; teeth absent; mouth not modified into a sucking disk

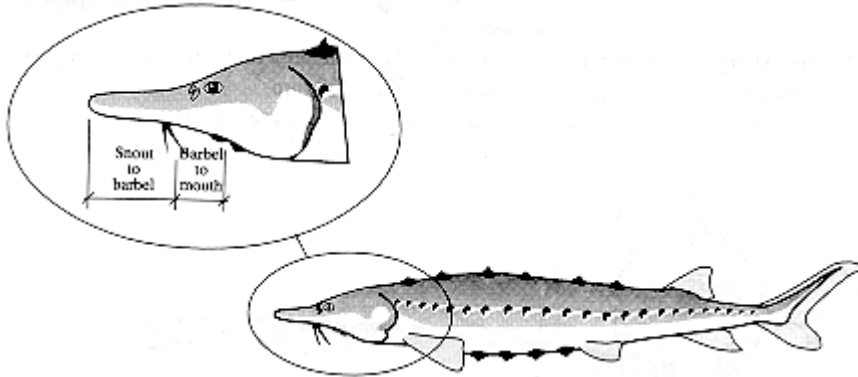
ammocoetes or larval lampreys

(see lamprey key in Appendix, page 199).

* Beamish (1985) reports the presence of an unusual non-migratory, parasitic lamprey in Morrison Creek, a Puntledge River tributary. In some aspects of its life-history and morphology it resembles both the river and brook lampreys.

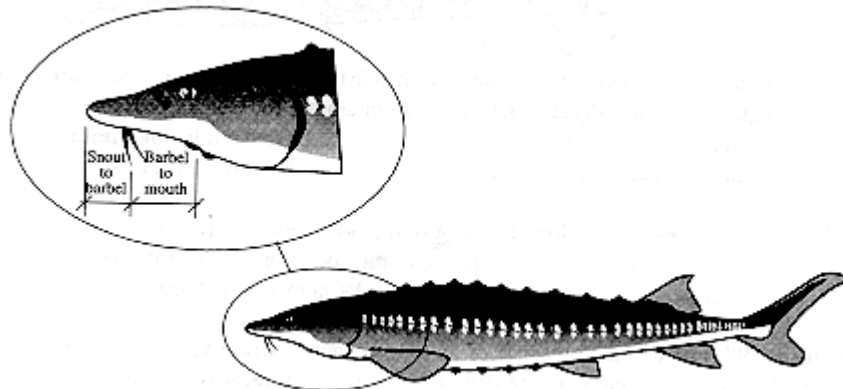
STURGEONS
FAMILY ACIPENSERIDAE

Two species of sturgeon are reported from the waters around Vancouver Island (green sturgeon and white sturgeon). Both species are morphologically variable and some of this variability may be associated with sex. We know very little about their life histories in this area, but the white sturgeon appears to be mainly a freshwater species while the green sturgeon is more common in the sea. However, most Vancouver Island records of white sturgeon are from the sea but, in the fall of 1995, they were observed in several rivers on the west coast of Vancouver Island.



1 (2) back green; snout usually elongate and narrow; barbels nearer to mouth than to tip of snout; sporadic in the Juan de Fuca strait and along the west coast of Vancouver Island

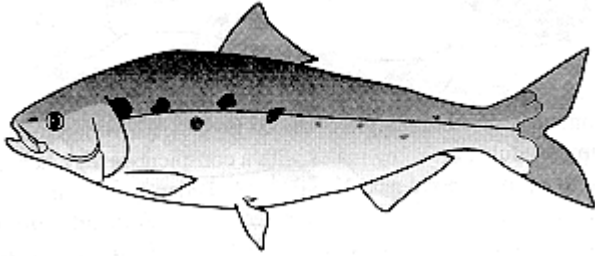
Green sturgeon
Acipenser medirostris



2 (1) back dark grey to black; snout short and broad (except in some specimens less than 250 mm in standard length); barbels nearer to tip of snout than to mouth; rare in the Juan de Fuca strait and perhaps in Barkley Sound, much less common in these areas than the green sturgeon

White sturgeon
Acipenser transmontanus

HERRINGS AND SHAD
FAMILY CLUPEIDAE

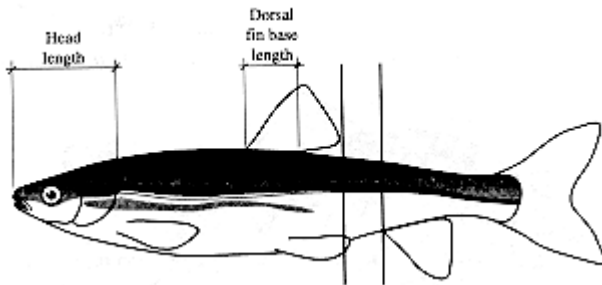


The shad (*Alosa sapidissima*) was introduced into California from eastern North America in the late nineteenth century. This species spawns in fresh water but spends most of its life in the sea. The shad spread rapidly along the Pacific coast of North America and eventually reached Alaska. In recent years, however, it has contracted its North Pacific range and now is rare north of Puget Sound. Although the first record of shad in BC was from the sea off Vancouver Island, there is no recent record of this species in the fresh waters of the island.

MINNOWS
FAMILY CYPRINIDAE

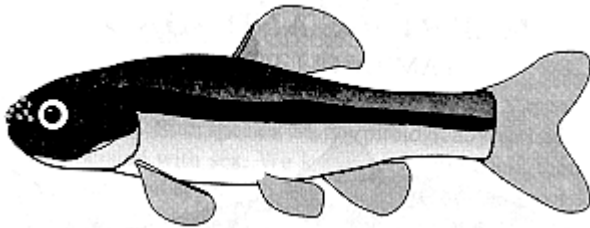
1 (4) Dorsal fin short, fin base much shorter than head

2



2 (3) Viewed from the side, hind margin of dorsal fin does not overlap anal fin; two dark stripes on side of body; Greenway, Holden and Quennell lakes in the Nanaimo area, Kennedy Lake system near Ucluelet and Cecilia Lake off Stewardson Inlet

Peamouth
Mylocheilus caurinus

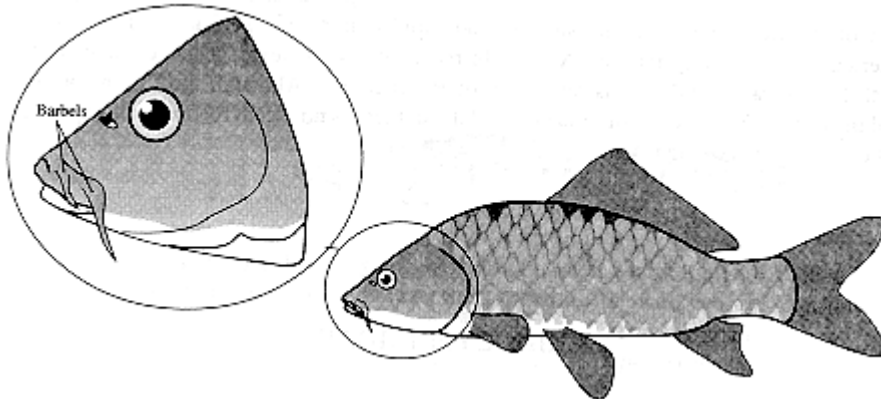


3 (2) Viewed from the side, hind margin of dorsal fin clearly overlaps anal fin; one mid-lateral stripe in adults; breeding males with a conspicuous dark head; apparently introduced to a private pond near Nanaimo (A. Peden, pers. comm.)

Fathead minnow
Pimephales promelas

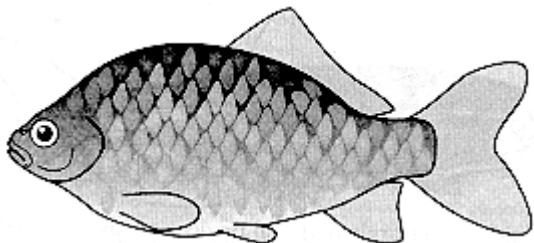
4 (1) Dorsal fin long, fin base much longer than head

5



5 (6) Conspicuous barbels on sides of upper jaw; Glen Lake near Victoria, population now extinct; occasional in the sea within the influence of the Fraser River plume (e.g. off Saturna Island)

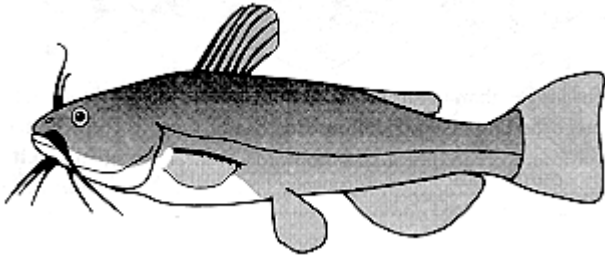
Carp
Cyprinus carpio



6 (5) No barbels on sides of upper jaw; appears sporadically in small lakes and streams around Victoria and Nanaimo; probably no self-sustaining populations except in private ponds

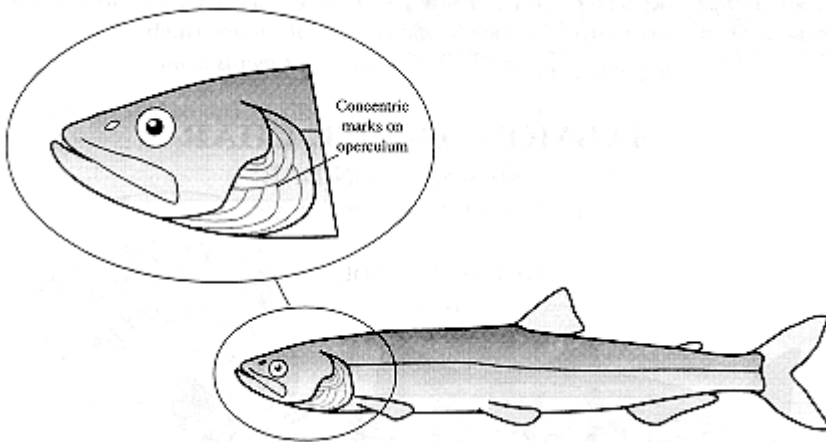
Goldfish
Carassius auratus

CATFISH
FAMILY ICTALURIDAE



The brown catfish (*Ameiurus nebulosus*) is established in many small lakes from Sooke north to about Nanaimo. This exotic species also occurs in a few large, oligotrophic lakes (e.g. Great Central, Sproat and Shawnigan Lakes) but apparently does not do well in such environments.

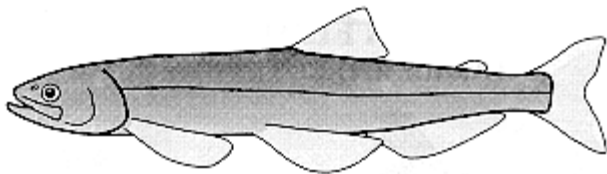
SMELTS
FAMILY OSMERIDAE



1 (2) Concentric marks on operculum; abundant in coastal waters but no freshwater records from Vancouver Island

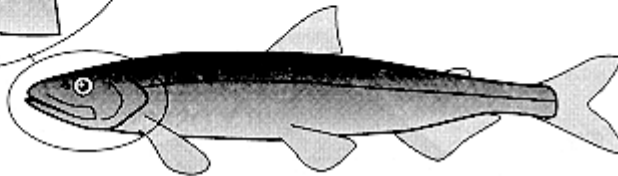
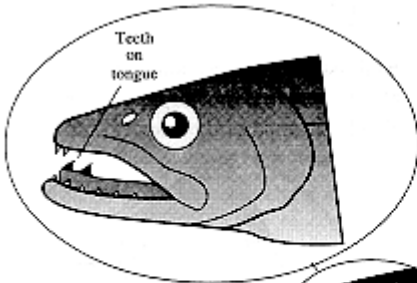
Eulachon
Thaleichthys pacificus

2 (1) No concentric marks on operculum



3 (4) Pectoral fin longer than head; no prominent canine teeth on tongue; juveniles common near the Gulf Islands but no freshwater records from Vancouver Island

Longfin smelt
Spirinchus thaleichthys

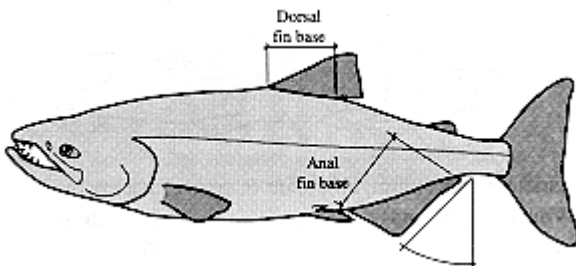


4 (3) Pectoral fin smaller than head; 1 or 2 prominent curved canine teeth on tongue; rare in our area, one record from Barkley Sound

Rainbow smelt
Osmerus dentex

SALMON, TROUT, CHAR FAMILY SALMONIDAE (SUBFAMILY SALMONINAE)

KEY TO THE ADULTS

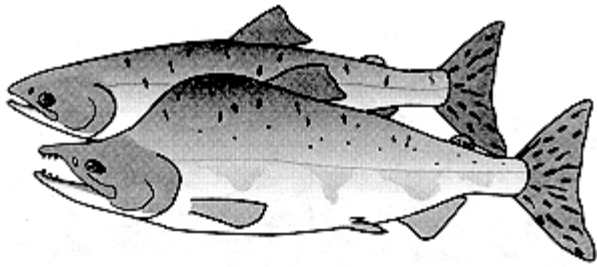


1 (10) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

2 (7) Distinct spots on tail

2

3

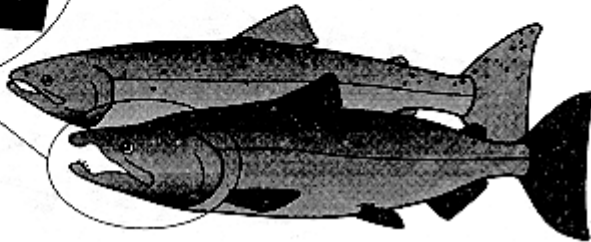
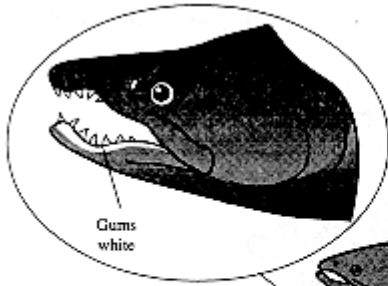


3 (4) Tail spots oblong (not round)

4 (3) Tail spots round (not oblong)

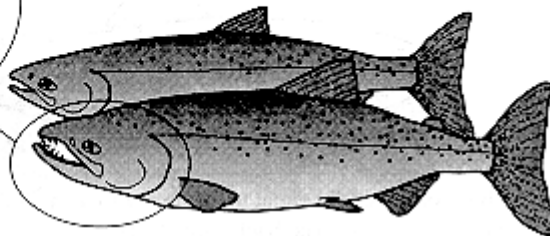
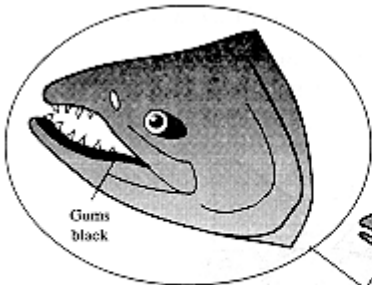
Pink salmon
Oncorhynchus gorbuscha

5



5 (6) Tail spotted on upper half; gums at base of teeth in lower jaw white

Coho salmon
Oncorhynchus kisutch

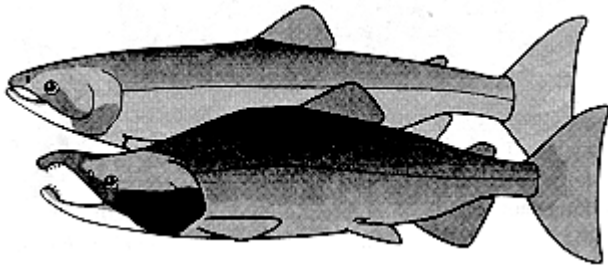


6 (5) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black

Chinook salmon
Oncorhynchus tshawytscha

7 (2) No spots on tail, but occasionally some fine speckles

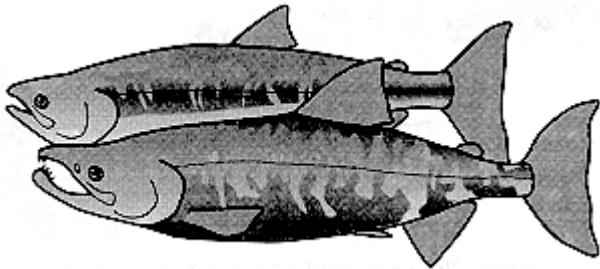
8



8 (9) Adults occur in fresh water both as migratory spawners (sockeye) and as residents (kokanee); flanks are uniformly coloured (silver in non-breeding kokanee, usually red in breeding sockeye and kokanee)

Sockeye salmon
(Kokanee)

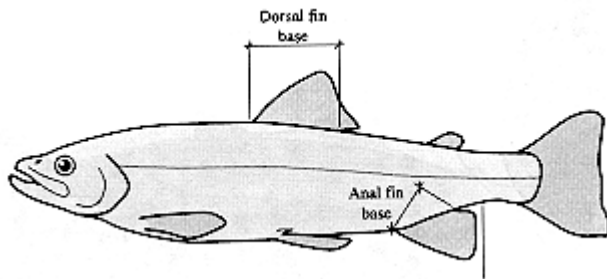
Oncorhynchus nerka



9 (8) Adults in fresh water only as spawners; flanks pale, male with irregular red and black blotches; female with broad dark purplish stripe

Chum salmon

Oncorhynchus keta

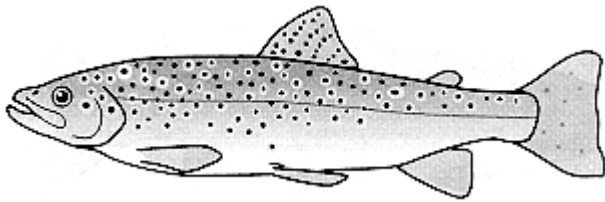


10 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile hind margin of anal fin is vertical (no backward slant)

11

11 (18) Background colour on back and flanks light (silver or golden) with dark spots

12



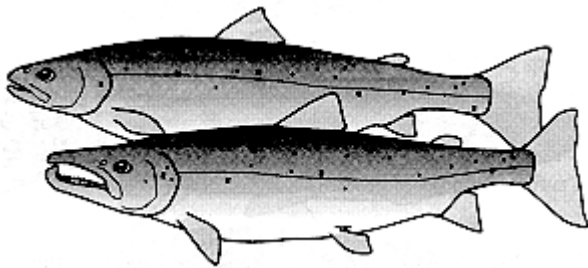
12 (13) Spots on flanks mostly dark surrounded by conspicuous light haloes; some spots along side are red; established in Cowichan system, Cameron Lake and in Eve River

Brown trout

Salmo trutta

13 (12) Spots on flanks black (no red spots); spots not surrounded by light haloes

14



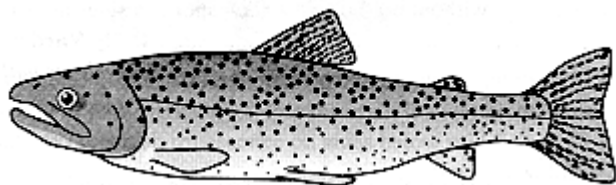
14 (15) Relatively few spots on flanks, mostly above lateral line, some spots X-shaped; caudal fin usually without spots; spawning males with conspicuously hooked lower jaw; so far known only from northern Vancouver Island streams (Cayeghle Creek, Kokish River and Quatse River)

Atlantic salmon

Salmo salar

15 (14) Spots on back and sides numerous with many below lateral line, none of the spots are X-shaped; spawning males without conspicuously hooked lower jaw

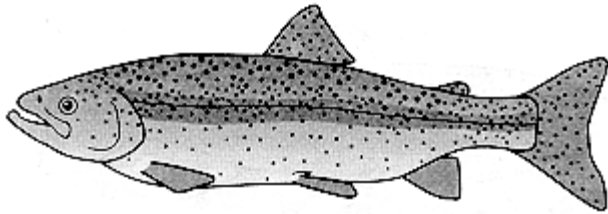
16



16 (17) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots

Coastal cutthroat trout

Oncorhynchus clarki clarki

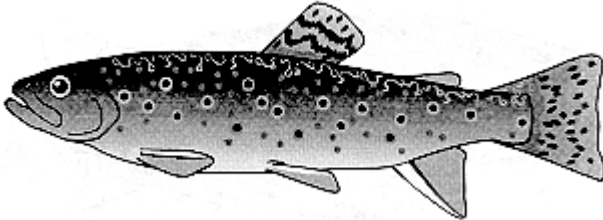


17 (16) No red or orange slash under lower jaw; except in spawning males, upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots

Rainbow trout
Oncorhynchus mykiss

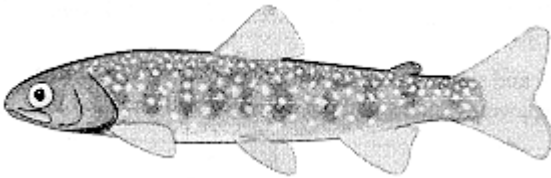
18 (11) Background colour on back and flanks dark with light or coloured spots

19



19 (20) Dorsal fin yellowish, with bold black streaks; red spots on flanks surrounded by blue haloes; established in several lakes on southern Vancouver Island

Brook trout
Salvelinus fontinalis



20 (19) Dorsal fin dusky, without bold black marks; spots on sides not surrounded by pale haloes

Dolly Varden
Salvelinus malma

KEY TO YOUNG SALMONIDS (45-100mm)

1 (10) anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin



2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish usually less than 50 mm long in fresh water

Pink salmon

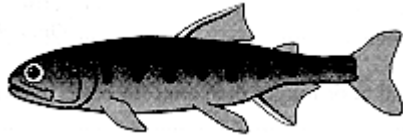
Oncorhynchus gorbuscha

3 (2) Parr marks on flanks

4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

5



5 (6) Adipose fin uniformly pigmented; parr marks variable but the spaces between marks usually wider than the marks themselves; anal fin sickle-shaped with a conspicuous white leading edge that contrasts sharply with dark pigment behind

Coho salmon*

Oncorhynchus kisutch



6 (5) Adipose fin with a clear unpigmented "window"; spaces between parr marks usually wider than the marks themselves; anal fin not sickle-shaped, white leading edge not conspicuously contrasting with dark pigment behind

Chinook salmon*

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye

8



8 (9) Size in fresh water to over 100 mm; parr marks divided roughly in half by mid-line; combined width of parr marks much less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line

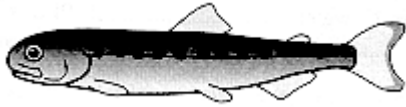
Sockeye salmon

(Kokanee)

Oncorhynchus nerka

* In many Vancouver Island systems some newly emerged coho and chinook fry migrate

to estuaries. These fry are especially difficult to identify, but usually coho have larger eyes and shorter., more rounded snouts than chinook of the same size. In addition, chinook fry usually migrate a week or two earlier than coho fry.



9 (8) Size in fresh water less than 50 mm; back mottled green, sides silvery, with a faint green iridescence below mid-line; combined width of dark areas along mid-line more than half the combined width of the light areas; parr marks faint or absent below mid-line

Chum salmon
Oncorhynchus keta

10 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin vertical

11

11 (18) Numerous distinct dark spots on dorsal fin; in very small specimens only the first dorsal ray may be black

12

12 (15) Coloured spots (red to yellow) along mid-line or between parr marks; combined width of the light areas

13



13 (14) No definite spots other than parr marks below the mid-line; 8 or 9 parr marks, the widest about equal to eye diameter; adipose fin dusky

Brook trout
Salvelinus fontinalis

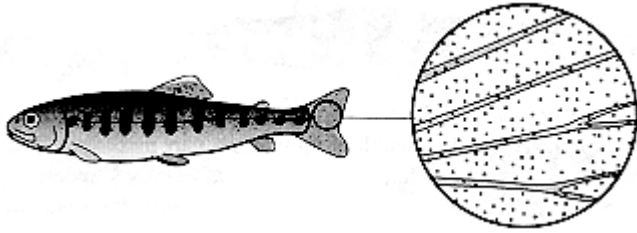


14 (13) Small black spots above and below mid-line (in addition to parr marks); 9 to 11 parr marks, none as wide as eye diameter; adipose fin orange

Brown trout
Salmo trutta

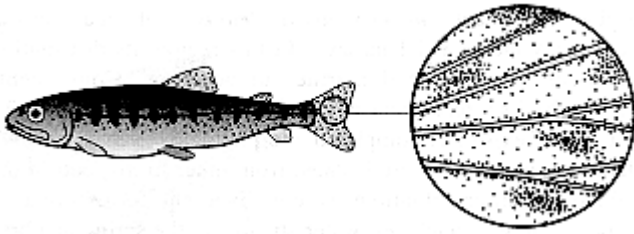
15 (12) No coloured (red to yellow) spots; width of dark areas along mid-line less than width of light areas

16



16 (17) On fish below 50 mm melanophores are evenly distributed over entire tail; few or no spots on tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye

Rainbow trout
Oncorhynchus mykiss



17 (16) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye

Coastal cutthroat trout
Oncorhynchus clarki clarki

18 (11) Dorsal fin without numerous dark spots; in very small specimens the first dorsal ray may be dusky but not black

19



19 (20) Black spots on back and sides; 8-10 regularly shaped parr marks; width of dark are as on mid-line about equal to width of light areas; a single red dot between each parr mark

Atlantic salmon
Salmo salar

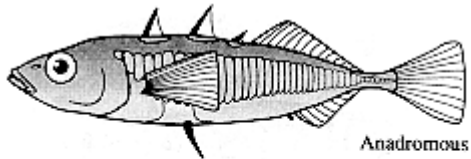


20 (19) No black spots on back and sides; parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; parr marks not separated by a single red dot

Dolly Varden
Salvelinus malma

STICKLEBACKS FAMILY GASTEROSTEIDAE

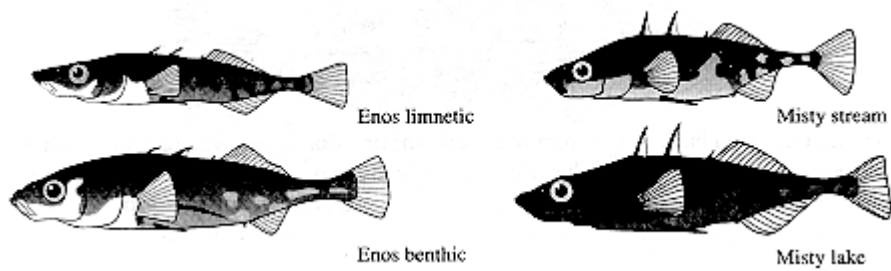
The threespine stickleback *Gasterosteus aculeatus* is abundant in quiet, lowland waters throughout the Vancouver Island area. In this region, its distribution is strongly associated with areas of postglacial marine submergence. Consequently, natural populations of sticklebacks rarely occur at altitudes much above 200 m. The species is notoriously variable, and exists as a complex of morphological, ecological and behavioural forms. Most divergent populations are isolated from other forms, but in the Vancouver Island region there are three situations where divergent forms come into contact. 1) Anadromous populations ascend freshwater streams in the spring and breed alongside some freshwater resident populations. This situation is common on southern Vancouver Island but rare at the north end of the island. 2) In Misty Lake, Keogh River system, sticklebacks in the inlet and outlet stream are genetically distinct from those in the lake. The two forms are ecologically and morphologically differentiated and rarely interbreed. 3) In Enos Lake near NanOOSE, and in several lakes on Texada Island and in Hadley Lake on Lasqueti Island, littoral, benthic-feeding sticklebacks and limnetic plankton-feeding sticklebacks coexist. In these lakes, genetic and ecological divergence is also accompanied by a high degree of reproductive isolation.



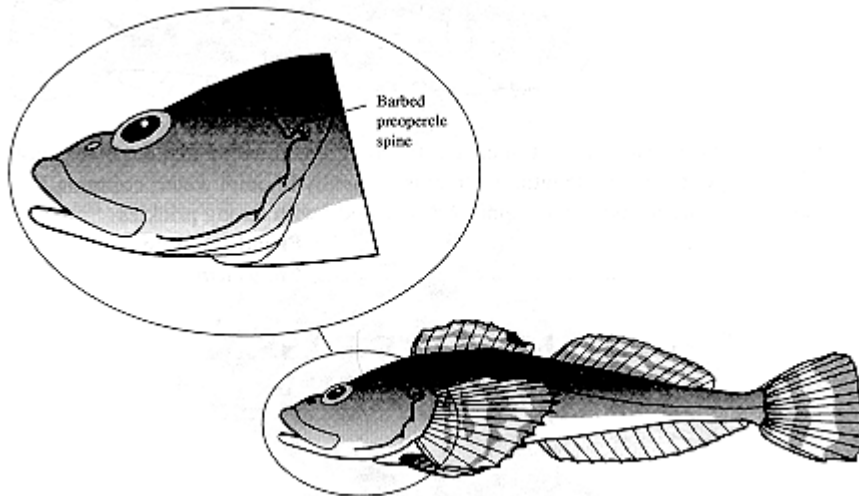
Anadromous



Stream resident



SCULPINS FAMILY COTTIDAE

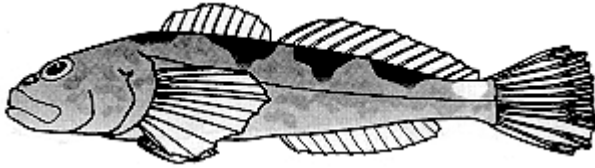


1 (2) underside dead white; spine on preopercle with obvious hooks; pectoral fins with alternating yellow and dark bands of approximately equal width; only in estuaries or areas under tidal influence

Pacific staghorn sculpin

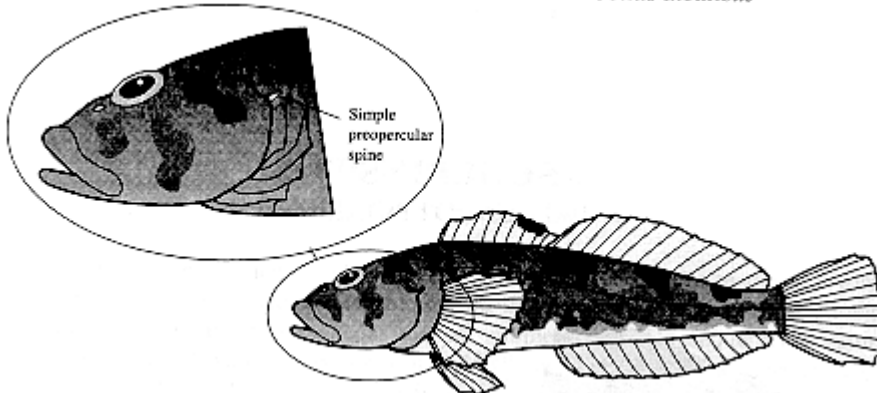
Leptocottus armatus

2 (1) Underside light or dusky but not dead white; spine on preopercle simple; pectoral fins speckled but without broad dark bands; rivers, streams, lakes and estuaries.



3 (4) Light marks on back jaw just in front of caudal fin; first dorsal fin without distinct black spot; anal fin about equal to head length; typically in riffles, rarely in lakes and never in estuaries

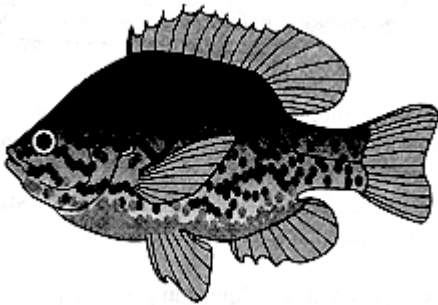
Coastrange sculpin
Cottus aleuticus



4 (3) No light mark on back in front of caudal fin; first dorsal with a distinct black spot; anal fin longer than head length; in streams, typically in quiet water; common in lakes and estuaries; sometimes upper side of body with strong prickles

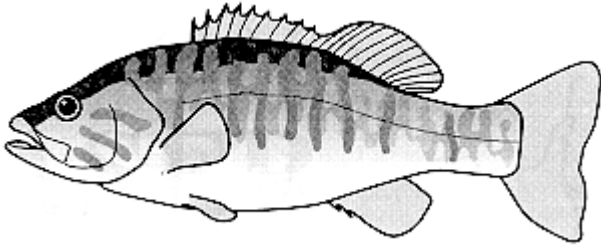
Prickly sculpin
Cottus asper

SUNFISH AND BASS **FAMILY CENTRARCHIDAE**



1 (2) Distinct, black opercular flap (outlined in red in mature males); pelvic fins reach vent; established in small lakes in the Victoria, Nanaimo and Alberni areas

Pumpkinseed
Lepomis gibbosus

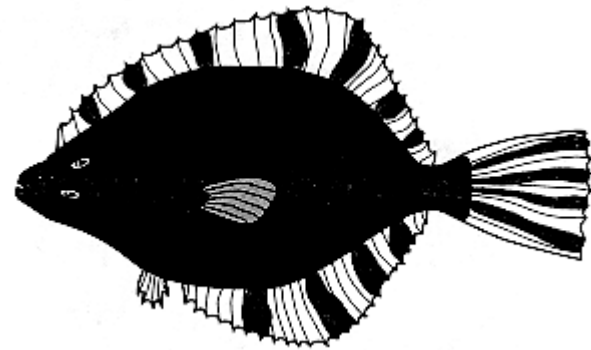


2 (1) No black opercular flap; pelvic fins do not reach vent; established in lakes in the Sooke, Victoria area as well as St. Mary's Lake on Saltspring Island and Spider Lake near Qualicum Beach

Smallmouth bass
Micropterus dolomieu

FLOUNDERS

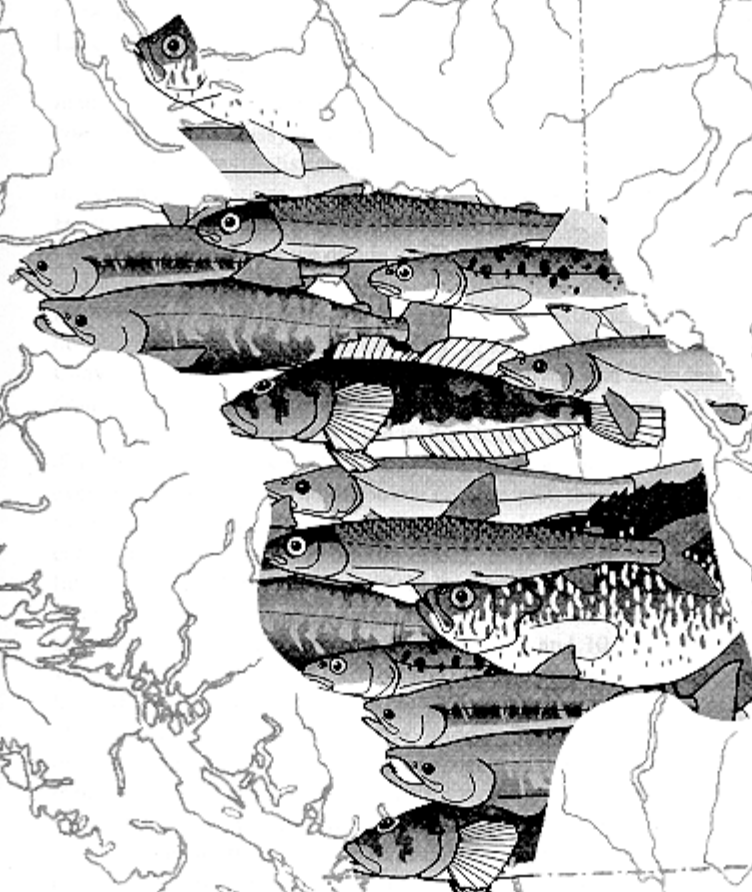
FAMILY PLEURONECTIDAE



The starry flounder (*Platichthys stellatus*) is a common inshore marine species. Juveniles are especially abundant in estuaries and, on Vancouver Island, they regularly penetrate low gradient rivers up to the limits of tidal influence.

FRASER

FRASER REGION



The Fraser is the second largest drainage system in BC (over 220,000 sq km) and the largest river system contained entirely within the province. Although not part of the Fraser proper, for convenience we have included here small independent drainages in the Vancouver area, including those on the Sechelt Peninsula and near Powell River as well as the BC portions of the Nooksack and Skagit rivers (Fig. 3). In the keys we refer to these systems adjacent to the lower Fraser as peripheral drainages. Fifty-two species of fish occur in the Fraser system, and of these 43 are native (Table 2). Most of the introduced species (shad, *Alosa sapidissima*; fathead minnow, *Pimephales promelas*; brown catfish, *Amiurus nebulosus*; pumpkinseed, *Lepomis gibbosus*; largemouth bass, *Micropterus salmoides*; and black crappie, *Pomoxis nigromaculatus*) are confined to the lower Fraser Valley, but carp and goldfish also occur in the Thompson region. An introduced subspecies of rainbow trout (the golden trout, *Oncorhynchus mykiss aguabonita*) occurs in Nicomen Lake, Skagit system (*pers. comm.*, R. K. Dahl, Conservation Officer).

The 43 native species represent a mixed fauna: all are postglacial immigrants; mainly from the Columbia but with at least two species (white sucker, *Catostomus commersoni* and brassy minnow, *Hybognathus hankinsoni*) from the Great Plains, and two undescribed forms (Salish sucker, *Catostomus* sp. and Nooksack dace, *Rhinichthys* sp.) from the Chehalis refugium. In addition, the landlocked smelts (*Spirinchus thaleichthys*) in Harrison and Pitt lakes may be glacio-marine relicts.

For convenience, we divide the Fraser system into four subregions: the upper, middle and lower Fraser, and the Thompson system. The upper Fraser extends from its source (Moose Lake) to the junction of the Willow River with the Fraser; the middle Fraser extends downstream from the confluence of the Fraser and Willow rivers to the end of the Fraser Canyon; the lower Fraser starts below the canyon and includes the adjacent peripheral drainages, and the Thompson system includes both the North and South Thompson rivers.

The upper Fraser rises high in the Rocky Mountain Trench and receives tributaries directly from glaciers in the Rocky and Cariboo mountains. The gradient is steep, and even in summer it is a cold, turbulent environment that contains only half as many species as the lower Fraser. Presumably, these species are all tolerant of the relatively harsh conditions. In contrast, the middle Fraser flows through the relatively flat, gently sloping Interior Plateau. It retains a heavy silt load but the gradient is less, and some tributaries are clear and relatively warm in summer. The surface of the Interior Plateau contains about half the small and medium-sized lakes in BC and 10 lakes with a surface area of over 100 sq km (Northcote and Larkin 1963). Three species (lake trout, *Salvelinus namaycush*; lake whitefish, *Coregonus clupeaformis*; and the white sucker) reach the southern limits of their BC distributions in the middle Fraser. In addition, disjunct populations of chiselmouth (*Acrocheilus alutaceus*) occur in the West Road and Chilcotin rivers, major tributaries of the middle Fraser. These populations, and the one in Nicola Lake (Thompson system), are the only chiselmouth populations known from the Fraser system.

Further south, where the river cuts through the Coast Range, the gradient increases and the river flows through a steep-sided, constricted canyon. A major clear water tributary, the Thompson River enters the muddy Fraser at Lytton. The Thompson drains the central and eastern parts of the Interior Plateau. There are three large lakes (Shuswap, Adams, and Kamloops) associated with the Thompson system. At Kamloops the Thompson divides

into a north and south fork. The North Thompson contains one Columbia species (the torrent sculpin, *Cottus rhotheus*) that is found nowhere else in the Fraser system, and another species (the mountain sucker, *Catostomus platyrhynchus*) that is modestly common in the North Thompson but elsewhere known only from juvenile specimens in the Fraser between Chilliwack and Hope. The South Thompson contains the only native populations of Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in the Fraser system.

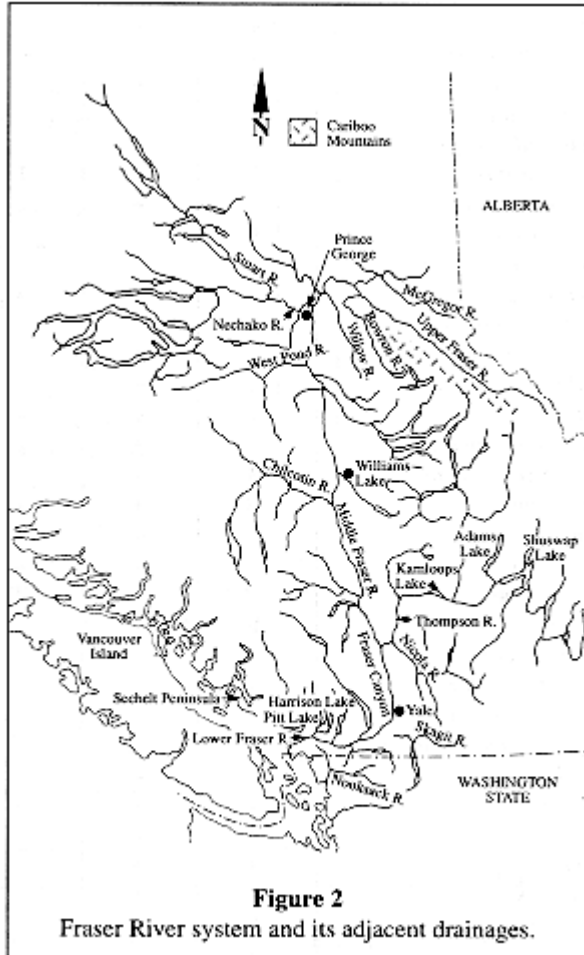
Not surprisingly, the Fraser Canyon is a major barrier to fish, and many anadromous species that are common in the lower Fraser are absent above the canyon. In at least two cases, however, the canyon *per se* is not the barrier. Both the coastal cutthroat (*Oncorhynchus clarki clarki*) and the coastrange sculpin (*Cottus aleuticus*) occur, but are not widespread, above the canyon. Curiously, the canyon appears as effective a barrier to downstream movement as to upstream movement. Seven species (lake trout; pygmy whitefish, *Prosopium coulteri*; lake chub, *Couesius plumbeus*; longnose sucker, *Catostomus catostomus*; bridgelip sucker, *Catostomus columbianus*; burbot, *Lota lota*; and slimy sculpin, *Cottus cognatus*) are common in either the mainstem Fraser or its tributaries, at the southern end of the Interior Plateau. Yet, none of these species have established populations in the lower Fraser, although four species (pygmy whitefish, longnose sucker, bridgelip sucker and slimy sculpin) occur more than halfway down the canyon at the mouth of Anderson Creek. In addition, single specimens of bridgelip sucker, lake trout and burbot are known from the Fraser below the canyon.

The lower Fraser consists of the approximately 180 km of river between Yale and the sea, as well as the adjacent peripheral drainages. The lower Fraser is wider and deeper than the middle and upper portions of the system, but the current is still strong even as it flows through the relatively flat Fraser Valley. The lower Fraser contains more species than the other parts of the system. Two of these species (the Salish sucker and the Nooksack dace) are of special interest. In BC, they occur only in small streams in the southern parts of the lower Fraser Valley. The Salish sucker occurs in the Salween River near Chilliwack, Fishtrap and Bertrand creeks (Nooksack system) near Aldergrove, and the Salmon River near Langley. Historically, it also occurred in the Little Campbell River near Whiterock but now appears to be extinct in this short coastal drainage. The Salish sucker is related to the longnose sucker (*Catostomus catostomus*) but is morphologically and genetically different from this widespread species. Its taxonomic status is under review, however, similar suckers occur on the Olympic Peninsula and in other areas in western Washington. Like the Salish sucker, the Nooksack dace, is also closely related to a widespread, common species—in this case, the longnose dace (*Rhinichthys cataractae*). Again, however, it is morphologically and genetically different from the widespread species and similar to populations in western Washington. Apparently, the Nooksack dace is another member of the Chehalis fauna. In BC, the Nooksack dace is known only from Bertrand and Fishtrap creeks near Aldergrove; however, it is widespread in western Washington, especially in the Nooksack and Skagit rivers.

Another special fish in the lower Fraser is a sculpin found in Cultus Lake. The coastrange sculpin (*Cottus aleuticus*) occurs in both the inlet and outlet of Cultus Lake, and in the lake itself there are prickly sculpins (*Cottus asper*). The lake also contains a curious dwarf sculpin that apparently is related to *C. aleuticus* (Ricker 1960). This dwarf sculpin is unusual in that it migrates to the surface of the lake at night. Sculpins usually live on the bottom, and because they lack a swimbladder they are denser than water. Normal

C. aleuticus have a streamlined body as befits an animal adapted for life in fast water. The dwarf Cultus Lake form, however, is less streamlined and has reduced its density by reducing bone thickness and storing oils under the skin. It also has the enlarged head pores characteristic of lacustrine species of *Cottus* (Bailey and Bond 1963). It breeds at an exceptionally small size and has larger than normal eggs. Nothing more is known about its biology or specific relationships, but -there is a similar sculpin in Lake Washington (Larson and Brown 1975).

There are non-migratory longfin smelts, *Spirinchus thaleichthys*, in Harrison and Pitt lakes. This species normally is anadromous and these populations probably were landlocked at the end of the marine submergence that briefly flooded the Fraser Valley after the retreat of the glaciers (Armstrong 1981). Similar landlocked smelts occur in Lake Washington near Seattle.



Species	Lower Fraser	Middle Fraser	Thompson	Upper Fraser
<i>Lampetra ayresi</i>	+	-	-	-
<i>L. richardsoni</i>	+	-	-	-
<i>L. tridentata</i>	+	+	+	-
<i>Acipenser medirostris</i>	+	-	-	-
<i>A. transmontanus</i>	+	+	+	+
<i>Alosa sapidissima</i>	I	-	-	-
<i>Acrocheilus alutaceus</i>	-	+	+	-
<i>Carassius auratus</i>	I	-	I	-
<i>Couesius plumbeus</i>	-	+	+	+
<i>Cyprinus carpio</i>	I	I	I	-
<i>Hybognathus hankinsoni</i>	+	+	-	-
<i>Mylocheilus caurinus</i>	+	+	+	+
<i>Pimephales promelas</i>	I	-	-	-
<i>Ptchocheilus oregonesis</i>	+	+	+	+
<i>Rhinichthys cataractae</i>	2	+	+	+
<i>R. falcatus</i>	+	+	+	-
<i>Richardsonius balteatus</i>	+	+	+	+
<i>Catostomus catostomus</i>	3	+	+	+
<i>C. columbianus</i>	R	+	+	-
<i>C. commersoni</i>	-	+	+	-
<i>C. macrocheilus</i>	+	+	+	+
<i>C. platyrhynchus</i>	R	-	+	-
<i>Ameiurus nebulosus</i>	I	-	-	-
<i>Hypomesus pretiosus</i>	1	-	-	-
<i>Spirinchus thaleichthys</i>	+	-	-	-
<i>Thaleichthys oacificus</i>	+	-	-	-
<i>Oncorhynchus clarki clarki</i>	+	R	-	-
<i>O. clarki lewisi</i>	-	-	+	-
<i>O. gorbuscha</i>	+	+	+	-
<i>O. keta</i>	+	-	-	-
<i>O. kisutch</i>	+	+	+	-
<i>O. mykiss mykiss</i>	+	+	+	+
<i>O. mykiss aguabonita</i>	I	-	-	-
<i>O. nerka</i>	+	+	+	+

Species cont.	Lower Fraser	Middle Fraser	Thompson	Upper Fraser
<i>O. tshawytscha</i>	+	+	+	+
<i>Salvelinus confluentus</i>	+	+	+	+
<i>S. fontinalis</i>	I	I	I	-
<i>S. malma</i>	+	-	-	-
<i>S. namaycush</i>	R	+	+	+
<i>Coregonus clupeaformis</i>	I	+	+	+
<i>Prosopium coulteri</i>	-	+	+	+
<i>P. williamsoni</i>	+	+	+	+
<i>Lota lota</i>	R	+	+	+
<i>Gasterosteus aculeatus</i>	+	-	-	-
<i>Cottus aleuticus</i>	+	+	-	-
<i>C. asper</i>	+	+	+	-
<i>C. cognatus</i>	-	+	+	+
<i>C. rhotheus</i>	-	-	+	-
<i>Leptocottus armatus</i>	E	-	-	-
<i>Lepomis gibbosus</i>	I	-	-	-
<i>Micropterus salmoides</i>	I	-	-	-
<i>Pomoxis nigromaculatus</i>	I	-	-	-
<i>Platichthys stellatus</i>	E	-	-	-

Table 2

Distribution of fishes in the Fraser River and adjacent small drainages
(Nootsack and Skagit rivers, and Sechelt Peninsula).

+ = present

- = absent

E = estuarine or tidal

I = introduced

R = in this area known from a single specimen

1 = The surf smelt occurs in Pitt Lake but it is not known if it spawns in the lake

2 = The longnose dace in Nootsack tributaries is genetically distinct from those in the Fraser system.

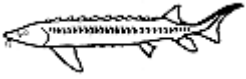
3 = The Salish sucker in the lower Fraser Valley is genetically distinct from *C. catostomus*

Pictorial Key To Families



LAMPREYS (PETROMYZONTIDAE)

33



STURGEONS (ACIPENSERIDAE)

35



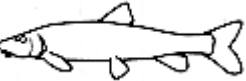
HERRINGS (CLUPEIDAE)

36



MINNOWS (CYPRINIDAE)

36



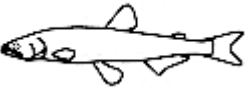
SUCKERS (CATOSTOMIDAE)

41



CATFISH (ICTALURIDAE)

43



SMELTS (OSMERIDAE)

43



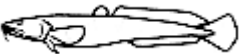
SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

44



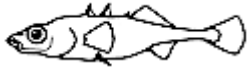
WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

54



CODS (GADIDAE)

55



STICKLEBACKS (GASTEROSTEIDAE)

55



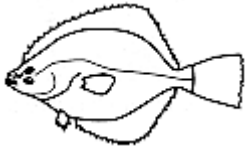
SCULPINS (COTTIDAE)

56



SUNFISH, BASS (CENTRARCHIDAE)

58



FLOUNDERS (PLEURONECTIDAE)

59

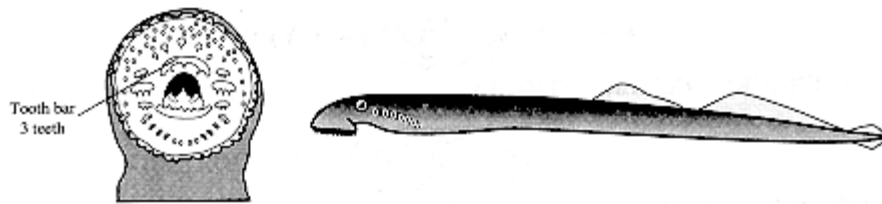
LAMPREYS **FAMILY PETROMYZONTIDAE**

Lampreys are not easy to identify. Their morphology changes with each of three distinctive life-history stages: filter-feeding ammocoetes, newly transformed "macrophthalmic" juveniles, and adults. For adults, tooth patterns and body size provide reliable field guides (a handlens is useful here), but for ammocoetes and newly transformed juveniles positive identifications require morphometric and meristic comparisons. Ammocoetes usually are associated with slow currents and soft, mud bottoms. Transformation takes place from late summer through early autumn, and the macrophthalmic juveniles move into faster water over gravel substrates. In anadromous species (Pacific and river lampreys), migration of young adults to the sea occurs in the spring. Spawning usually occurs in the spring but in the non-parasitic brook lamprey the spawning period can extend into the summer. The adults of some populations of Pacific and river lampreys return from the sea in the fall and over-winter in fresh water before spawning the next spring (Beamish 1980).



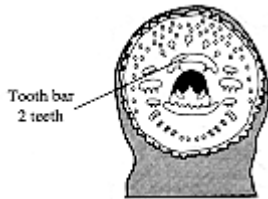
1 (6) Mouth a sucking disk; teeth and eyes present

adult or transforming lampreys



2 (3) Tooth bar immediately above mouth has three teeth; a large parasitic lamprey that ascends the Fraser upstream to at least the Chilcotin River; landlocked populations in Sakinaw and Ruby lakes, Sechelt Peninsula

Pacific lamprey
Lampetra tridentata



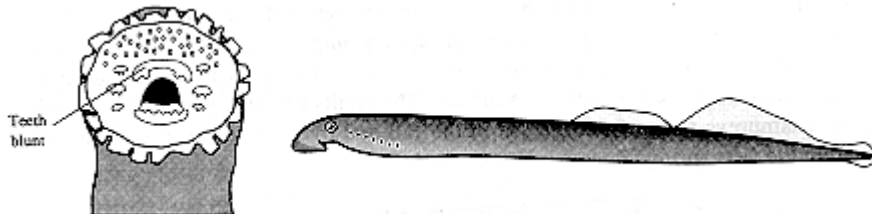
3 (2) Tooth bar immediately above the mouth has two teeth

4



4 (5) Teeth sharp, well developed; center pair of lateral teeth with three points; sharp tooth on center of tongue; a parasitic lamprey with adults usually longer than 200 mm; in Fraser system apparently confined to the lower river and its tributaries; also known from Powell River area

River lamprey
Lampetra ayresi



5 (4) Teeth blunt, poorly developed; center pair of side teeth with two points; no sharp tooth on tongue; a small non-parasitic lamprey (adults usually less than 160 mm); in Fraser system confined to the lower Fraser and Sechelt Peninsula

Western brook lamprey
Lampetra richardsoni

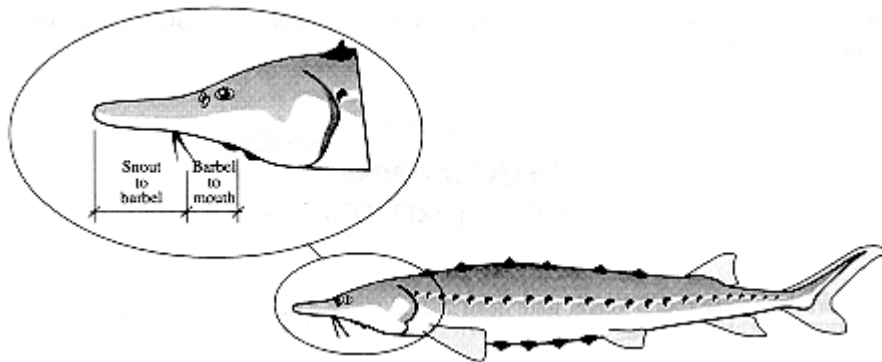
6 (1) Eyes absent or poorly developed; teeth absent; mouth not modified into a sucking disk

ammocoetes or larval lampreys
(see lamprey key in appendix, page 195).

STURGEONS

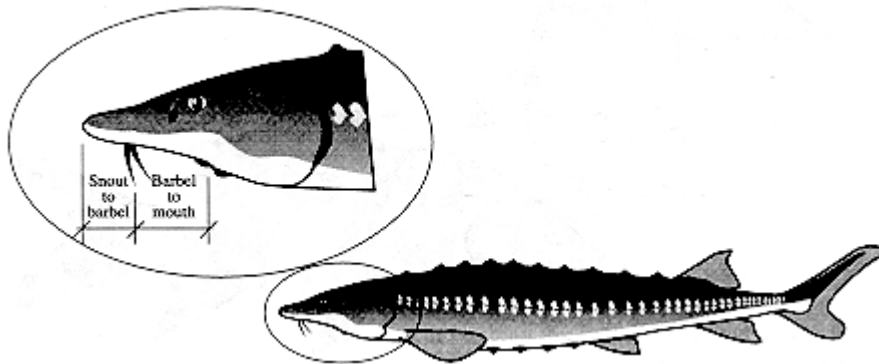
FAMILY ACIPENSERIDAE

Two species of sturgeon are reported from the Fraser system (green sturgeon and white sturgeon). The white sturgeon is a freshwater species that is widespread in mainstem waters throughout the system and only rarely enters the sea; while the green sturgeon is more common in the sea and is only rarely taken in fresh water and then only in the lower river. Both species are morphologically variable, especially in snout length and snout shape. Some of this variability may be associated with sex but it can make identification difficult.



1 (2) Back green; snout usually elongate and narrow; barbels nearer to mouth than to tip of snout; sporadic in the Trait of Georgia and Fraser estuary

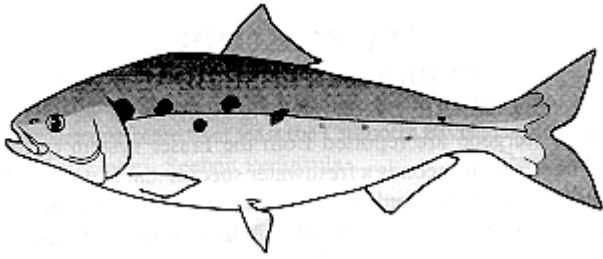
Green sturgeon
Acipenser medirostris



2 (1) Back dark grey to black; snout short and broad (except in some specimens less than 250 mm in length); barbels nearer to tip of snout than to mouth; common throughout the main river; occasional in large lakes

White sturgeon
Acipenser transmontanus

HERRINGS AND SHAD
FAMILY CLUPEIDAE

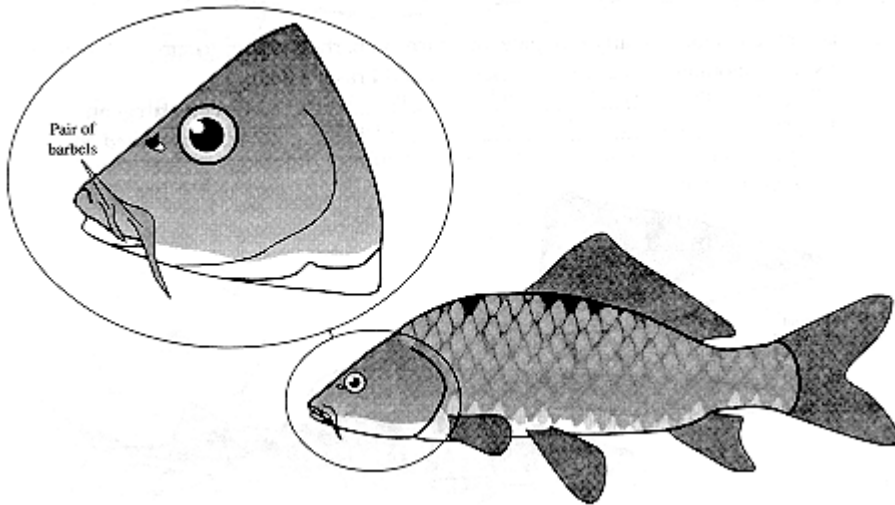


The shad (*Alosa sapidissima*), was introduced into California from eastern North America in the late nineteenth century. This species spawns in fresh water but spends most of its life in the sea. No self-sustaining runs of shad are known in BC but occasional individuals enter the lower Fraser River.

MINNOWS
FAMILY CYPRINIDAE

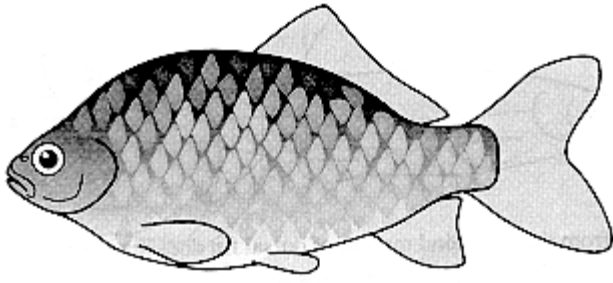
1 (4) Dorsal fin base much longer than head

2



2 (3) Two pairs of barbels on sides of upper jaw; common in the lower Fraser Valley, also in a number of lakes in the Thompson and Nicola systems

Carp
Cyprinus carpio

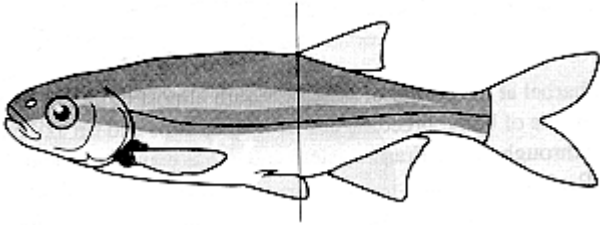


3 (2) No barbels on side of upper jaw; reported from a pond in the Salmon Arm area, and occasionally in ditches and streams in the lower Fraser Valley; probably no self-sustaining populations except in park ponds

Goldfish
Carassius auratus

4 (1) Dorsal fin base shorter than head

5

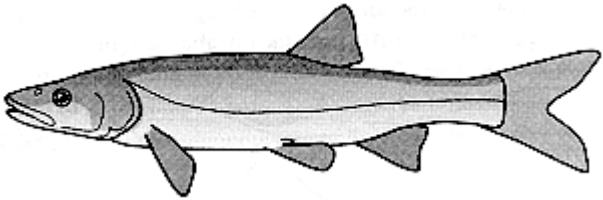


5 (6) Dorsal fin set far back on body, viewed from the side its origin is almost directly above the posterior tips of pelvic fins; widespread throughout the Fraser proper but absent from peripheral drainages

Redside shiner
Richardsonius balteatus

6 (5) Dorsal fin originates at about the middle of the body; viewed from the side the posterior tips of the pelvic fins extend well beyond the dorsal origin

7

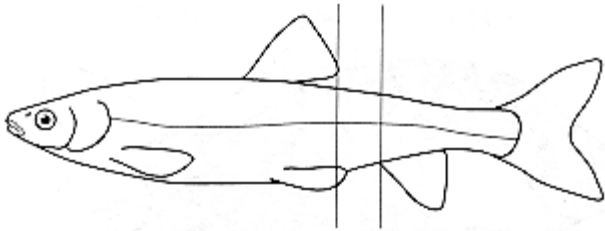


7 (8) Mouth large, upper jaw extends beyond anterior margin of eye; adults up to 450 mm in length; no dark mid-lateral strip in individuals less than 80 mm but in small fish a dark spot at base of tail; common throughout the Fraser proper but absent from peripheral drainages

Northern squawfish
Ptychocheilus oregonensis

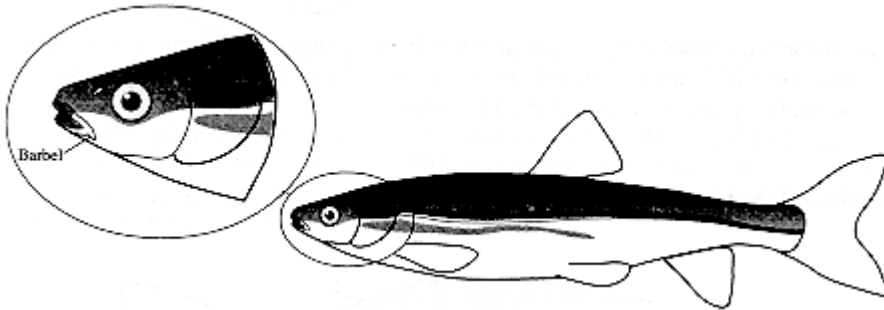
8 (7) Mouth small, upper jaw does not extend beyond anterior margin of eye

9



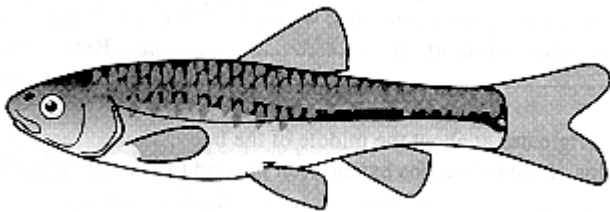
9 (12) Viewed from the side, hind margin of dorsal fin does not overlap anal fin

12



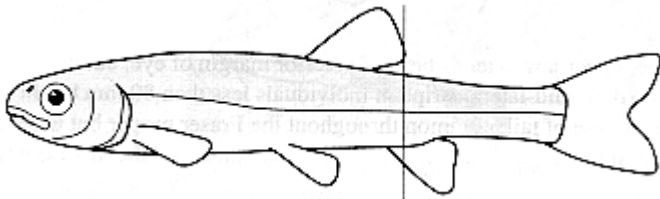
10 (11) Small barbel at the corner of mouth; mouth almost terminal; two dark horizontal stripes on side of body; breeding adults with red lips and fin axils; length to 250 mm; common throughout the Fraser system and in Sakinaw, Ruby and Waugh lakes on the Sechelt Peninsula

Peamouth
Mylocheilus caurinus



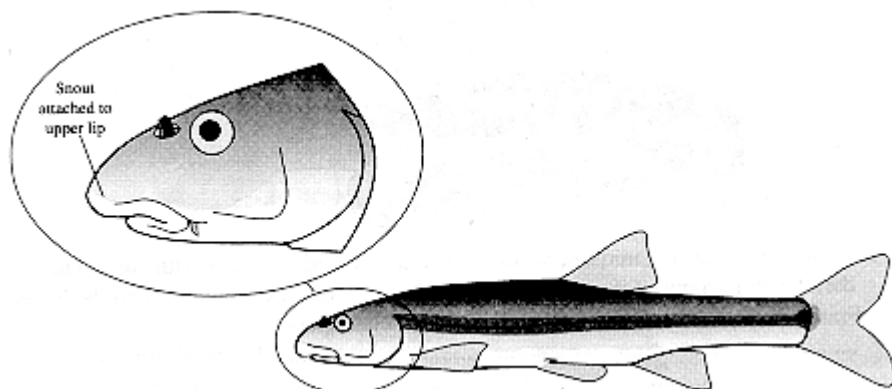
11 (10) No barbel at corner of mouth; snout overhangs mouth; flanks of breeding males with a brassy cast; length to 100 mm; locally abundant in the Vanderhoof-Prince George area and the lower Fraser Valley; rare in intervening areas

Brassy minnow
Hybognathus hankinsoni



12 (8) Viewed from the side, hind margin of dorsal fin clearly overlaps anal fin

13



13 (14) Snout directly attached to upper lip; upper jaw not protractile; eyes exceptionally small, their diameter usually less than one third snout length; adults common in riffles and occasionally in large lakes throughout the Fraser proper; replaced in the Nootsack by the closely related Nootsack dace

Longnose dace
Rhinichthys cataractae

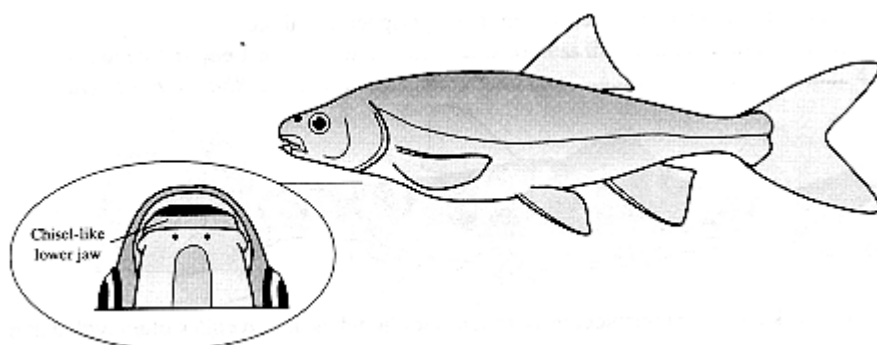


14 (13) Snout separated from upper lip by a groove across mid-line of snout; upper jaw protractile; eye diameter about half snout length

15 (18) No barbel at corner of mouth

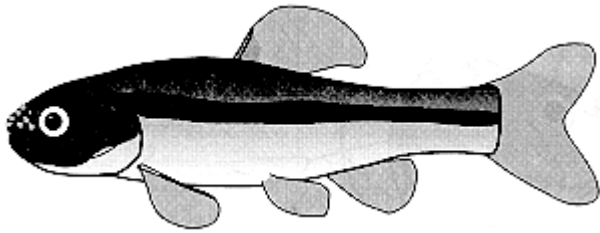
15

16



16 (17) Lower jaw chisel-like, nearly straight in adults; flanks a uniform silvery colour; sporadic in the middle Fraser where it is known from the Westroad and Chilcotin rivers and from Nicola Lake in the Thompson system

Chiselmouth
Acrocheilus alutaceus

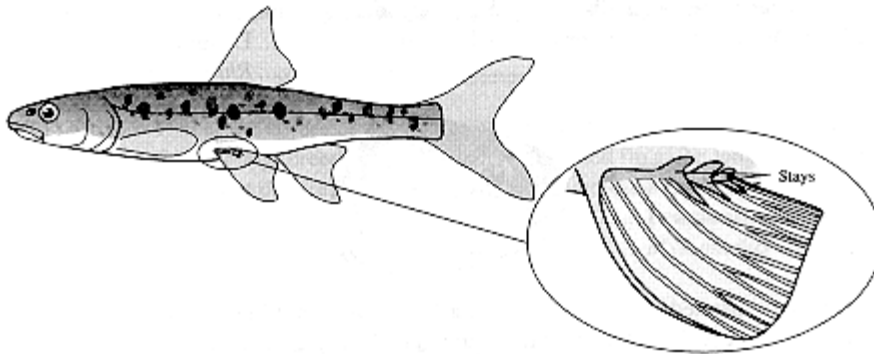


17 (16) Lower jaw normal; mid-lateral stripe in adults; breeding males with conspicuous dark head; introduced into the Little Cambell, Nootsack tributaries and the lower Fraser River, and also near Powell River (A. Peden, pers. comm.)

Fathead minnow
Pimephales promelas

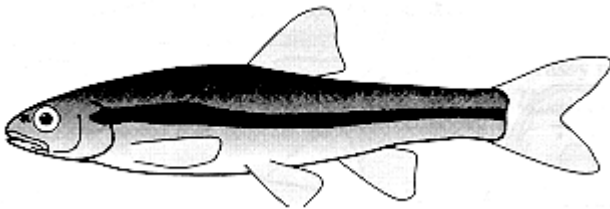
18 (15) Barbel at corner of mouth

19



19 (20) Flanks with conspicuous irregular dark blotches; fleshy membranes (stays) connect inner rays of pelvic fins to body; caudal peduncle depth less than distance from tip of snout to posterior margin of eye; abundant in the middle and lower Fraser especially in the main river, absent from peripheral drainages

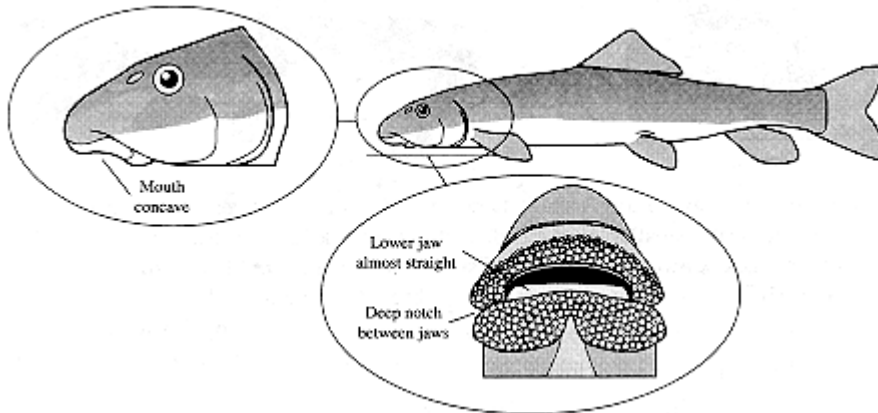
Leopard dace
Rhinichthys falcatus



20 (19) Flanks without conspicuous irregular dark blotches but juveniles often with a dark mid-lateral stripe; no fleshy membranes (stays) connecting inner rays of pelvic fins to body; caudal peduncle depth almost equal to distance from tip of snout to posterior margin of eye; common in the upper and middle Fraser and Thompson systems but apparently absent below the Fraser Canyon

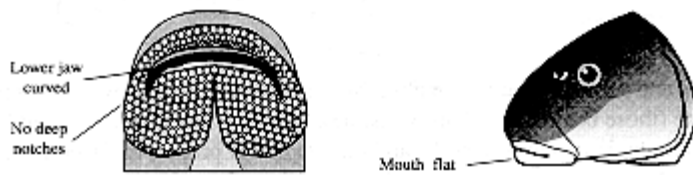
Lake chub
Couesius plumbeus

SUCKERS FAMILY CATOSTOMIDAE



1 (2) Deep notch between upper and lower lips at outer corners of mouth; lower jaw almost straight when viewed from below; viewed from the side the mouth is slightly cupped; a small species (usually less than 200 mm); in the Fraser known only from the North Thompson and the Fraser Thompson and the Fraser River between Chilliwack and Hope

Mountain sucker
Catostomus platyrhynchus



2 (1) No deep notches between upper and lower lips at outer corners of mouth; lower jaw curved when viewed from below; viewed from the side the mouth is flat

3 (7) Caudal peduncle narrow, its least depth half, or less than half, the dorsal fin base

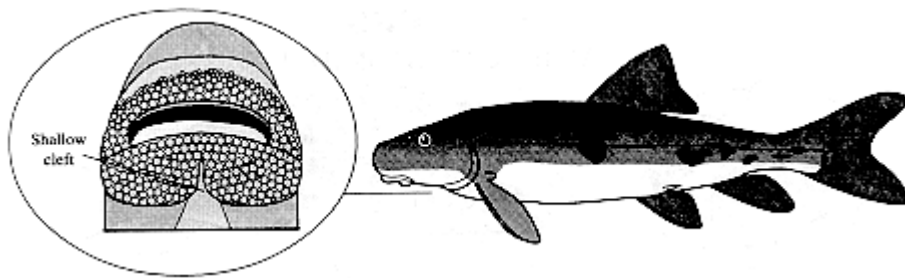
3

4



4 (5) cleft in lower lip deep, usually no papillae between cleft and lower jaw; scales large on adults even those near the head are clearly visible to naked eye; juveniles with light coloured peritoneum; breeding fish with a dark lateral stripe; common throughout the Fraser proper, also in the Nootsack but absent from the other peripheral drainages

Largescale sucker
Catostomus macrocheilus



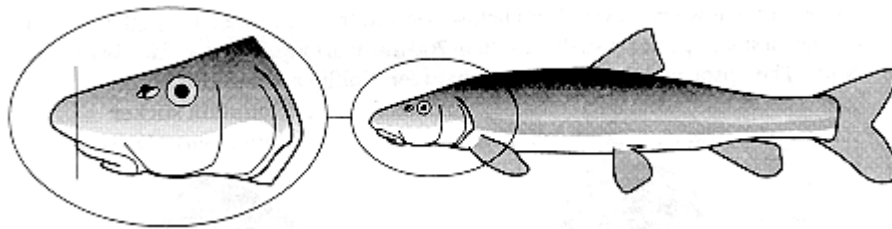
5 (4) Cleft in lower lip shallow, usually two or more rows of papillae between cleft and lower jaw; scales smaller, even on adults those near the head are hard to see; juveniles with jet black peritoneum; breeding fish with an orangish-red lateral stripe; rare in Fraser below canyon but common above; absent from peripheral drainages

Bridgelip sucker

Catostomus columbianus

6 (3) Caudal peduncle deep; its least depth much more than half the dorsal fin base

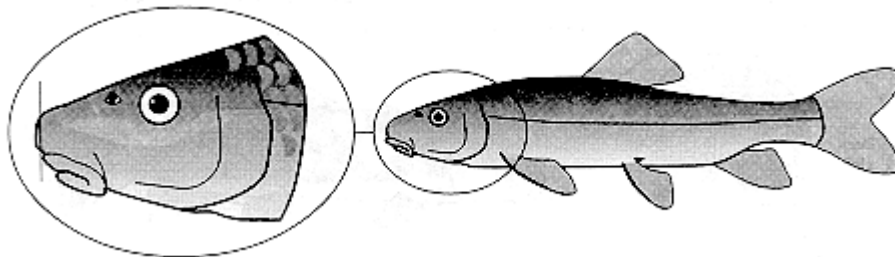
7



7 (8) Snout long and pointed; mouth strongly subterminal (snout clearly over-hangs mouth); scales fine (those behind head barely visible); breeding fish with a rosy red lateral stripe; common in cooler waters throughout the Fraser proper; replaced in the lower Fraser and Nootsack by the closely related Salish sucker

Longnose sucker

Catostomus catostomus

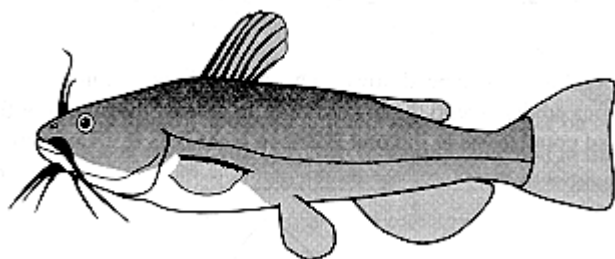


8 (7) Snout short and blunt; mouth not strongly subterminal (snout barely over-hangs mouth); scales large (those behind head clearly visible to naked eye); breeding fish with a bronze cast; common in upper Fraser lakes but rare south of Williams Lake; absent from peripheral drainages

White sucker

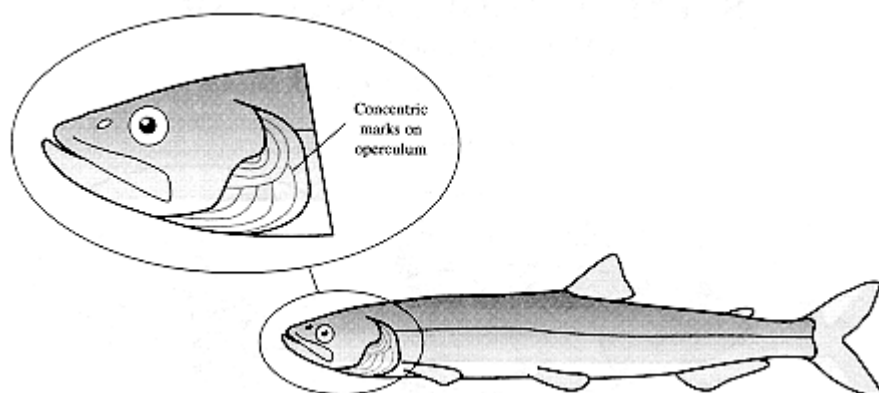
Catostomus commersoni

CATFISH
FAMILY ICTALURIDAE



The brown catfish (*ameiurus nebulosus*) is abundant in the lower Fraser Valley. This introduced species is common in sloughs and creeks that are closely associated with the main river; however, it is also found in the Serpentine and Little Cambell rivers and in several small lakes and ponds throughout the lower Fraser Valley.

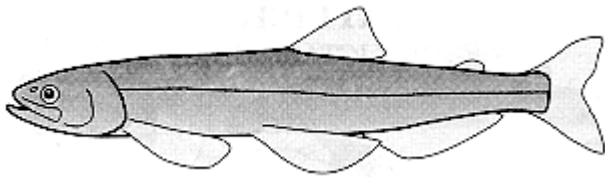
SMELTS
FAMILY OSMERIDAE



1 (2) Concentric marks on operculum; common in the mainstem lower Fraser in early spring when large numbers ascend to about Chilliwack

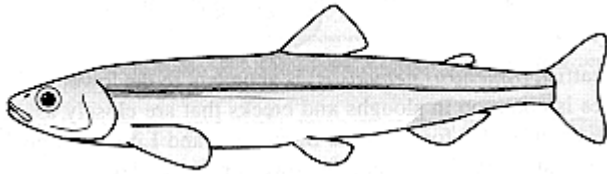
2 (1) No concentric marks on operculum

Eulachon
Thaleichthys pacificus



3 (4) Pectoral fin longer than head; lower jaw extends back to hind margin of eye; in fall anadromous adults ascend the lower Fraser to at least the mouth of the Pitt River; landlocked populations in Pitt and Harrison lakes

Longfin smelt
Spirinchus thaleichthys

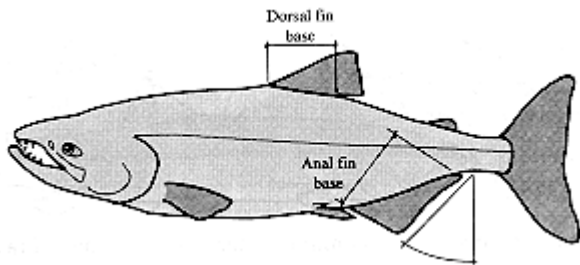


4 (3) Pectoral fin shorter than head; lower jaw does not extend back as far as hind margin of eye; ascends the lower Fraser to the mouth of the Pitt River and occasional individuals in Pitt Lake

Surf smelt
Hypomesus pretiosus

SALMON, TROUT AND CHAR
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS

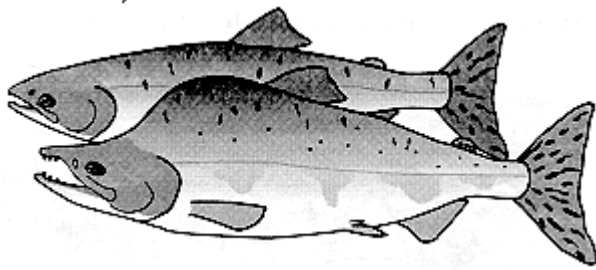


1 (10) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

2

2 (7) Distinct spots on tail

3



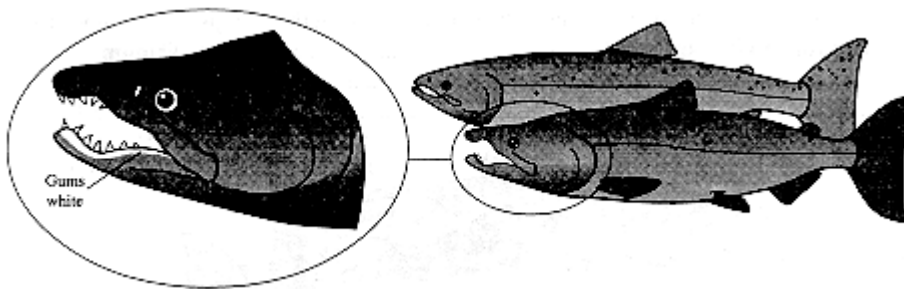
3 (4) Tail spots oblong (not round); adults common in the lower Fraser on odd numbered years; small runs ascend the canyon to spawn in Seton Creek and in the Thompson River

Pink salmon

Oncorhynchus gorbuscha

4 (3) Tail spots round (not oblong)

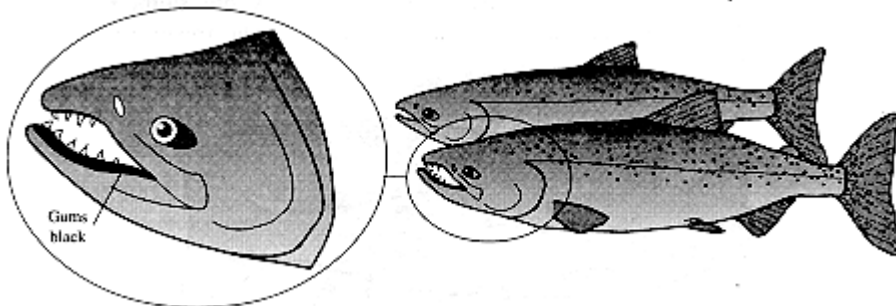
5



5 (6) Tail spotted on upper half; gums at base of teeth in lower jaw white; especially common in small streams throughout the lower Fraser (including peripheral drainages); adults regularly ascend the Thompson (both North and South) almost to their headwaters, but only rarely ascend the mainstem Fraser above Bridge River although there are sporadic reports as for upstream as Prince George

Coho salmon

Oncorhynchus kisutch



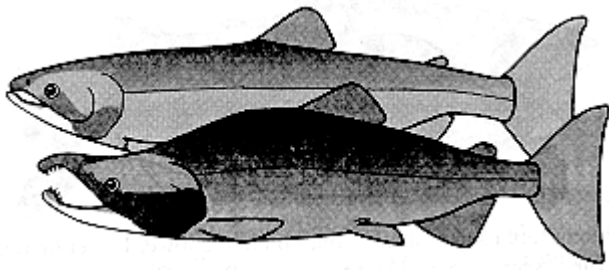
6 (5) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black; adults ascend the mainstem Fraser and the Thompson system almost to their sources

Chinook salmon

Oncorhynchus tshawytscha

7 (2) No spots on tail, but occasionally some fine speckles

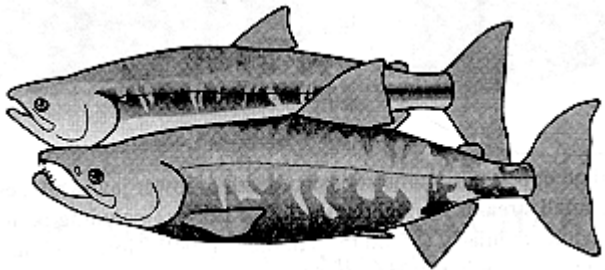
8



8 (9) Adults occur in fresh water both as migratory spawners (sockeye) and as residents (kokanee); flanks are uniformly coloured (silver in non-breeding kokanee, usually red in breeding sockeye and kokanee); kokanee occur in most large lakes associated with the Fraser system; anadromous adults ascend the mainstem Fraser to the McGregor and Bowron rivers (upper Fraser), and the Nechako and Stuart rivers (near Prince George) to their headwaters; the Adams River run (South Thompson) is famous for its strong four year cycle

Sockeye salmon
(Kokanee)

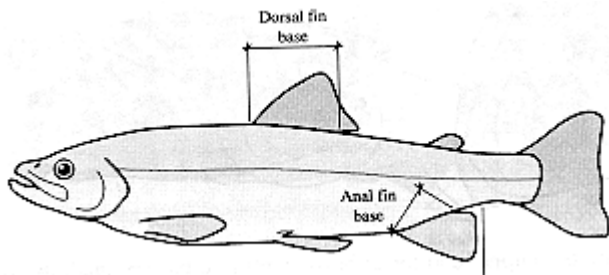
Oncorhynchus nerka



9 (8) Adults in freshwater only as spawners; flanks in males pale with irregular red and black blotches, females with a purplish lateral stripe; adults common in the lower Fraser (including peripheral drainages) but do not ascend the main river above Hope

Chum salmon

Oncorhynchus keta

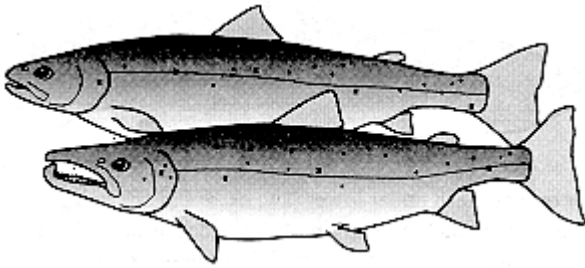


10 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

11

11 (18) Background colour on flanks light (silver or golden) with dark spots

12



12 (13) Relatively few spots on flanks, mostly above lateral line, some spots X-shaped; caudal fin usually without spots; spawning males with conspicuously hooked lower jaw; so far known only from the Stave River (lower Fraser)

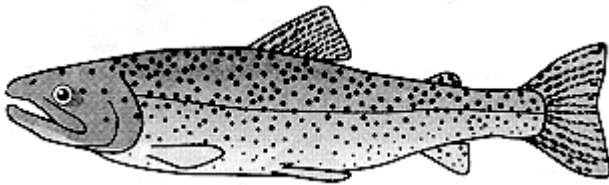
Atlantic salmon
Salmo salar

13 (12) Spots on back and sides more numerous; none X-shaped; caudal fin usually heavily spotted

14

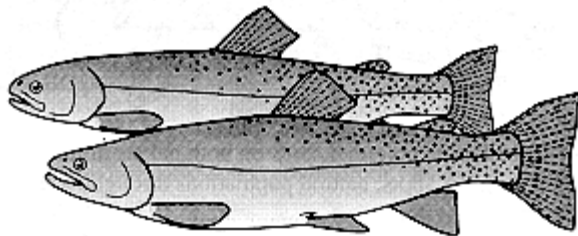
14 (17) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots

15



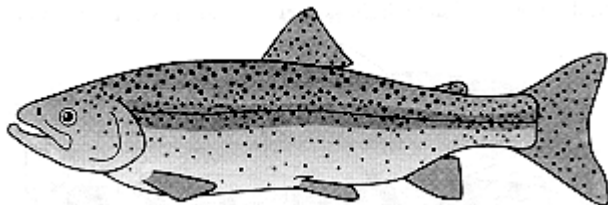
15 (16) Anterior flanks heavily spotted above and below lateral line, anal fin usually with spots; common in the lower Fraser (including the peripheral drainages except the BC portion of Skagit); ascends the Fraser as far as the Bahatlatch River near Boston Bar; one old record from the Thompson near Ashcroft

Coastal cutthroat trout
Oncorhynchus clarki clarki



16 (15) Anterior flanks lightly spotted (mostly above lateral line), anal fin usually without spots; in the Fraser system confined to headwater streams in the Shuswap drainage (South Thompson)

Westslope cutthroat trout
Oncorhynchus clarki lewisi

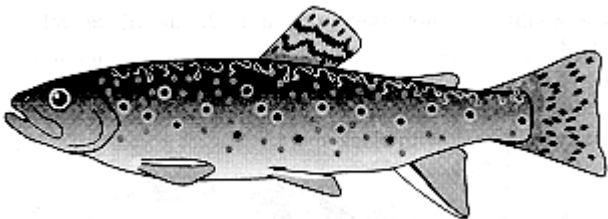


17 (14) No red or orange slash under lower jaw; except in spawning males upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots; common throughout the Fraser system (including the peripheral drainages)

Rainbow trout*
Oncorhynchus mykiss

18 (11) Background colour on sides dark with light or coloured spots

19

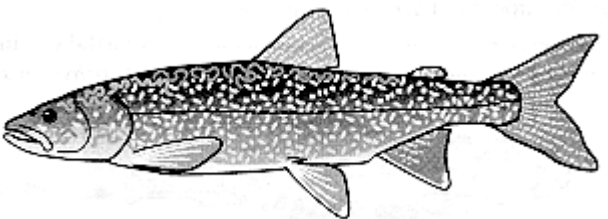


19 (20) Dorsal fin yellowish, with bold black streaks; red spots on flanks surrounded by blue haloes; introduced throughout the Fraser system

Brook trout
Salvelinus fontinalis

20 (19) Dorsal fin dusky and without bold black marks; spots on sides not surrounded by light haloes

21

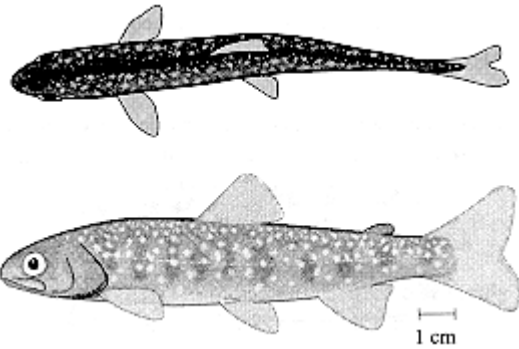


21 (22) Tail deeply forked, light coloured spots on both halves of tail; head and body covered in light irregular spots; natural populations throughout the upper and middle Fraser and Thompson system

Lake trout
Salvelinus namaycush

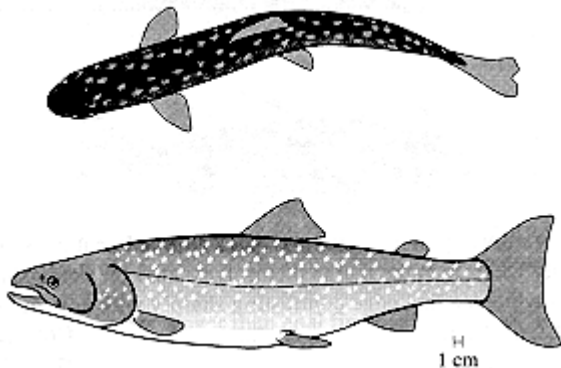
22 (21) Tail not deeply forked; spots if present only on upper half of tail

23



23 (24) Viewed from the side snout is blunt; viewed from above spots on back are small and crowded together; upper jaw short (barely reaches hind margin of eye); moderately abundant in lower Fraser lakes and streams (including peripheral drainages); absent from the middle and upper Fraser (except for the Stuart system)

Dolly Varden**
Salvelinus malma



24 (23) Viewed from the side snout is more pointed; viewed from above spots on back are large and well separated; upper jaw long (reaches well past hind margin of eye); moderately abundant in upper and middle Fraser and North Thompson lakes and streams, less common but present in the South Thompson and lower Fraser (including the BC portion of the Skagit)

Bull trout**
Salvelinus confluentus

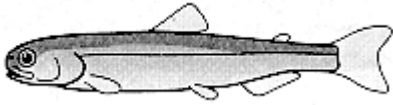
* In the Fraser region, the exotic subspecies (golden trout, *Oncorhynchus mykiss aguabonita*) occurs in Nicomen Lake, Skagit system.

** This species pair is difficult to distinguish and often hybridize. In sympatry, Dolly Varden usually mature at less than 200 mm and typically retain parr marks into adult life; whereas, bull trout rarely mature at less than 300 mm and do not retain parr marks into adult life. For a more reliable identification see the Appendix, pages 214 - 215.

KEY TO YOUNG SALMONIDS (45-100 mm)

1 (10) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish usually less than 50 mm long in freshwater

Pink salmon

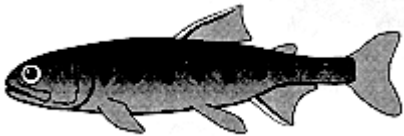
Oncorhynchus gorbuscha

3 (2) Parr marks on flanks

4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

5



5 (6) adipose fin uniformly pigmented; parr marks variable but the spaces between marks usually wider than the marks themselves; anal fin sickle-shaped with a conspicuous white leading edge contrasting sharply with adjoining dark pigment

Coho salmon

Oncorhynchus kisutch



6 (5) adipose fin with a clear unpigmented "windows"; spaces between parr marks usually wider than the marks themselves; anal fin not sickle-shaped, white leading edge not contrasting conspicuously with adjacent dark pigment

Chinook salmon

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye

8



8 (9) Size in fresh water to over 100 mm; parr marks divided roughly in half by mid-line; combined width of parr marks much less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line

Sockeye salmon

(Kokanee)

Oncorhynchus nerka



9 (8) Size in fresh water less than 50 mm; back mottled green, sides silvery, with a faint green iridescence below mid-line; combined width of dark areas along mid-line more than half the combined width of the light areas; parr marks faint or absent below mid-line

Chum salmon

Oncorhynchus keta

10 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin vertical

11

11 (17) Numerous distinct dark spots on dorsal fin; in very small specimens the first dorsal ray may be black

12

12 (15) Coloured spots (red to yellow) along mid-line or between parr marks; combined width of parr marks along mid-line about equal to or greater than the combined width of the light areas

13

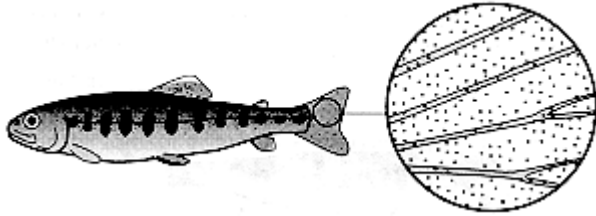


13 (14) No definite spots other than parr marks below the mid-line; 8 or 9 parr marks, the widest about equal to eye diameter; adipose fin dusky

Brook trout
Salvelinus fontinalis

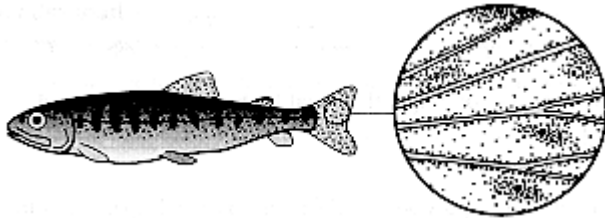
14 (13) No coloured (red to yellow) spots; width of dark areas along mid-line less than width of light areas

15



15 (16) On fish below 50 mm melanophores are distributed over entire tail; few or no spots on tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye

Rainbow trout
Oncorhynchus mykiss



16 (15) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye

Cutthroat trout*
Oncorhynchus clarki clarki

17 (11) Dorsal fin without numerous dark spots; in very small specimens the first dorsal ray may be dusky but not black

18



18 (19) Black spots on back and sides; 8-10 regularly shaped parr marks; width of dark areas on mid-line about equal to width of light areas; a single red dot between each parr mark

Atlantic salmon

Salmo salar

19 (18) No black spots on back and sides; parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; parr marks not separated by single red dots

20



20 (21) Parr marks along mid-line are vertical bars with width of dark areas equal to or less than width of light areas; dorsal fin starts about middle of body (excluding tail)

Lake trout

Salvelinus namaycush



Dolly Varden



Bull trout

21 (20) Parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; dorsal fin starts in front of middle of body (excluding tail)

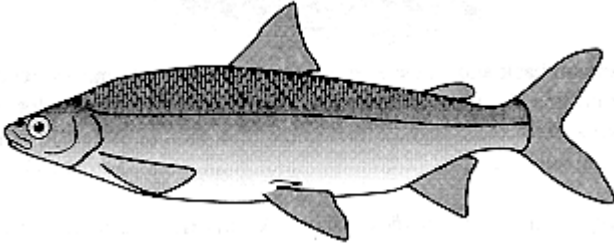
Dolly Varden and Bull trout**

Salvelinus malma or *S. confluentus*

* Below the Fraser Canyon the subspecies is (*Oncorhynchus clarki clarki*); while in the Fraser system the interior subspecies (*Oncorhynchus clarki lewisi*) is confined to headwater streams in the South Thompson.

** Small specimens of these two species cannot be easily differentiated in the field (use the key in the appendix, page 223).

WHITEFISH
FAMILY SALMONIDAE
(SUBFAMILY COREGONINAE)

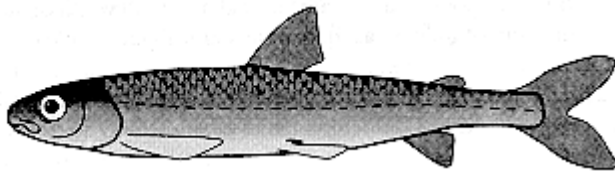


1 (2) Body deep, slab-sided; lower surface curves downward when viewed from side; common in large lakes throughout the upper and middle Fraser, absent from the lower Fraser (including peripheral drainages)

Lake whitefish
Coregonus clupeaformis

2 (1) Body slender, round in cross-section; lower surface nearly flat when viewed from side

3

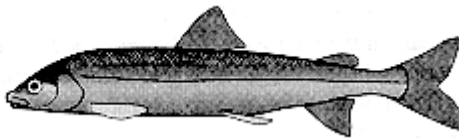


3 (4) Viewed from above snout blunt, rounded; adipose fin small, base equal to eye diameter; deep lakes in upper and middle Fraser and Thompson systems, absent from the lower Fraser (including peripheral drainages)

Pygmy whitefish
Prosopium coulteri



"normal"



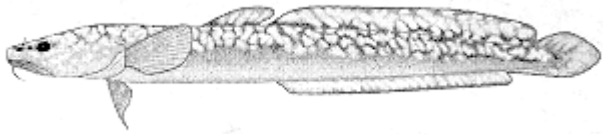
"pinocchio"

4 (3) Viewed from above snout pointed; adipose fin large, base about 1.5 times eye diameter; widespread throughout the Fraser proper; absent in BC portions of all peripheral drainages except Nootsack

Mountain whitefish*
Prosopium williamsoni

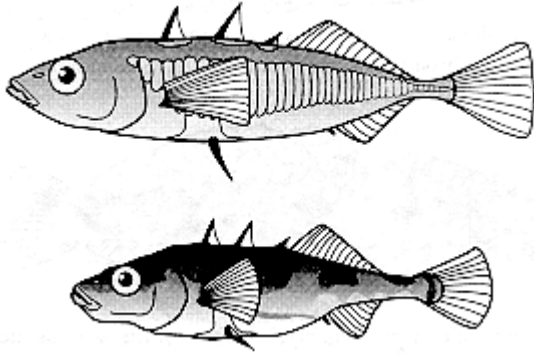
* Many fluvial populations contain two forms: normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

CODS
FAMILY GADIDAE



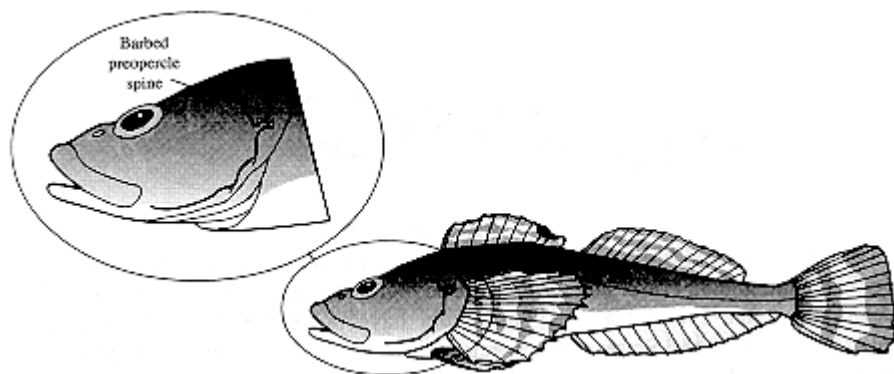
One species of cod (the burbot, *Lota lota*) is a permanent resident of lakes and rivers in the upper and middle Fraser and the Thompson region. Occasional specimens are taken downstream of the Fraser Canyon, but burbot have not established self-sustaining populations in the lower Fraser. This species is absent from the peripheral drainages. A marine species (*Microgadus proximus*) occasionally enters the Fraser estuary but never penetrates the Fraser Delta.

STICKLEBACKS
FAMILY GASTEROSTEIDAE



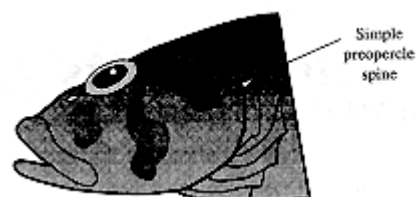
The threespine stickleback (*Gasterosteus aculeatus*) is abundant in lakes and low gradient streams throughout the lower Fraser (including the peripheral drainages except for the BC portion of the Skagit). Two genetically different life-history forms occur in the lower Fraser: a permanent freshwater resident, and a migratory marine form that in the spring ascends freshwater streams to spawn. The species is notoriously variable, and in many lower Fraser sites the two forms hybridize.

SCULPINS
FAMILY COTTIDAE



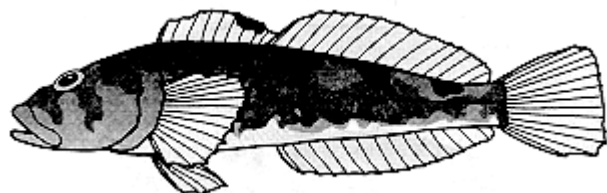
1 (2) Underside dead white; spine on preopercle with obvious hooks; pectoral fins with alternating yellow and dark bands of approximately equal width; common in estuaries

Pacific staghorn sculpin
Leptocottus armatus



2 (1) Underside light or dusky but not dead white; spine on preopercle simple; pectoral fins speckled but without broad dark bands

3

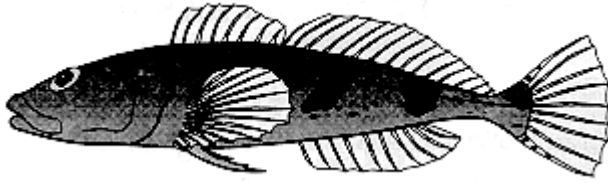


3 (4) First dorsal fin with a conspicuous black spot; anal fin base distinctly longer than head length; in streams, typically in quiet water; common in lakes and estuaries; widespread throughout the Fraser proper (including the peripheral drainages except for the BC portion of the Skagit)

Prickly sculpin
Cottus asper

4 (3) First dorsal fin without a conspicuous black spot; anal fin base about equal to head length

5



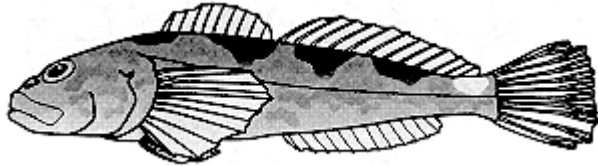
5 (6) Back and sides usually strongly prickled; chin heavily mottled; usually two distinct dark saddle marks under second dorsal fin; in the Fraser system only in the North Thompson drainage

Torrent sculpin

Cottus rhotheus

6 (5) Back and sides without strong prickles; chin pale or dusky, not heavily mottled; no conspicuous dark saddle marks under second dorsal fin

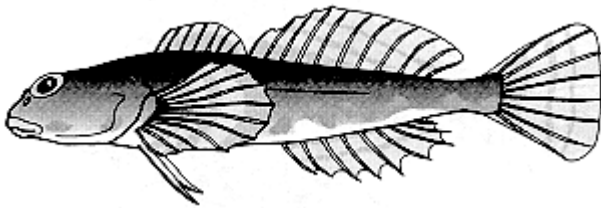
7



7 (8) Usually a conspicuous light mark on back just in front of caudal fin; lateral line complete; adults typically in riffles, although occasionally in lakes; common in the lower Fraser system but rare above the canyon where it is known only from streams tributary to the Bridge River

Coastrange sculpin*

Cottus aleuticus



8 (7) No conspicuous light mark on back just in front of caudal fin; lateral line incomplete; common throughout the middle and upper Fraser but absent in the lower Fraser (including peripheral drainages)

Slimy sculpin

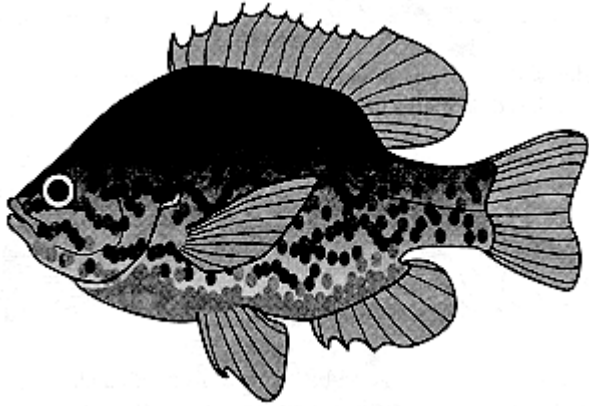
Cottus cognatus

* There are two forms of *Cottus aleuticus* in Cultus Lake: normal sized, bottom-dwelling individuals, and vertically migrating, dwarf individuals.

SUNFISH AND BASSES
FAMILY CENTRARCHIDAE

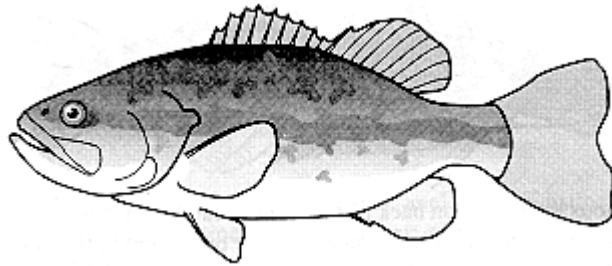
1 (4) Dorsal fin base (including both spinous and soft portions) noticeably longer than anal fin base

2



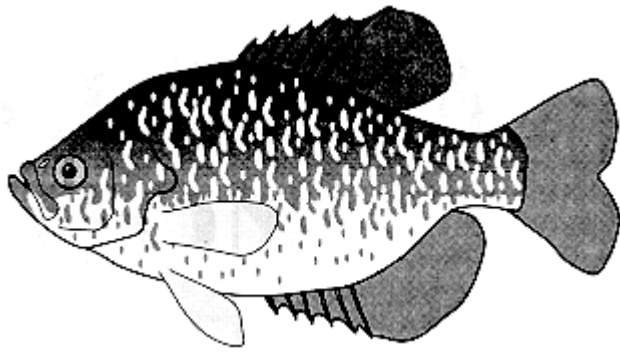
2 (3) Distinct, black opercular flap (outlined in red in mature males); pelvic fins reach vent; in Fraser system confined to the lower Fraser Valley

Pumpkinseed
Lepomis gibbosus



3 (2) No distinct black opercular flap; pelvic fins do not reach vent; in Fraser system confined to the Sumas drainage (lower Fraser)

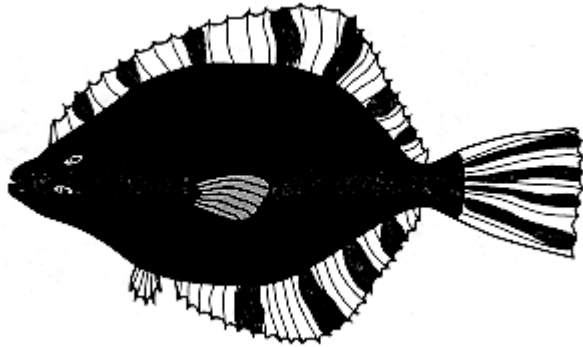
Largemouth bass
Micropterus salmoides



4 (1) Dorsal fin base (including both spinous and soft portions) about equal to anal fin base; in the Fraser system confined to sloughs and lakes of the lower Fraser Valley

Black crappie
Pomoxis nigromaculatus

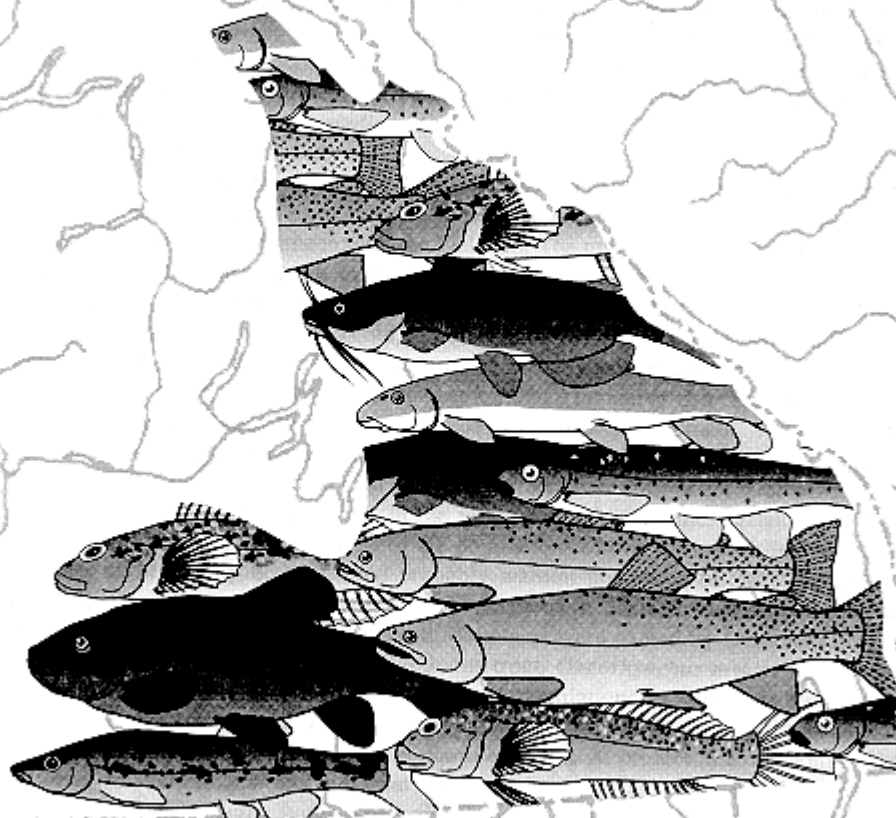
FLOUNDERS FAMILY PLEURONECTIDAE



The starry flounder (*Platichthys stellatus*) is a marine flatfish whose juveniles are common in estuaries. In the Fraser, they occur from the estuary upstream to about Mission. These flounders do not breed in fresh water and mature adults typically are found in shallow inshore marine environments.

COLUMBIA REGION

COLUMBIA



The Columbia is the third largest drainage basin in BC with over 100,000 sq km inside provincial boundaries. The Columbia River rises near Canal Flats and flows north through the Rocky Mountain Trench to about Mica Creek. It then swings south and flows through the Arrow Lakes and crosses the border just south of Trail (Fig. 4). The BC portion of the Columbia system contains 43 species of fish, of which 27 are native and 16 are introduced (Table 3). The indigenous fishes of the Columbia and its tributaries form one of the most distinctive fish faunas in North America (Miller 1965), and all 27 native species probably survived glaciation somewhere within the Columbia system. There are also more introduced species in the Columbia than anywhere else in BC. The majority of introduced species (brown trout, *Salmo trutta*; lake trout, *Salvelinus namaycush*; lake whitefish, *Coregonus clupeaformis*; carp, *Cyprinus carpio*; goldfish, *Carassius auratus*; tench, *Tinca tinca*; brown catfish, *Ameiurus nebulosus*; black catfish, *Ameiurus melas*; pumpkinseed, *Lepomis gibbosus*; black crappie, *Pomoxis nigromaculatus*; largemouth bass, *Micropterus salmoides*; smallmouth bass, *Micropterus dolomieu*; yellow perch, *Perca flavescens*; and walleye, *Stizostedion vitreum*) are found in the lower Columbia, Kettle and Okanagan drainages.

For convenience we divide the Columbia system in BC into eight subregions: the upper Columbia; the upper Kootenay; the lower Columbia; the lower Kootenay; the Kettle; the Okanagan; the Similkameen; and the Flathead. The upper Columbia extends from its source (Columbia Lake) downstream to the Arrow Lakes. The upper Columbia rises at high altitude and receives tributaries directly from glaciers in the Rocky and Purcell mountains. Even in summer it is a cold, turbulent and silt-loaded environment that probably resembles the meltwater channels and streams of early postglacial time more than the clear, less turbulent lower reaches of the same river. The native fish fauna is sparse and limited to the few species that can tolerate the harsh environment. Because of the mountainous terrain, there are barriers (falls and rapids) on most upper Columbia tributaries. Usually, only trout or char occur above these barriers, but occasionally there are sculpins. The native cutthroat trout in the upper Columbia are the westslope cutthroat (*Oncorhynchus clarki lewisi*). Many of the populations of this subspecies isolated above falls are exceptionally beautiful and probably warrant protection on aesthetic grounds alone. Some of the isolated rainbow trout populations in this area also are unusual, and those in high altitude lakes in the Selkirk Mountains were named by Dymond (1931) as a distinct subspecies: the mountain Kamloops trout, *Oncorhynchus mykiss whitehousei*. Dymond (1931) also described some isolated populations of cutthroat trout in the Revelstoke area (from both Columbia and Fraser tributaries) as a distinct subspecies: the mountain cutthroat trout, *Oncorhynchus clarki alpestris*. At present, the taxonomic status of these isolated rainbow and cutthroat trout populations is not clear, but they probably do not warrant subspecific status. The isolated char populations in the upper Columbia are all bull trout (*Salvelinus confluentus*).

Like the Columbia, the Kootenay River rises high in the Rocky Mountains but, unlike the Columbia, the Kootenay flows south into the US before re-entering BC to join the Columbia at Castlegar. The upper Kootenay extends from its source downstream to the first border crossing. In terms of its ecology and climate, the upper Kootenay is similar to the upper Columbia and shares the same sparse fish fauna. The lower Kootenay is that part of the river that extends from the second border crossing (where it re-enters BC) to the

confluence with the Columbia at Castlegar. Ecologically, the lower Kootenay is very different from the upper Kootenay: it is clear and less turbulent, although still strongly flowing, and its major feature is a large oligotrophic lake—Kootenay Lake. The fauna of the lower Kootenay is more diverse than that of the upper Kootenay and contains species like the white sturgeon (*Acipenser transmontanus*) and bridgelip sucker (*Catostomus columbianus*) that are absent in the upper river. In addition, Kootenay Lake contains a population of exceptionally large rainbow trout, the famous Gerrard stock.

The lower Columbia stretches from the Arrow Lakes south to the US border. Like the lower Kootenay, it is a much more benign environment than the upper river and, again, its most striking feature is a pair of large oligotrophic lakes—upper and lower Arrow lakes. Most of the smaller tributaries of the lower Columbia have high gradients, and there are often falls or other velocity barriers isolating them from the main river. The fauna isolated above these falls is more diverse than that found in similar circumstances in the upper river. For example, although trout and char are common above barriers, sometimes there are also sculpins, minnows and suckers. Occasionally there are barriers on major tributaries. Bonnington Falls on the Kootenay River between Kootenay Lake and the mainstem Columbia was clearly a barrier to the upstream dispersal of several species (Table 3), as was the velocity barrier where the Pend d' Oreille River enters the Columbia at Waneta.

The Flathead, Kettle, Okanagan and Similkameen subregions each are defined by their respective drainage basins. In BC, the Flathead subregion is isolated from the rest of the Columbia system by the Border Ranges. The Flathead River is one of the major headwaters of the Pend d' Oreille system, and like many headwater drainages it contains a relatively sparse fish fauna (Table 3), but one sculpin found in this subregion is of taxonomic interest. Originally, this sculpin was reported as *Cottus confusus*, the shorthead sculpin, and several sites in the Flathead drainage were the only known localities for this species in Canada (Carl *et al.* 1958, Peden and Hughes 1984). Recently, however, Peden *et al.* (1989) have called these records into question and suggest that the sculpin in the Flathead may be *Cottus bairdi*, the mottled sculpin.

The remaining three subregions (the Kettle, Okanagan and Similkameen) drain the southern parts of the Interior Plateau and the Monashee Mountains. These systems are smaller, less turbulent and warmer in summer than most other Columbia subregions. These differences are reflected in their fish faunas. For example, one species (the bull trout, *Salvelinus confluentus*) is abundant in the upper and lower Columbia and Kootenay systems but is absent from the Kettle, Okanagan and Similkameen rivers. Generally, however, their fish faunas are similar to that in the lower Columbia. Still, there are falls and rapids on these rivers that act as barriers to fish dispersal. For example, the velocity barrier at Cascade on the Kettle River appears to have prevented the upstream dispersal of widespread species such as the longnose dace (*Rhinichthys cataractae*) and torrent sculpin (*Cottus rhotheus*). The same is true of Okanagan Falls, where four species that occur below the falls are absent above the barrier (Table 3). A similar barrier on the Similkameen (Similkameen Falls) is much farther upstream, but only two native species (rainbow trout and longnose dace) are found above the falls. Such barriers not only prevent upstream dispersal, but also isolate upstream populations from gene flow with downstream populations of the same species. This isolation can accelerate the process of divergence, and in at least one case (a largescale sucker, *Catostomus macrocheilus*) in the Kettle River the upstream form is morphologically distinct from populations below the barrier.

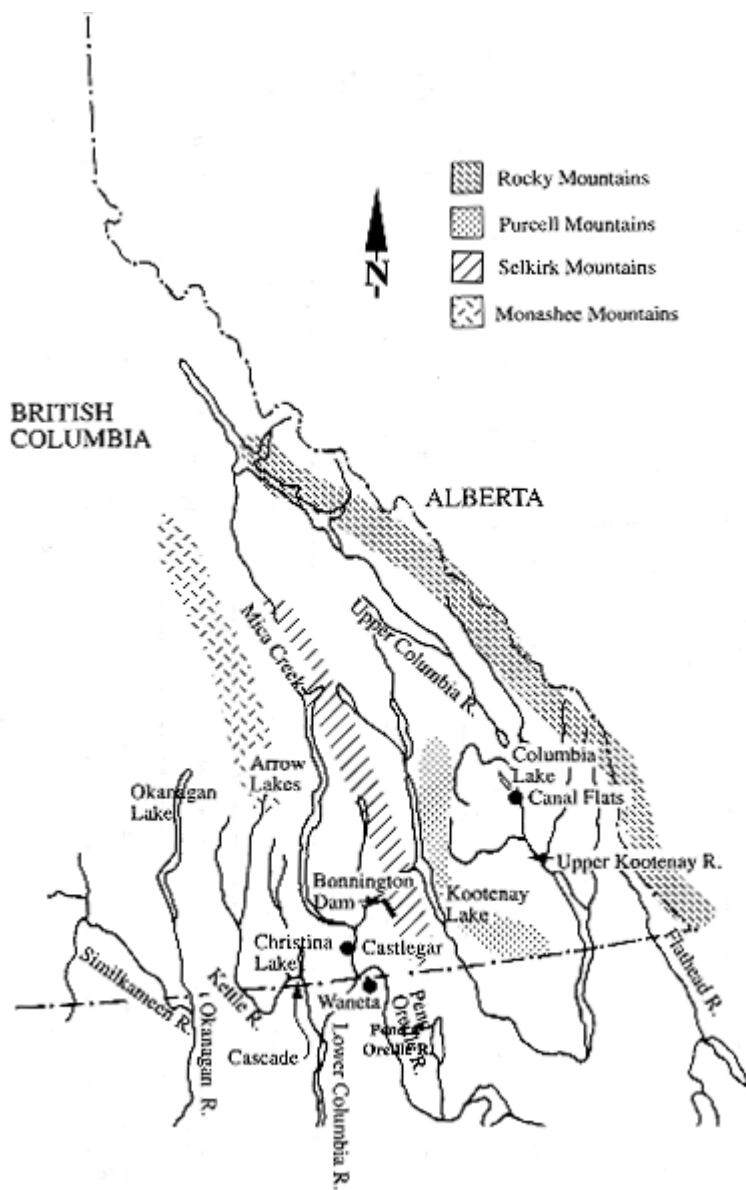


Figure 3
Columbia River system and its adjacent drainages

Species	Upper Columbia	Lower Columbia	Upper Kootenay	Lower Kootenay	Kettle	Okanagan	Similkameen	Flathead
<i>Acipenser transmontanus</i>	-	+	-	+	-	?	-	-
<i>Acrocheilus alutaceus</i>	+	B	-	B	+	B	B	-
<i>Carassius auratus</i>	-	I	-	-	-	I	-	-
<i>Couesius plumbeus</i>	-	+	-	+	+	+	B	-
<i>Cyprinus carpio</i>	-	I	-	I	I	I	-	-
<i>Mylocheilus caurinus</i>	+	+	+	+	+	+	B	-
<i>Ptchocheilus oregonesis</i>	+	+	+	+	+	+	B	-
<i>Rhinichthys cataractae</i>	+	+	+	+	B	+	+	-
<i>R. falcatus</i>	-	B	-	+	B	+	B	-
<i>R. osculus</i>	-	B	-	-	+	-	-	-
<i>R. umatilla</i>	-	B	-	+	B	?	B	-
<i>Richarsonius catostomus</i>	+	+	+	+	+	+	B	-
<i>Tinca tinca</i>	-	I	-	-	I,B	I,B	-	-
<i>Catostomus catostomus</i>	+	+	+	+	+	+	B	+
<i>C. columbianus</i>	-	+	-	+	-	B	B	-
<i>C. macrocheilus</i>	+	+	+	+	+	+	B	-
<i>C. platyrhynchus</i>	-	-	-	-	-	-	B	-
<i>Ameiurus melas</i>	-	I	-	I	-	I,B	-	-
<i>A. nebulosus</i>	-	?	-	-	-	?	-	-
<i>Oncorhynchus clarki lewisi</i>	+	+	+	+	-	-	I	+
<i>O. mykiss</i>	+	+	+	+	+	+	+	+
<i>O. nerka</i>	-	+	-	+	I	+	B	-
<i>O. tshawytscha</i>	E	E,I	-	-	-	B	-	-
<i>Salmo trutta</i>	-	-	-	-	I	-	I	-
<i>Salvelinus confluentus</i>	+	+	+	+	-	-	-	+
<i>S. fontinalis</i>	-	I	-	I	I	I	I	-
<i>S. namaycush</i>	-	I	-	I	-	I	-	-
<i>Thymallus arcticus</i>	-	-	-	-	-	-	-	I
<i>Coregonus clupeaformis</i>	-	I	-	I	-	I	-	-
<i>Prosopium coulteri</i>	+	+	+	+	-	+	-	-
<i>P. williamsoni</i>	+	+	+	+	+	+	B	+
<i>Lota lota</i>	+	+	+	+	-	+	B	-
<i>Cottus asper</i>	-	B	-	B	B	+	B	-
<i>C. bairdi (hubbsi?)</i>	-	B	-	B	B	-	B	+
<i>C. cognatus</i>	+	+	+	+	+	+	B	+
<i>C. confusus</i>	-	B	-	B	B	-	-	-
<i>C. rhotheus</i>	+	+	+	+	B	B	B	-
<i>Lepomis gibbosus</i>	-	I	-	I	I,B	I,B	-	-
<i>Micropterus dolomieu</i>	-	I	-	-	I,B	I	-	-
<i>M. salmoides</i>	-	I	-	I	I,B	I	-	-
<i>Pomoxis nigromaculatus</i>	-	-	-	-	-	I,B	-	-
<i>Perca flavescens</i>	-	I	I	I	-	I	I	-
<i>Stizostedion vitreum</i>	-	I,B	I	-	I,B	-	-	-

Table 3

Distribution of fishes in the Columbia River and adjacent small drainages.

+ = present

- = absent

? = uncertain record

I = introduced

B = below barriers

E = extinct

Pictorial Key To Families



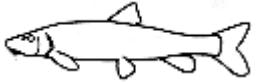
STURGEONS (ACIPENSERIDAE)

68



MINNOWS (CYPRINIDAE)

68



SUCKERS (CATOSTOMIDAE)

73



CATFISH (ICTALURIDAE)

74



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

75



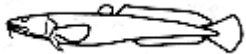
WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

80



GRAYLINGS (SALMONIDAE)
(SUBFAMILY THYMALLINAE)

81



CODS (GADIDAE)

82



SCULPINS (COTTIDAE)

82



SUNFISH, BASS (CENTRARCHIDAE)

84



PERCH (PERCIDAE)

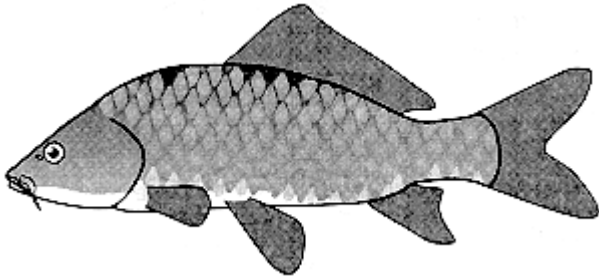
86

STURGEONS
FAMILY ACIPENSERIDAE



The white sturgeon (*Acipenser transmontanus*) is the only sturgeon in the Columbia system in BC. It is relatively common in the mainstem Columbia and Kootenay rivers and sporadic in large lakes such as the Arrow Lakes and Kootenay Lake. Presumably, the population in the Kootenay above Bonnington Falls has been isolated from the main Columbia population since the origin of the falls. There are also unconfirmed reports of sturgeon in Okanagan Lake.

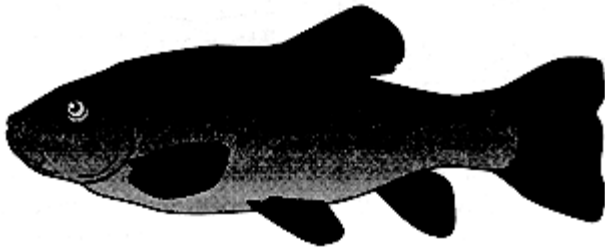
MINNOWS
FAMILY CYPRINIDAE



1 (2) Dorsal fin base much longer than head; established throughout the Okanagan system and Similkameen, also in the lower Columbia and in Christina Lake (Kettle system)

2 (1) Dorsal fin base shorter than head

Carp
Cyprinus carpio

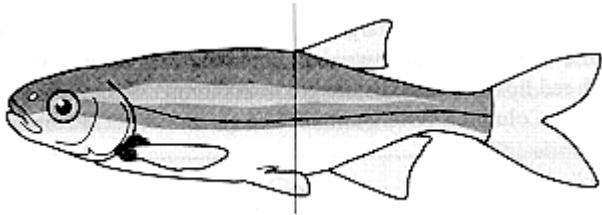


3 (4) Caudal peduncle deep, its depth more than half of head length; all fins are dark; established in the Okanagan system below Okanagan Falls, in Christina Lake (Kettle system) and the reservoir above Waneta Dam (Pend d'Oreille system)

Tench
Tinca tinca

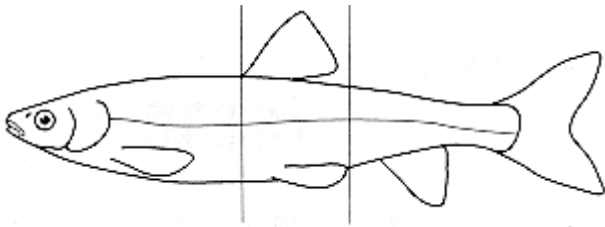
4 (3) Caudal peduncle slender, its depth less than half head length; not all fins are dark

5



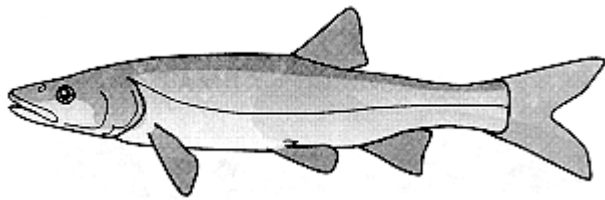
5 (6) Dorsal fin set far back on body, viewed from the side its origin is almost directly above the posterior tips of pelvic fins; widespread throughout the Columbia system in BC

Redside shiner
Richardsonius balteatus



6 (5) Dorsal fin originates at about the middle of the body; viewed from the side the posterior tips of the pelvic fins extend well beyond the dorsal origin

7



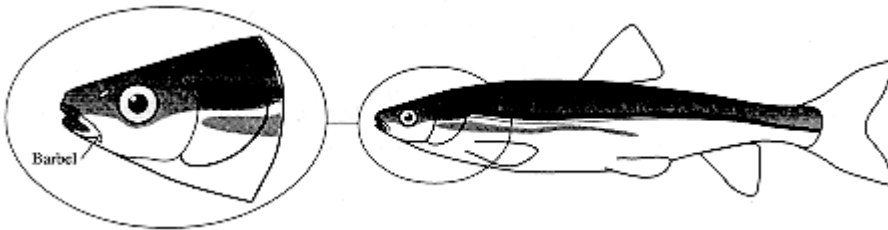
7 (8) Mouth large, upper jaw extends beyond anterior margin of eye; adults up to 300 mm in length; no dark mid-lateral stripe in individuals less than 80 mm but in small fish a dark spot at base of tail; common throughout the BC portion of the Columbia system

Northern squawfish

Ptychocheilus oregonensis

8 (7) Mouth small, upper jaw does not extend beyond anterior margin of eye

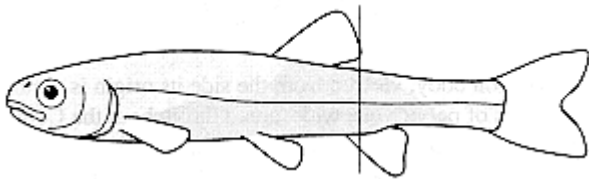
9



9 (10) Viewed from the side, hind margin of dorsal fin does not overlap anal fin; small barbel at the corner of mouth; two dark horizontal stripes on side of body; breeding adults with red lips and fin axils; length to 200 mm; common throughout the BC portion of the Columbia system

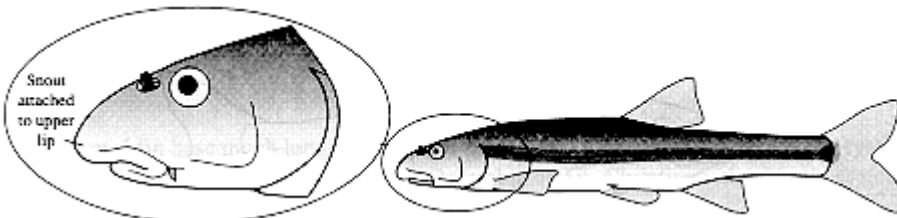
Peamouth

Mylocheilus caurinus



10 (9) Viewed from the side, hind margin of dorsal fin clearly overlaps anal fin

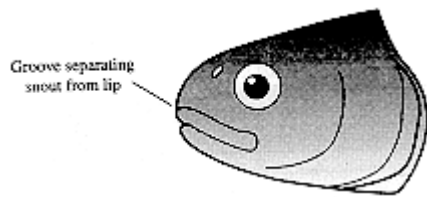
11



11 (12) Snout directly attached to upper lip; upper jaw not protractile; eyes exceptionally small, their diameter usually less than one third snout length; adults common in riffles and occasionally in large lakes throughout most of the Columbia system; absent from the Kettle (above the barrier at Cascade) and Flathead systems

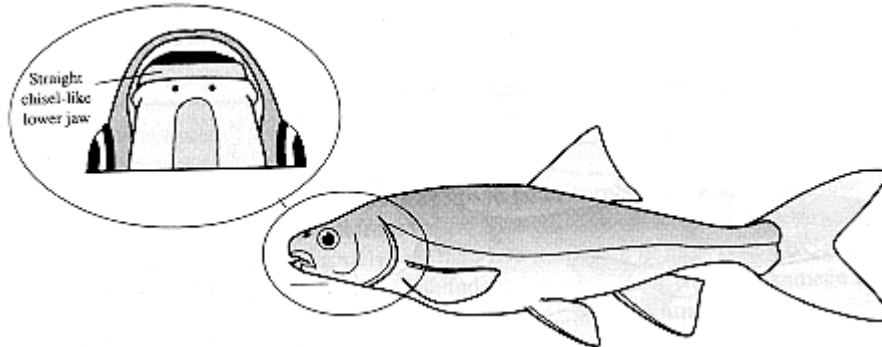
Longnose dace

Rhinichthys cataractae



12 (11) Snout separated from upper lip by a groove across mid-line of snout; upper jaw protractible; eye diameter about half snout length

13



13 (14) Lower jaw chisel-like, nearly straight in adults; flanks a uniform silvery colour; sporadic in the Okanagan, Similkameen, Kettle and upper and lower Columbia systems; absent from the Kootenay and Flathead systems

Chiselmouth

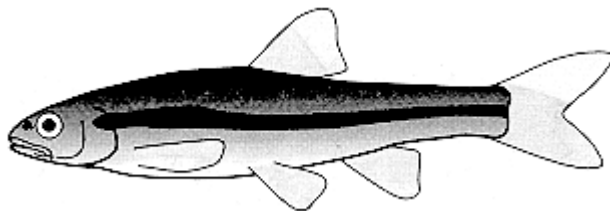
Acrocheilus alutaceus

14 (13) Lower jaw normal, not chisel-like; flanks speckled, or with an indistinct mid-lateral band, or conspicuous irregular dark blotches

15

15 (18) Mouth terminal (snout does not overhang mouth)

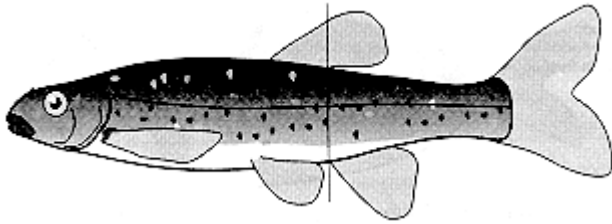
16



16 (17) Small barbel at corner of mouth; origin of anal fin well behind hind end of dorsal fin base; juveniles usually with a dark mid-lateral stripe; sporadic in small lakes in the Similkameen, Okanagan and Kettle systems; absent from the lower and upper Columbia, and the lower and upper Kootenay systems

Lake chub

Couesius plumbeus

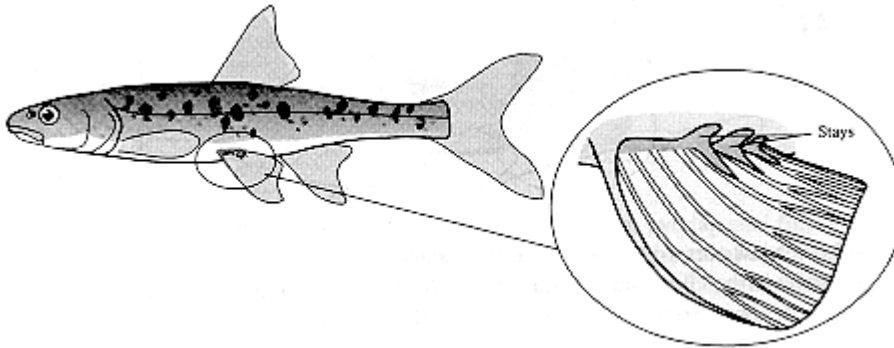


17 (16) No barbels at corner of mouth; origin of anal fin almost directly below the hind end of dorsal fin base; in BC known only from the Kettle system where it occurs both above and below the barrier at Cascade

Speckled dace
Rhinichthys osculus

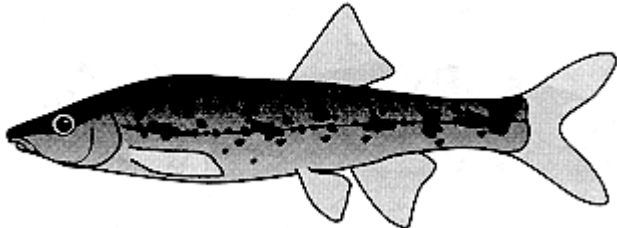
18 (15) Mouth subterminal (snout overhangs mouth)

19



19 (20) Barbel conspicuous, protrudes beyond corner of mouth; well developed fleshy membranes (stays) connect inner rays of pelvic fins to body; caudal peduncle depth only slightly wider than interorbital width; present in the Similkameen, Okanagan, lower Columbia and lower Kootenay (below Bonnington Falls) systems

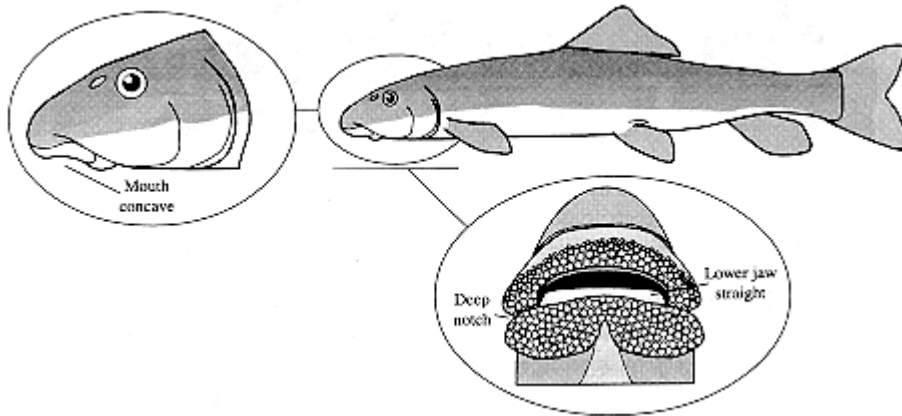
Leopard dace
Rhinichthys falcatus



20 (19) Barbel inconspicuous, does not protrude beyond corner of mouth; fleshy membranes (stays) not well developed; caudal peduncle depth conspicuously wider than interorbital width; in BC, known from the Similkameen, Kettle (below barrier at Cascade), lower Columbia and lower Kootenay (below Bonnington Falls) systems

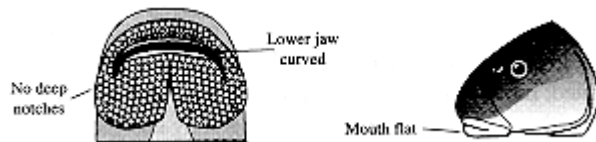
Umatilla dace
Rhinichthys umatilla

SUCKERS FAMILY CATOSTOMIDAE



1 (2) Deep notch between upper and lower lips at outer corners of mouth; lower jaw almost straight when viewed from below; viewed from the side the mouth is slightly cupped; a small species (usually less than 200 mm); rare in most of the BC parts of the Columbia system but modestly abundant at some sites in the Similkameen River

Mountain sucker
Catostomus platyrhynchus

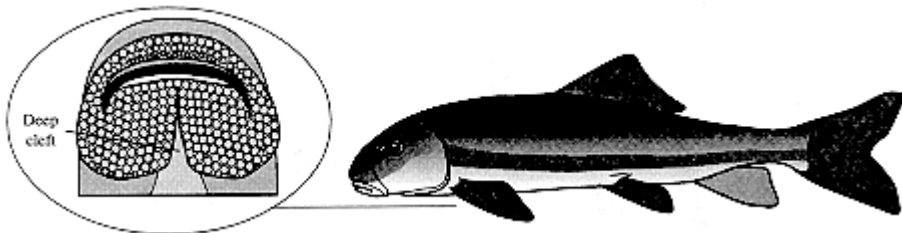


2 (1) No deep notches between upper and lower lips at outer corners of mouth; lower jaw curved when viewed from below; viewed from the side the mouth is flat

3 (6) Caudal peduncle narrow, its least depth half, or less than half, the dorsal fin base; snout blunt; mouth not strongly subterminal (snout barely overhangs mouth)

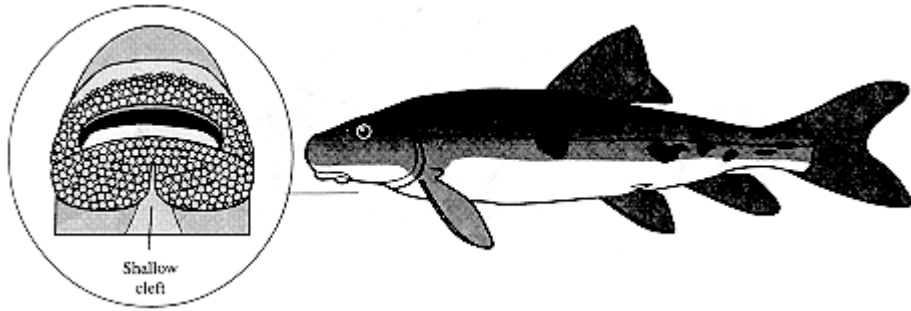
3

4



4 (5) Cleft in lower lip deep, usually no papillae between cleft and lower jaw; scales large, on adults even those near the head are clearly visible to naked eye; juveniles with light coloured peritoneum; breeding fish with a dark lateral stripe; common in lakes and larger streams throughout the Columbia system, even above major barriers

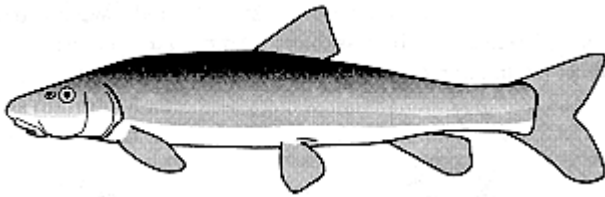
Largescale sucker
Catostomus macrocheilus



5 (4) Cleft in lower lip shallow, usually two or more rows of papillae between cleft and lower jaw; scales smaller, even on adults those near the head are hard to see; juveniles with jet black peritoneum; breeding fish with an orangish-red lateral stripe; abundant in the lower Columbia below barriers but absent from the upper Columbia and the Kootenay system above Bonnington Falls, also absent above the falls on the Okanagan, kettle and Similkameen systems

Bridgelip sucker

Catostomus columbianus

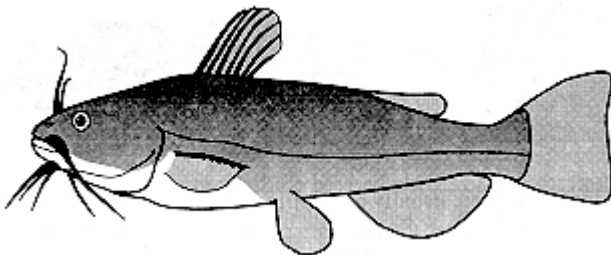


6 (3) Caudal peduncle deep, its least depth much more than half the dorsal fin base; snout long and pointed; mouth strongly subterminal (snout clearly overhangs mouth); breeding fish with a rosy red lateral stripe; moderately common in cooler waters throughout the Columbia system

Longnose sucker

Catostomus catostomus

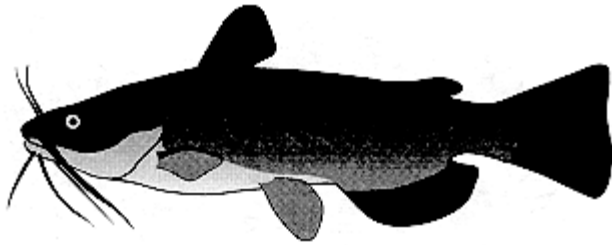
CATFISH
FAMILY ICTALURIDAE



1 (2) Hind margin of pectoral spine with strong hooks near the tip; membranes between dorsal rays dusky

Brown catfish*

Ameiurus nebulosus



2 (1) Hind margin of pectoral spine with weak hooks, often almost smooth near the tip; membranes between dorsal rays usually black; established in lower Columbia, mowar Kootenay River and Okanagan system below Okanagan falls

Black catfish*

Ameiurus melas

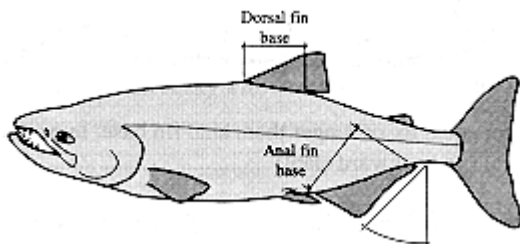
* these species are often confused, and at present the distribution of brown catfish in the BC portion of the Columbia system is unclear.

SALMON, TROUT AND CHAR

FAMILY SALMONIDAE

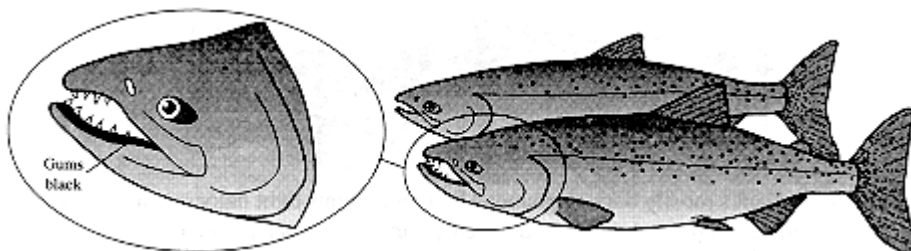
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS



1 (4) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

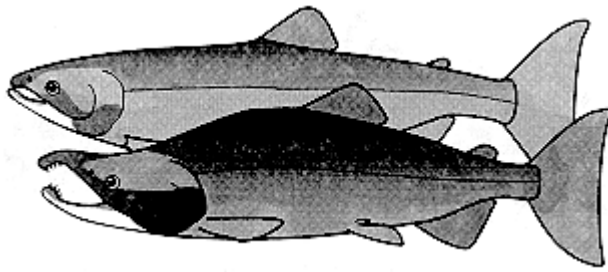
2



2 (3) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black; introduced into Roosevelt Reservoir in Washington, occasional individuals occur in the lower Columbia near Trail

Chinook salmon

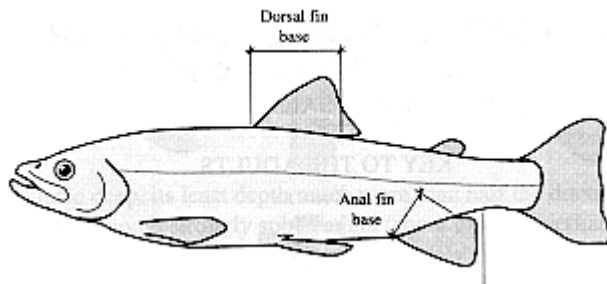
Oncorhynchus tshawytscha



3 (2) No spots on tail, but occasionally some fine speckles; gums at base of teeth in lower jaw light; adults occur in fresh water both as migratory spawners (sockeye) and as residents (kokanee); flanks are uniformly coloured (silver in non-breeding kokanee, usually red in breeding sockeye and kokanee); kokanee occur in most large lakes associated with the Columbia system, but in the BC portion of the Columbia anadromous sockeye spawn only in the Okanagan River between Osoyoos and Vaseaux lakes

Sockeye salmon
(Kokanee)

Oncorhynchus nerka

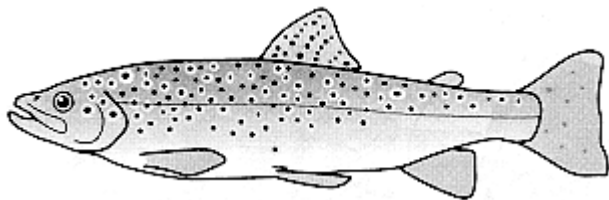


4 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

5

5 (10) Background colour on flanks light (silver or golden) with dark spots

6

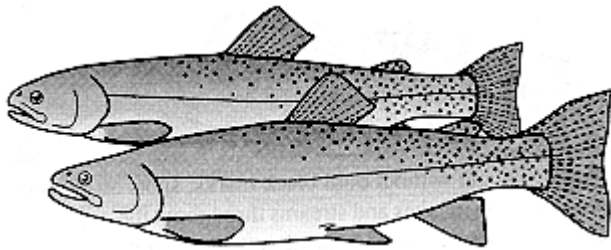


6 (7) Spots on flanks mostly dark surrounded by conspicuous light haloes; some spots along side are red; established in the Kettle and Similkameen systems

Brown trout
Salmo trutta

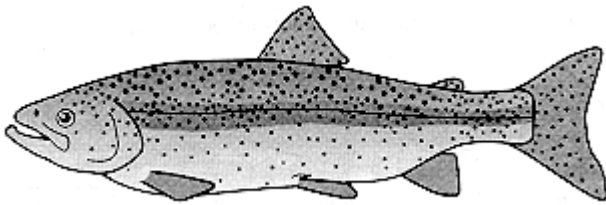
7 (6) Spots on flanks black (no red spots); spots not surrounded by light haloes

8



8 (9) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots; common in the upper Columbia, upper Kootenay and Flathead systems; sporadic populations in the lower Columbia and lower Kootenay; perhaps present in the Kettle, but natural populations absent in the Okanagan and Similkameen systems

Westslope cutthroat trout
Oncorhynchus clarki lewisi

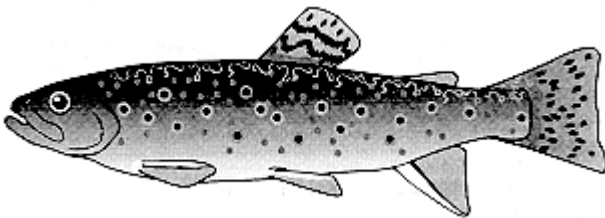


9 (8) No red or orange slash under lower jaw; except in spawning males, upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots; common throughout the Columbia system

Rainbow trout
Oncorhynchus mykiss

10 (5) Background colour on sides dark with light or coloured spots

11



11 (12) Dorsal fin yellowish, with bold black streaks; red spots on flanks surrounded by blue haloes; introduced throughout the Columbia system

Brook trout
Salvelinus fontinalis



12 (11) Dorsal fin dusky and without bold black marks; spots on sides not surrounded by light haloes; common in lakes and streams throughout the upper and lower Columbia, upper and lower Kootenay and Flathead systems; absent from the Kettle, Okanagan and Similkameen systems

Bull trout
Salvelinus confluentus

KEY TO YOUNG SALMONIDS (45-100 mm)

1 (4) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Parr marks on flanks in the form of deep bars, the largest marks deeper than the vertical eye diameter

Chinook salmon
Oncorhynchus tshawytscha



3 (2) Parr marks small, oval shaped, non much higher than the vertical diameter of the eye

Sockeye salmon
(Kokanee)
Oncorhynchus nerka

4 (1) Dorsal fin base equal to or longer than anal fin base; in profile hind margin of anal fin vertical

5

5 (12) Numerous distinct dark spots on dorsal fin; in very small specimens only the first dorsal ray may be black

6

6 (9) Coloured spots (red to yellow) along mid-line about equal to or greater than the combined width of the light areas

7



7 (8) No definite spots other than parr marks below the mid-line; 8 or 9 parr marks, the widest about equal to eye diameter; adipose fin dusky

Brook trout
Salvelinus fontinalis

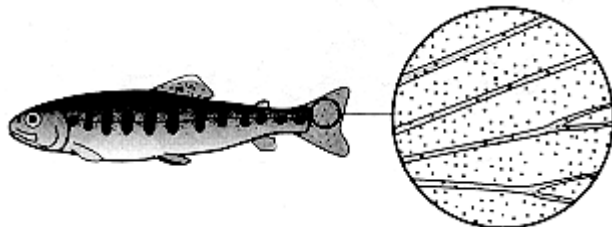


8 (7) Small black spots above and below mid-line (in addition to parr marks); 9 to 11 parr marks, none as wide as eye diameter; adipose fin orange

Brown trout
Salmo trutta

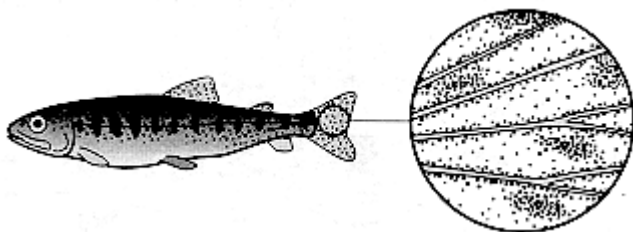
9 (6) No coloured (red to yellow) spots; width of dark areas along mid-line less than width of light areas

10



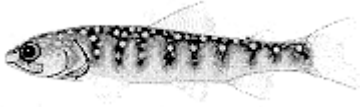
10 (11) On fish below 50 mm melanophores are evenly distributed over entire tail; few or no spots on tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye

Rainbow trout
Oncorhynchus mykiss



11 (10) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye

Westslope cutthroat trout
Oncorhynchus clarki lewisi



12 (5) Dorsal fin without numerous dark spots; in very small specimens the first dorsal ray may be dusky but not black; parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas

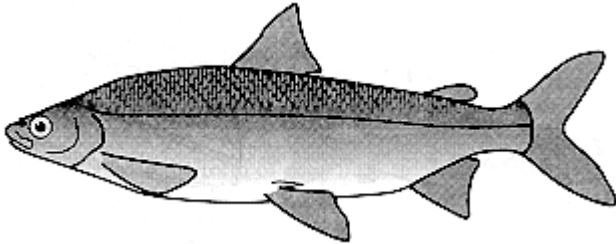
Bull trout

Salvelinus confluentus

WHITEFISH

FAMILY SALMONIDAE

(SUBFAMILY COREGONINAE)



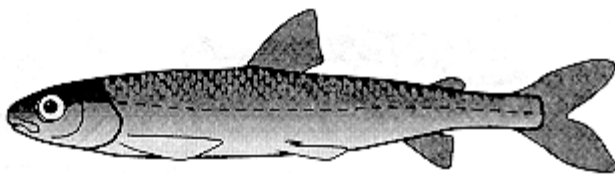
1 (2) Body deep, slab-sided; lower surface curves downward when viewed from side; introduced into Arrow Lakes, Kootenay Lake, and large lakes throughout the Okanagan system

Lake whitefish

Coregonus clupeaformis

2 (1) Body slender, rounder in cross-section; lower surface nearly flat when viewed from side

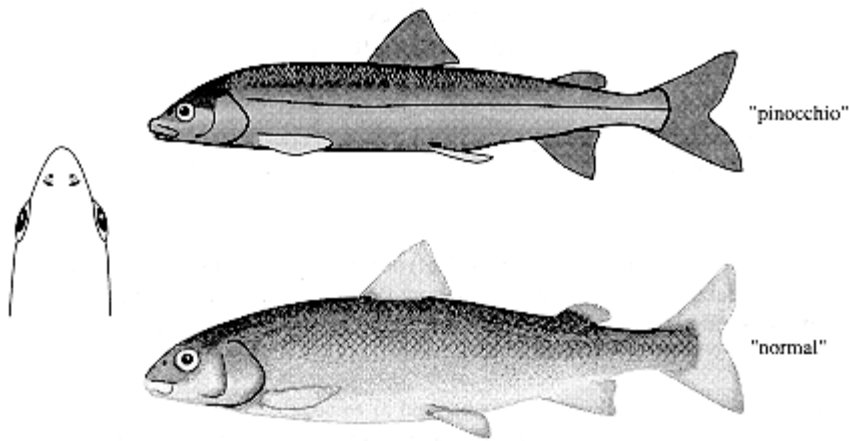
3



3 (4) Viewed from above snout blunt, rounded; adipose fin small, base about equal to eye diameter; lakes and rivers in the upper Columbia and upper Kootenay systems, also in Kootenay Lake, Arrow Lakes and Okanagan, Skaha and Osoyoos lakes in the Okanagan system

Pygmy whitefish

Prosopium coulteri



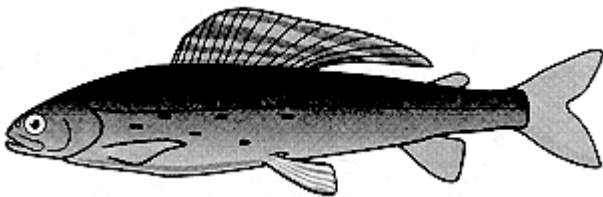
4 (3) Viewed from above snout pointed; adipose fin large, base about 1.5 times eye diameter; widespread in lakes and rivers throughout the Columbia system

Mountain whitefish*

Prosopium williamsoni

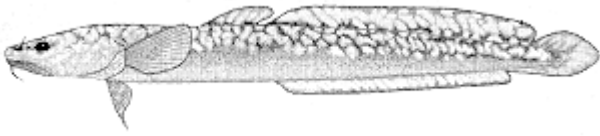
* Many fluvial populations contain two forms: normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

GRAYLINGS
FAMILY SALMONIDAE
(SUBFAMILY THYMALLINAE)



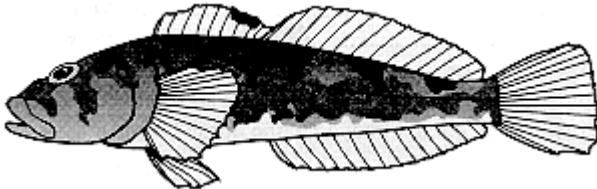
The Artic grayling (*Thymallus arcticus*) is not a native of the Columbia system; however, it occurs naturally across the Continental Divide in headwaters of the Missouri system. From there it was introduced into the Flathead River in Glacier National Park, western Montana. Presumably, it then spread into southeastern BC, but there have been no recent reports of grayling in the BC portion of the Flathead and it now may be extinct in this area.

CODS
FAMILY GADIDAE



One species of cod (the burbot, *Lota lota*) occurs in the Columbia system. The burbot is common in lakes and large rivers throughout the upper Columbia and upper Kootenay, but in more southerly parts of the system it is found mostly in large, deep lakes.

SCULPINS
FAMILY COTTIDAE

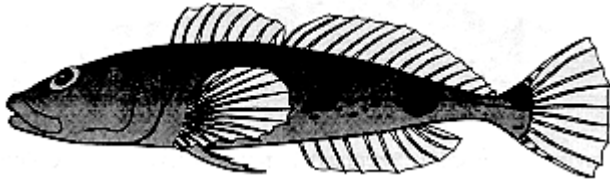


1 (2) Anal fin base distinctly longer than head length; abundant below barriers in the lower Columbia and Arrow Lakes but absent in the upper Columbia; also absent above barriers on the Kootenay (Bonnington Falls), Pend d'Oreille and Kettle rivers; common in streams and lakes throughout the Okanagan system

Prickly sculpin
Cottus asper

2 (1) Anal fin base about equal to head length

3



3 (4) Head large (less than 3 times into standard length); caudal peduncle narrow (less than interorbital width); usually heavily prickled on back and sides; abundant in upper and lower Columbia and upper and lower Kootenay, but absent above barriers on the Pend d'Oreille, Kettle, Okanagan and Similkameen systems

Torrent sculpin
Cottus rhotheus

4 (3) Head smaller (more than 3 times into standard length); caudal peduncle deeper (greater than interorbital width); prickles, if present, reduced to a patch behind pectoral fin

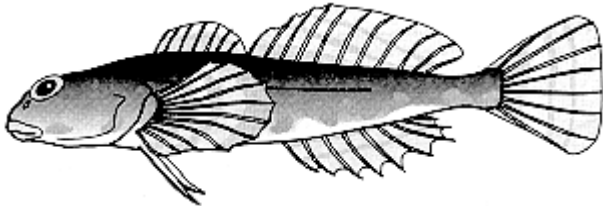
Three species

Mottled sculpin
Cottus bairdi;

Slimy sculpin
Cottus cognatus;

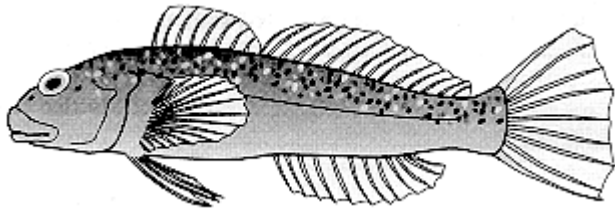
Shorthead sculpin
Cottus confusus.

At present, a field key to these species is beyond our capability. These species coexist in various combinations in the BC portion of the Columbia system, and our attempts to construct a key have foundered on problems with site-to-site variation within species and hybridization among species. For example, the fish identified as *C. confusus* in the Flathead River (McAllister and Lindsey 1961; Peden and Hughes 1984) are not the same species as the fish identified as *C. confusus* in the Columbia and Kettle rivers (Alex Peden, pers. comm.). Based on allozyme data, the Flathead fish appear to be *C. Bairdi* (Alex Peden, pers., comm.). To make matters worse, fish that apparently are hybrids between *C. confusus* and *C. bairdi* in this region are the typical Columbia form (originally described as *C. hubbsi*) and not the same fish as the *C. Bairdi* in the Flathead River (if, indeed, the fish in the Flathead really are *C. bairdi* and not *C. confusus*). With this level of taxonomic clarity, a field key is clearly premature. If indentifications are absolutely necessary, a few specimens should be preserved and run through the key in the Azppendix (page 228). What we know about the distribution of these species in the Columbia system is summarized below.



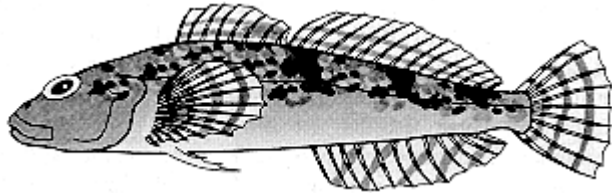
Common above barriers in the lower Columbia, Kettle and Okanagan systems; widespread throughout the upper Columbia and upper Kootenay; abundant in the upper Flathead River

Slimy sculpin
Cottus cognatus



Common in low gradient sections of streams tributary to the Columbia River below Keenleyside Dam; in the Kootenay River and tributaries below Bonnington Falls, in the Kettle River below the barrier at Cascade, and in the Flathead River and tributaries

Shorthead sculpin
Cottus confusus

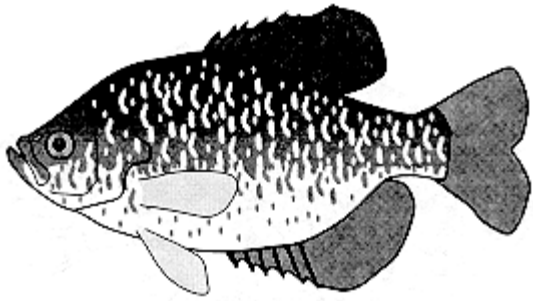


Common below barriers in the lower Columbia, Kettle and Similkameen systems; absent from the Kootenay River (above Bonnington Falls) and the Okanagan system above Okanagan Falls

Mottled sculpin
Cottus bairdi

SUNFISH AND BASS **FAMILY CENTRARCHIDAE**

1 (6) Dorsal fin base (including both spinous and soft portions) noticeably longer than anal fin base

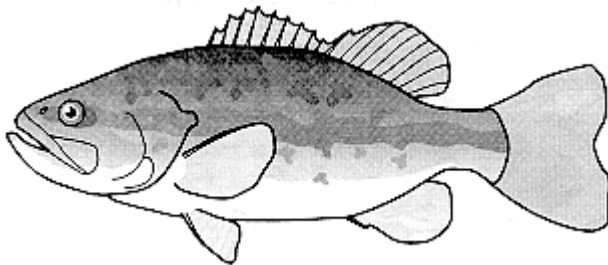


2 (3) Distinct, black opercular flap (outlined in red in mature males); pelvic fins reach vent; established in the lower Columbia, lower Kootenay, Kettle and Okanagan systems

Pumpkinseed
Lepomis gibbosus

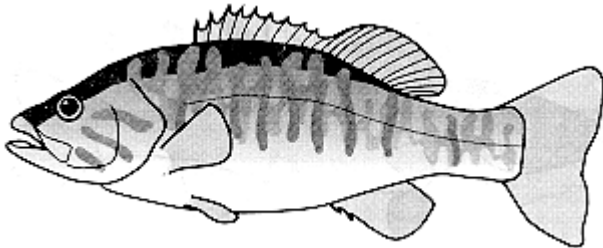
3 (2) No distinct black opercular flap; pelvic fins do not reach vent

4



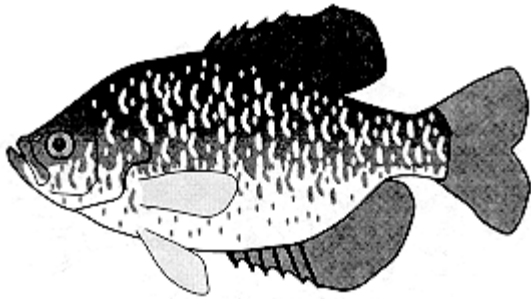
4 (5) Upper jaw reaches to beyond hind margin of eye; eye brown; young with black band continuous across snout and gill cover but broken along sides; established in lower Columbia, lower Kootenay, upper Kootenay, Kettle and Okanagan system

Largemouth bass
Micropterus salmoides



5 (4) Upper jaw reaches back to about mid-eye; eye red to orange; young with dark, radiating bands on gill cover; established in lower Columbia, lower Kootenay, Kettle and Okanagan system

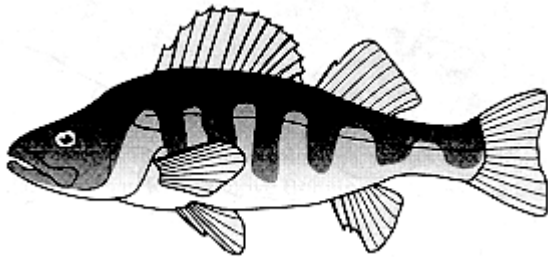
Smallmouth bass
Micropterus dolomieu



6 (1) Dorsal fin base (including both spinous and soft portions) about equal to anal fin base; established in the Okanagan system below Okanagan Falls

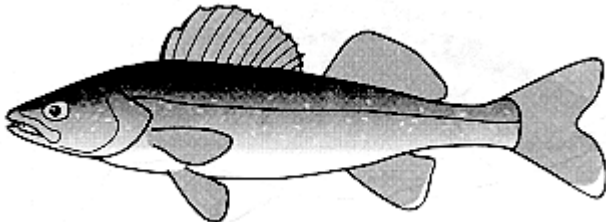
Black crappie
Pomoxis nigromaculatus

PERCHES
FAMILY PERCIDAE



1 (2) Sides in adults with 6 to 9 dark vertical bars; lower lobe of tail without a conspicuous white mark; jaws without prominent canine teeth; established in the lower Columbia (including the Pend d'Oreille), upper and lower Kootenay and Okanagan systems

Yellow perch
Perca flavescens



2 (1) Sides in adults without dark vertical bars (irregular bars in juveniles); lower lobe of tail with a conspicuous white mark; jaws with prominent canine teeth; established in the lower Columbia and unconfirmed reports from Wasa sloughs in the upper Kootenay

Walleye
Stizostedion vitreum

MACKENZIE



MACKENZIE REGION

The Mackenzie system (Fig. 5) is the largest drainage basin in BC (over 270,000 sq km). Its two major BC tributaries, the Peace and Liard, flow eastward and there are velocity barriers where these rivers cut through the mountains. These barriers form natural divisions between the upper and lower reaches of both rivers. Thus, the Mackenzie system in BC is divisible into four subregions: the upper Peace, above Peace Canyon Dam, drains much of the Rocky Mountain Trench; the lower Peace, below Peace Canyon Dam drains the Rocky Mountain foothills and the southern portion of the Alberta Plateau; the BC portion of the upper Liard, above Liard Canyon, rises near Dease Lake and drains the east slopes of the Stikine and Kechika ranges; and the lower Liard, below the canyon, with its major tributary, the Fort Nelson River, drains the northern half of the Alberta Plateau.

Forty-three species of fish occur in the BC portion of the Mackenzie; of these 39 are native and three (Westslope cutthroat, *Oncorhynchus clarki lewisi*; brook trout, *Salvelinus fontinalis*; and fathead minnow, *Pimephales promelas*) are introduced (Table 4). The faunas of the lower Peace and lower Liard are dominated by Great Plains species, 13 of which occur nowhere else in the province. Thus, after the Columbia, the Mackenzie system in BC contains the most distinctive fish fauna in the province.

Originally, the upper Peace was a high-gradient, silt-laden river formed by the junction of two rivers in the Rocky Mountain Trench: the south-flowing Finlay and the north-flowing Parsnip. A large reservoir, Williston Lake, now covers the upper Peace from Hudson Hope (where it cuts through the mountains) to well up both the Parsnip and Finlay rivers. The upper Peace contains a mixed fish fauna. Seven species (mountain whitefish, *Prosopium williamsoni*; kokanee, *Oncorhynchus nerka*; largescale sucker, *Catostomus macrocheilus*; peamouth, *Mylocheilus carinus*; redbelt shiner, *Richardsonius balteatus*; squawfish, *Ptychocheilus oregonensis*, and prickly sculpin; *Cottus asper*) are clearly of Columbia origin. Two species (white sucker, *Catostomus commersoni*, and brassy minnow, *Hybognathus hankinsoni*) are of Great Plains origin; while one species (Arctic grayling, *Thymallus arcticus*) probably is of northern origin. Populations of three other species (longnose sucker, *Catostomus catostomus*; lake chub, *Couesius plumbeus*; and longnose dace, *Rhinichthys cataractae*) show some morphological differences above and below the barrier on the Peace, and this suggests that they probably dispersed into the system from the Great Plains and Columbia refuges.

The lower Peace flows through the rolling, highly dissected terrain of the Alberta Plateau. Fourteen Great Plains species (goldeye, *Hiodon alosoides*; pike, *Esox lucius*; flathead chub, *Platygobio gracilis*; northern redbelly dace, *Phoxinus eos*; finescale dace, *Phoxinus neogaeus*; pearl dace, *Margariscus margarita*; trout perch, *Percopsis omiscomaycus*; brook stickleback, *Culaea inconstans*; walleye, *Stizostedion vitreum*; yellow perch, *Perca flavescens*; and spoonhead sculpin, *Cottus ricei*) that are absent from the upper Peace occur in the lower Peace.

The upper and lower Liard are separated by a velocity barrier in the Liard Canyon just downstream of the Alaska Highway. The 17 species found in the upper Liard are of mixed origins. Four species (rainbow trout, *Oncorhynchus mykiss*; Dolly Varden, *Salvelinus malma*; bull trout, *Salvelinus confluentus*; and mountain whitefish) clearly came from the south. Three other species (white sucker, longnose dace, and spoonhead sculpin) are Great Plains species, and four species (pygmy whitefish, *Prosopium coulteri*; round whitefish, *Prosopium cylindraceum*; lake whitefish, *Coregonus clupeaformis*; and Arctic grayling) are of Yukon origin. The remaining species are of uncertain origin. In the Liard

system, rainbow trout, Dolly Varden, and pygmy whitefish are found only in the Upper Liard.

The lower Liard and its tributaries drain the relatively flat northern half of the Alberta Plateau. Here the main rivers are less turbulent, although still heavily silted and strongly flowing, but on the Fort Nelson Lowlands there are large muskeg areas with blackwater streams, ponds and lakes. The fauna of the lower Liard is dominated by species of eastern origin, four of which are found nowhere else in BC (lake cisco, *Coregonus artedii*; spottail shiner, *Notropis hudsonius*; emerald shiner, *Notropis atherinoides*; and ninespine stickleback, *Pungitius pungitius*); however, there are also two Columbia species (bull trout and mountain whitefish), and two arctic species (arctic cisco, *Coregonus autumnalis*, and inconnu, *Stenodus leucichthys*). In addition, there is a sporadic run of chum salmon, *Oncorhynchus keta*, in the lower Liard. There are also persistent rumours of lampreys in the lower Liard. No reliable records exist, but since the Arctic lamprey (*Lampetra japonica*) occurs in the Mackenzie system above and below the confluence of the Liard and Mackenzie rivers, it is possible that this species occurs in BC.

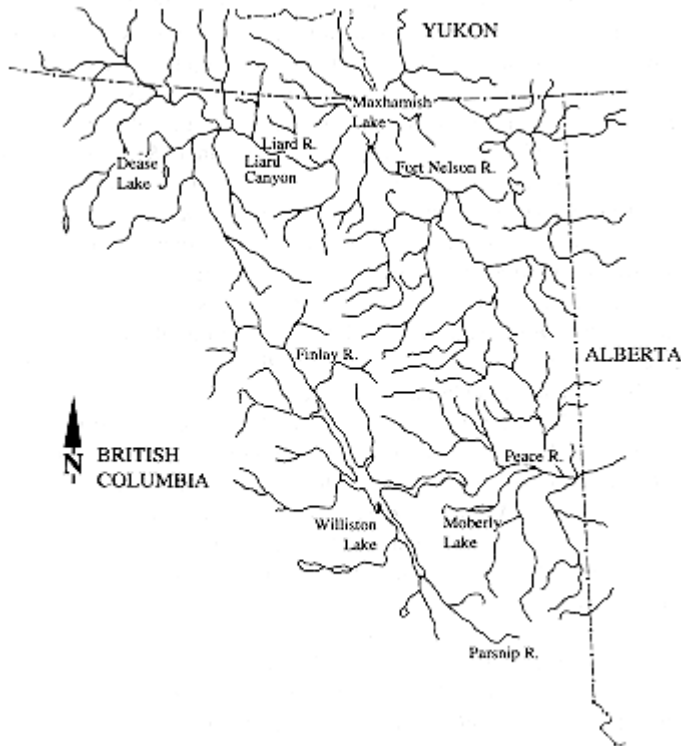


Figure 5
MacKenzie River systems.

Species	Upper Liard	Lower Liard	Upper Peace	Lower Peace
<i>Hiodon alosoides</i>	-	+	-	+
<i>Couesius plumbeus</i>	+	+	+	+
<i>Hybognathus hankinsoni</i>	-	-	+	-
<i>Platygobio gracilis</i>	-	+	-	+
<i>Mylocheilus caurinus</i>	-	-	+	+
<i>Notropis atherinoides</i>	-	+	-	-
<i>N. hudsonius</i>	-	+	-	I
<i>Phoxinus eos</i>	-	-	-	+
<i>P. neogaeus</i>	-	+	-	+
<i>Pimephales promelas</i>	-	-	-	I
<i>Ptychocheilus oregonensis</i>	-	-	+	+
<i>Rhinichthys cataractae</i>	+	+	+	+
<i>Richardonius balteatus</i>	-	-	+	+
<i>Margariscus margarita</i>	-	-	-	+
<i>Catostomus catostomus</i>	+	+	+	+
<i>C. commersoni</i>	+	+	+	+
<i>C. macrocheilus</i>	-	-	+	+
<i>Esox lucius</i>	+	+	-	+
<i>Oncorhynchus clarki lewisi</i>	-	-	-	I
<i>O. keta</i>	+	+	-	-
<i>O. mykiss</i>	+	-	+	+
<i>O. nerka</i>	-	-	+, I	+
<i>Salvelinus confluentus</i>	+	+	+	+
<i>S. fontinalis</i>	-	-	I	I
<i>S. malma</i>	+	-	+	-
<i>S. namaycush</i>	+	-	+	+
<i>Coregonus artedii</i>	-	+	-	-
<i>C. autumnalis</i>	-	+	-	-
<i>C. clupeaformis</i>	+	+	+	+
<i>Prosopium coulteri</i>	+	-	+	+
<i>P. cylindraceum</i>	+	+	-	-
<i>P. williamsoni</i>	+	+	+	+
<i>Stenodus leucichthys</i>	-	+	-	-
<i>Thymallus arcticus</i>	+	+	+	+
<i>Percopsis omiscomaycus</i>	-	+	-	+
<i>Lota lota</i>	+	+	+	+
<i>Culaea inconstans</i>	-	+	-	+
<i>Pungitius pungitius</i>	-	+	-	-
<i>Cottus asper</i>	-	-	+	+
<i>C. cognatus</i>	+	+	+	+
<i>C. ricei</i>	+	+	-	+
<i>Perca Flavescens</i>	-	-	-	+(I ?)
<i>Sitostedion vitreum</i>	-	+	-	+

Table 4

Distribution of fishes in the four subregions of the MacKenzie system in BC.

+	= present	-	= absent	I	= introduced
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Pictorial Key to Families



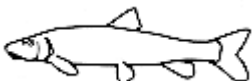
GOLDEYES (HODONTIDAE)

93



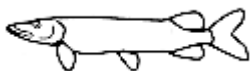
MINNOWS (CYPRINIDAE)

94



SUCKERS (CATOSTOMIDAE)

99



PIKES (ESOCIDAE)

100



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

100



WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

106



GRAYLINGS (SALMONIDAE)
(SUBFAMILY THYMALLINAE)

108



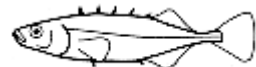
TROUT-PERCH (PERCOPSIDAE)

109



CODS (GADIDAE)

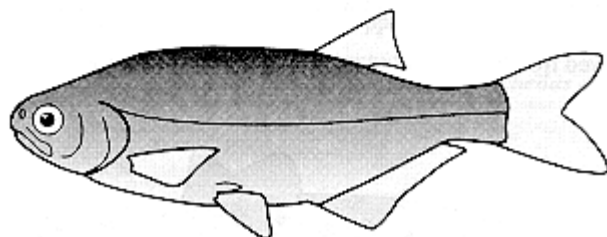
109



STICKLEBACKS (GASTEROSTEIDAE)

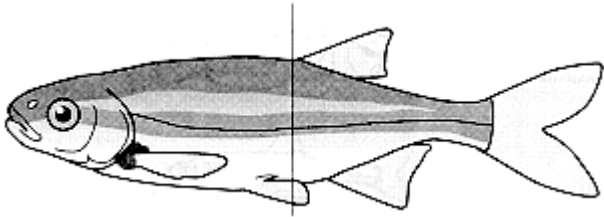
110

Pictorial Key to Families



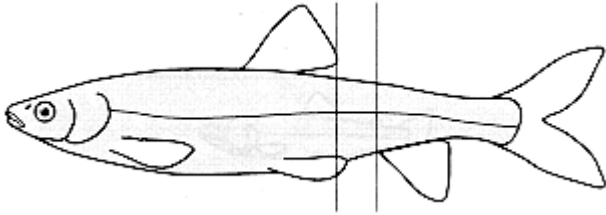
The goldeye (*Hiodon alosoides*) is a native of the large, muddy rivers of the Great Plains. In the Mackenzie region it is found only in the lower Liard and the lower Peace below Taylor.

MINNOWS
FAMILY CYPRINIDAE



1 (2) Dorsal fin set far back on body, viewed from the side its origin is almost directly above posterior tips of pelvic fins; in the Mackenzie system confined to the upper and lower Peace

Redside shiner
Richardsonius balteatus

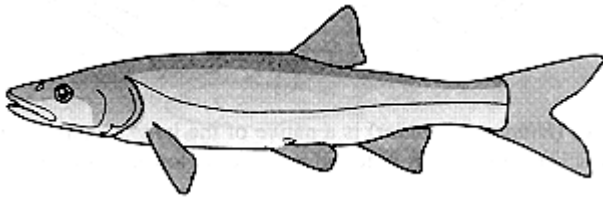


2 (1) Dorsal fin originates about the middle of the body, viewed from the side the posterior tips of the pelvic fins extend well past dorsal origin

3 (10) Viewed from the side, hind margin of dorsal fin does not overlap anal fin

3

4

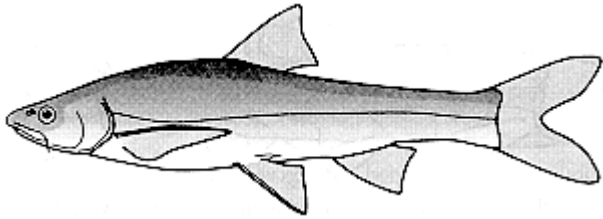


4 (5) Mouth large, upper jaw extends beyond from margin of eye; adults up to 300 mm in length; juveniles with a dark spot at base of tail; in the Mackenzie system confined to the upper and lower Peace

Northern squawfish
Ptychocheilus oregonensis

5 (4) Mouth small, upper jaw does not extend beyond from margin of eye

6

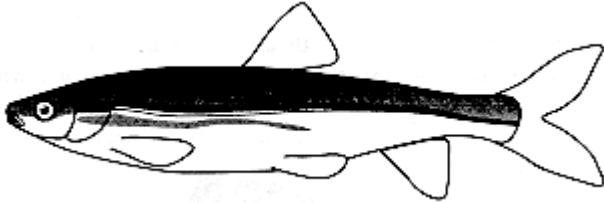


6 (7) Outer pectoral rays long and pointed, equal to head length and nearly reaching pelvic fins; top of head flat; snout overhangs mouth; prominent barbels at each corner of mouth; typical of larger turbid tributaries and the main-stem Peace and Leard downstream of their canyons

Flathead chub
Platygobio gracilis

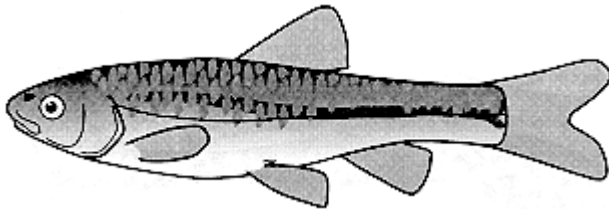
7 (6) Outer pectoral rays not long and pointed, not equal to head length; top of head not flat

8



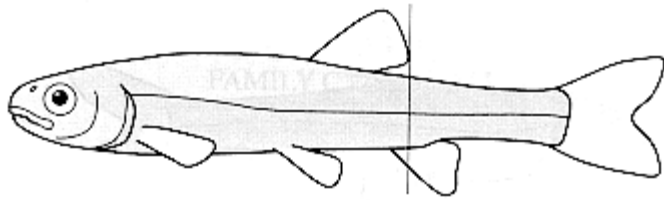
8 (9) Small barbel at the corner of mouth; snout barely overhangs mouth; two dark horizontal stripes on side of body; breeding adults with red lips and fin axils; length to 200 mm; in Mackenzie system confined to the upper and lower Peace

Peamouth
Mylocheilus caurinus



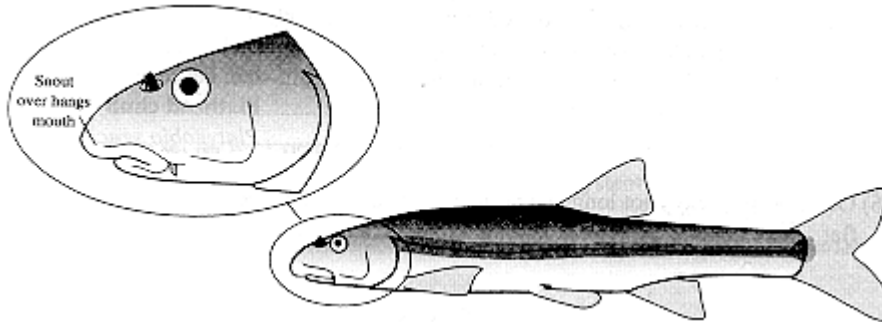
9 (8) No barbel at corner of mouth; snout overhangs mouth; flanks of breeding males with a brassy cast; length to 100 mm; in the BC parts of the Mackenzie system this species is known only from the upper Peace (Summit Lake area) but it is recorded from the lower Peace in Alberta

Brassy minnow
Hybognathus hankinsoni



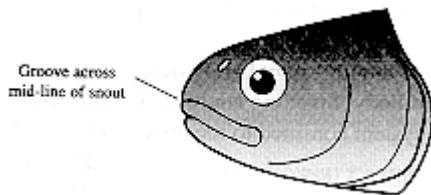
10 (3) Viewed from the side, hind margin of dorsal fin clearly overlaps anal fin

11



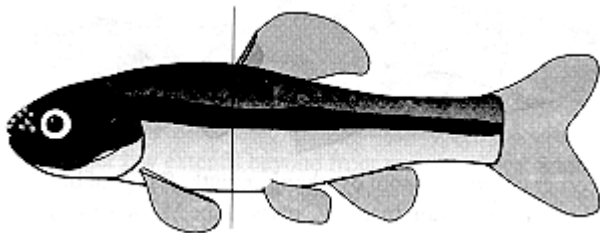
11 (12) Snout over hangs mouth and is directly attached to upper lip; juveniles with a distinct dark lateral stripe; widespread, adults typically associated with fast water

Longnose dace
Rhinichthys cataractae



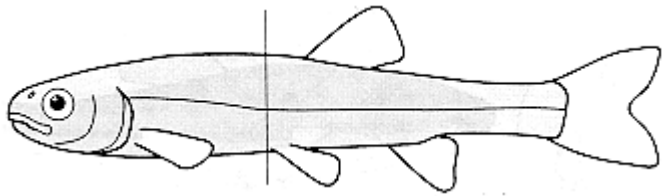
12 (11) Snout does not over hang mouth and is separated from upper lip by a groove across mid-line of snout

13



13 (14) Viewed from the side, dorsal fin originates directly above or slightly in front of pelvic fins; introduced into One Island Lake (lower Peace)

Fathead minnow
Pimephales promelas

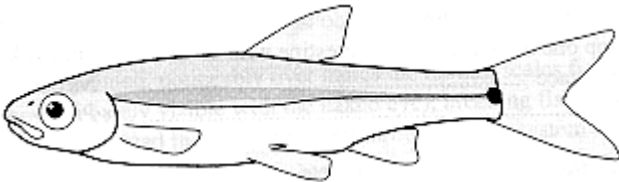


14 (13) Viewed from the side, dorsal fin originates behind origin of pelvic fins

15

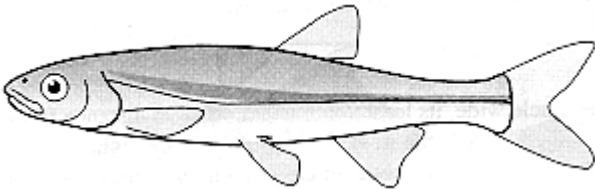
15 (18) Distinct silver or, depending on the light, emerald green mid-lateral band

16



16 (17) Prominent black spot directly in front of tail; anal fin short, usually 8 rays (7-9); in BC known only from Maxhamish Lake (lower Liard) but introduced into Charlie Lake near Ft. St. John

Spottail shiner
Notropis hudsonius



17 (16) No prominent black spot directly in front of tail; anal fin longer, usually with 11 rays (10-12); in BC known only from a small stream about three km downstream from Old Fort Nelson (lower Liard)

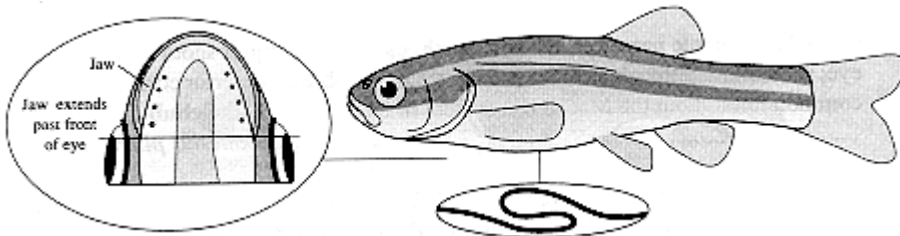
Emerald shiner
Notropis atherinoides

18 (15) No silver midlateral band

19

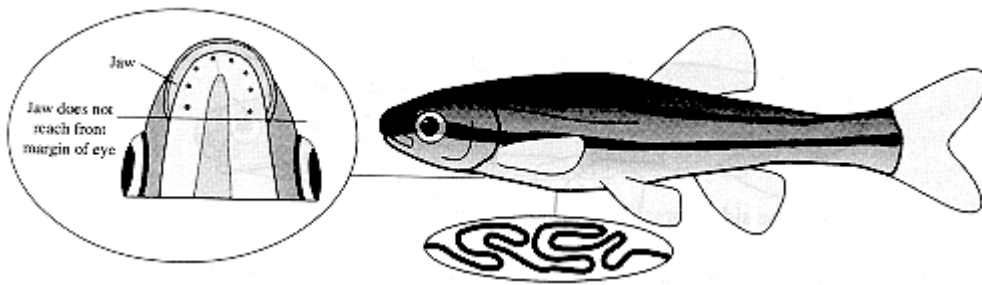
19 (22) Barbels absent; lateral line incomplete

20



20 (21) Hywen viewed from below, jaws extend beyond front margin of eye; single dark lateral stripe; intertine with a single loop; scattered records throughout the lower Peace and lower Liard, most common in boggy lakes and streams but also occasionally in large turbid rivers

Finescale dace
*Phoxinus neogaeus**

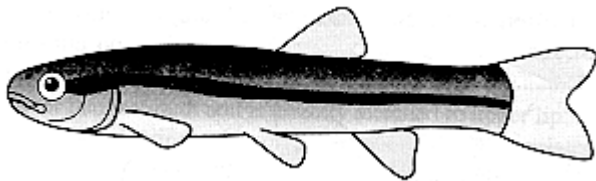


21 (20) When viewed from below, jaws do not reach front margin of eye; two dark lateral stripes (top one often indistinct); intestine with several coils; in BC known only from the lower Peace

Northern redbelly dace
*Phoxinus eos**

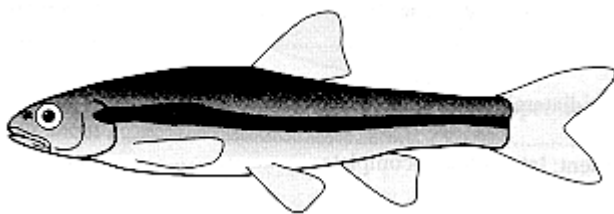
22 (19) Barbels present; lateral line complete

23



23 (24) Caudal peduncle narrower, its least depth about equal to distance from tip of snout to hind margin of eye; snout blunt; small flap-like barbel slightly in front corner of mouth rarely visible to naked eye; in BC known only from a few localities in the lower Peace

Northern pearl dace
*Margariscus margarita***



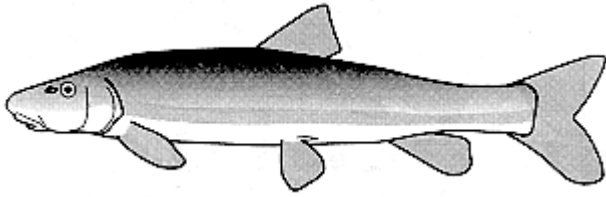
24 (23) caudal peduncle narrower, its least depth reaches from tip of snout to middle of eye; snout more pointed, a barbel; usually clearly visible at posterior corner of mouth; common throughout the Mackenzie system in BC

Lake chub
Couesius plumbeus

* Positive identification of *Phoxinus* is difficult in BC. The two species hybridize extensively and in BC no "pure" population of *P. eos* is known; however, *P. neogaeus* occurs at many sites without *P. eos*.

** *Couesius plumbeus* and *M. margarita* commonly hybridize in BC and, again, no "pure" populations of Pearl dace are known from the province.

SUCKERS
FAMILY CATOSTOMIDAE



1 (2) Snout long and pointed, noticeably over hangs the muth; scales fine (just behind the head they are barely visible with the naked eye); breeding fish pink to red lateral stripe; widespread in lakes and rivers throughout the system

Longnose sucker
Catostomus catostomus

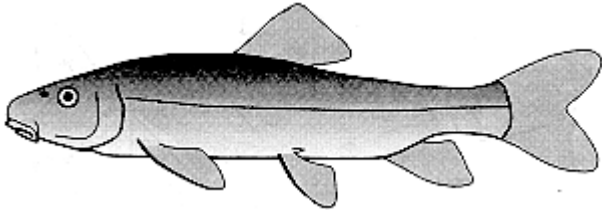
2 (1) Snout short and rounded barely over hanging the mouth; scales on body large, in adults even those behind the head are easily seen with the naked eye

3



3 (4) Caudal peduncle narrow its least depth half, or less than half, the dorsal fin base; breeding fish with a dark lateral stripe; confined to the Peace River and the lower reaches of its tributaries; most common in, and upstream of, Williston Reservoir

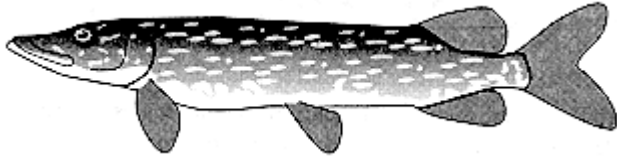
Largescale sucker
Catostomus macrocheilus



4 (3) Caudal peduncle deeper, its least depth almost equal to dorsal fin base; breeding fish with a bronze cast, no dark lateral stripe; common in lakes and streams throughout the Peace system and lower Liard but only one record (Barney Lake) from the upper Liard

White sucker
Catostomus commersoni

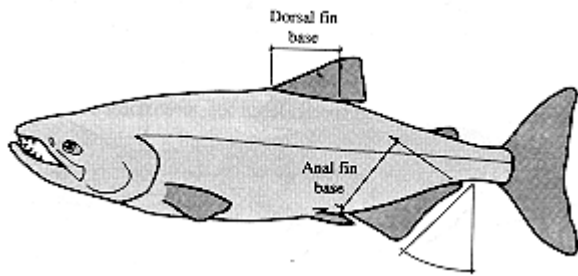
PIKES
FAMILY ESOCIDAE



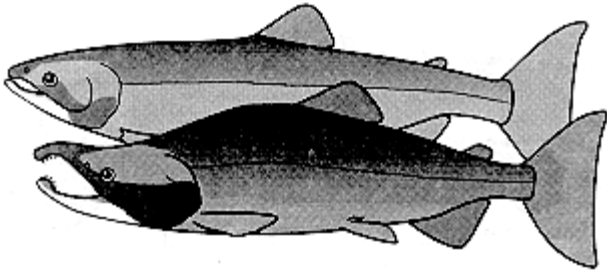
In BC, except for the upper Peace, the northern pike (*Esox lucius*) is found throughout the Mackenzie system. It is particularly abundant in shallow weedy lakes and slow flowing streams. This species was illegally introduced into the upper Peace but, fortunately, does not appear to have established a self-sustaining population.

SALMON, TROUT AND CHARRS
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS

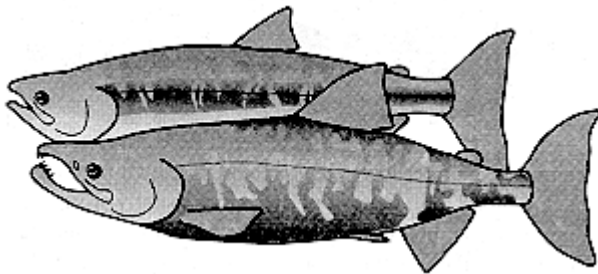


1 (4) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)



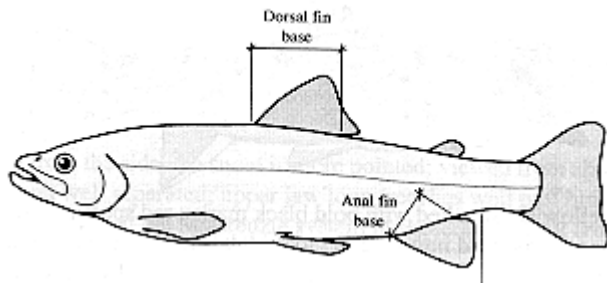
2 (3) Silver bright adults in fresh water are usually less than 38 cm; spawning fish usually with bright red flanks; in the Mackenzie system in BC native populations are known only from the upper Peace: Arctic Lake (headwaters of the Parsnip River), and Thutade Lake (headwaters of the Finlay River); since the formation of Williston Reservoir, Kokanee have dispersed downstream in the Peace into Alberta.

Sockeye salmon
(Kokanee)
Oncorhynchus nerka



3 (2) Adults only in fresh water as spawners, flanks in males pale with irregular red and black blotches, females with a purplish lateral stripe; adult size is usually much greater than 38 cm; in the Mackenzie in BC there is a small run that ascends the Liard River to above the Liard Canyon

Chum salmon
Oncorhynchus keta

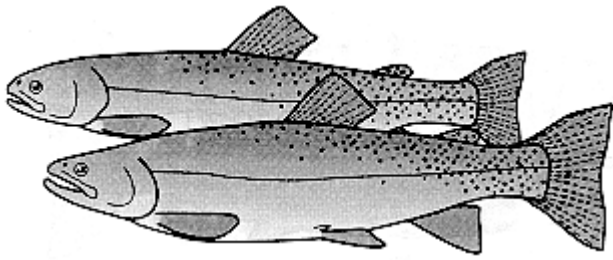


4 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

5

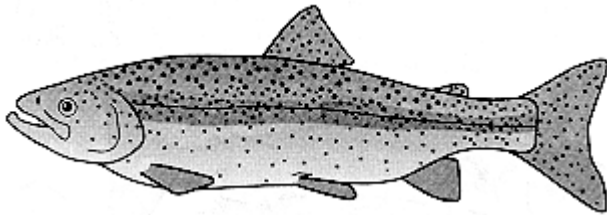
5 (8) Background colour on sides light (silver or golden) with dark spots

6



6 (7) Red or orange slash under lower jaw; upper jaw back past hind margin of eye; black spots on flanks concentrated near the tail; tail usually yellowish with strong black spots; introduced into Onion and Paxton lakes in the lower Peace

Westslope cutthroat trout
Oncorhynchus clarki lewisi

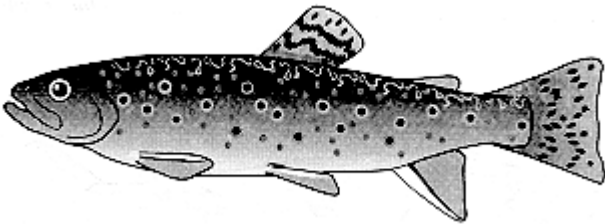


7 (6) No red or orange slash under lower jaw; except in spawning males upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; black spots on flanks evenly dispersed; tail dusky with dark spots; native populations throughout the Peace system and also in the upper Liard

Rainbow trout
Oncorhynchus mykiss

8 (7) Background colour on sides with light or colored spots

9

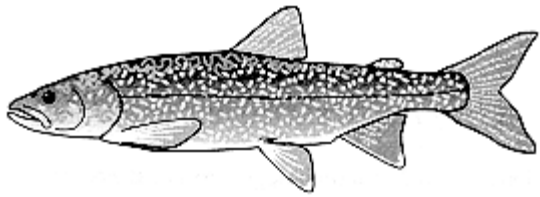


9 (10) Dorsal fin yellowish, streaked with bold black marks; red spots on sides surrounded by blue haloes; introduced into several closed lakes in both the upper and lower Peace systems

Brook trout
Salvelinus fontinalis

10 (9) Dorsal fin dusky, without bold black marks; spots on side not surrounded by light haloes

11



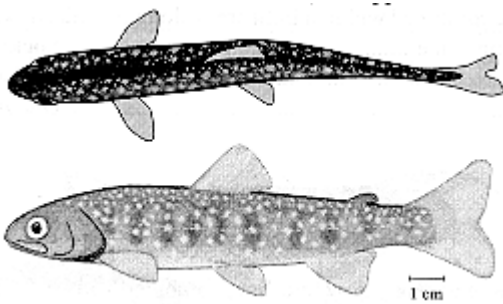
11 (12) Tail usually deeply forkey, light coloured on both halves of tail; head and body covered in light ireegular spots; common in lakes associated with the upper Peace and upper Liard systems, also present in a few Peace lakes

Lake trout

Salvelinus namaycush

12 (11) Tail not deeply forkey; spots if present only on upper half of tail

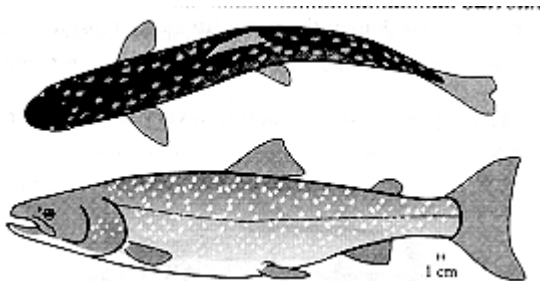
13



13 (14) Viewed from the side, the snout is blunt; viewed from above spots on bacvk are small and crowded together; upper jaw short (barely reaches hind margin of eye); in the Mackenzie system in BC known only from the upper Finlay and upper Liard rivers.

Dolly Varden*

Salvelinus malma



14 (13) Viewed from the side, the snout is more pointed; viewed from above on back are large and well sparated; upper jaw long (reaches well past hind margin of eye); abundant throughout the Mackenzie system in BC

Bull trout*

Salvelinus confluentus

* These species are difficult to distinguish except where they coexist, In sympatry, Dolly Varden mature at less than 200 mm and typically retain parr marks into adult life; whereas bull trout rarely mature at less than 300 mm and do not retain parr marks into adult life. For a more reliable identification use the key in the Appendix, pages 214-215.

KEY TO YOUNG SALMONIDS (45-100 mm)

1 (4) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct spots on dorsal fin

2



2 (3) Parr marks divided roughly in half by mid-line, combined width of parr marks much less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line

Sockeye salmon
(Kokanee)

Oncorhynchus nerka



3 (2) Parr marks faint or absent below mid-line; combined width of dark areas along mid-line more than half the combined width of the light areas; back mottled green, sides silvery with a faint green iridescence below mid-line

Chum salmon
Oncorhynchus keta

4 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin is vertical

5

5 (10) Numerous distinct dark spots on dorsal fin; in very small specimens the first dorsal ray may be black

6

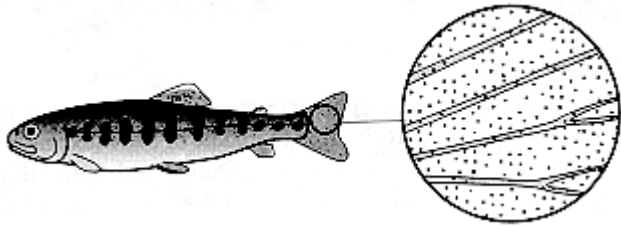


6 (7) Coloured spots (red to yellow) along mid-line or between parr marks; combined width of parr marks along mid-line about equal to or greater than the combined width of the light areas

Brook trout
Salvelinus fontinalis

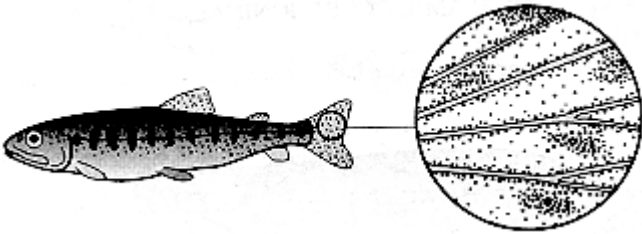
7 (6) No coloured (red to yellow) spots along mid-line; width of dark areas along mid-line less than width of light areas

8



8 (9) On fish below 50 mm melanophores are evenly distributed over entire tail; few or no spots on tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye

Rainbow trout
Oncorhynchus mykiss



9 (8) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye

Westslope cutthroat trout
Oncorhynchus clarki lewisi

10 (5) Dorsal fin without dark spots; first dorsal ray not black

11



11 (12) Parr marks along mid-line are vertical bars with width of dark areas equal to or less than width of light areas; dorsal fin starts middle of body (excluding tail)

Lake trout
Salvelinus namaycush



Dolly Varden



Bull trout

12 (11) Parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; dorsal fin starts in front of middle of body (excluding tail)

Dolly Varden and Bull trout*

Salvelinus malma or *S. confluentus*

* Small specimens of these two species cannot be easily differentiated in the field (use the key in the appendix, page 223).

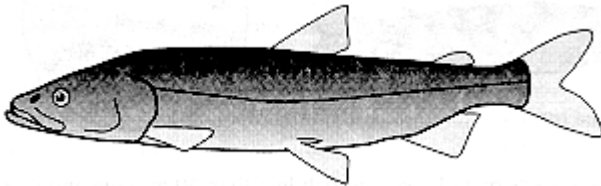
WHITEFISH

FAMILY SALMONIDAE

(SUBFAMILY COREGONINAE)

1 (6) Lower jaw equal to, or projects beyond, upper jaw

2



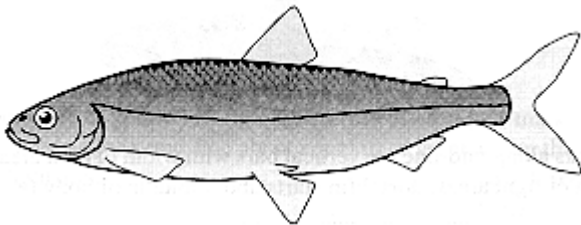
2 (3) Viewed from above, mouth almost as wide as head at eyes and snout hardly tapers; occasionally in the lower Liard

Inconnu

Stenodus leucichthys

3 (2) Viewed from above, mouth nowhere near as wide as head at eyes and snout distinctly tapered

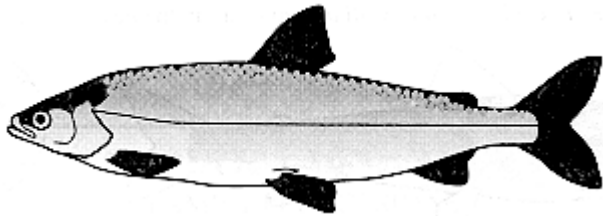
4



4 (5) Eye large, its diameter just a little less than the width of space between the eyes; in the Mackenzie system in BC known only from Maxhamish Lake (lower Liard)

Lake cisco

Coregonus artedii

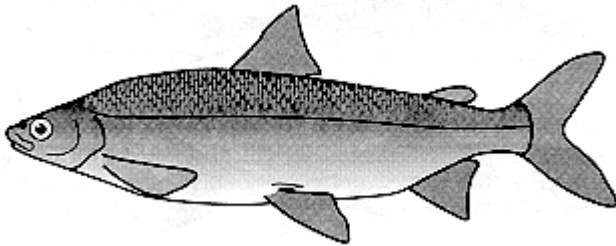


5 (4) Eye small, its diameter almost half the width of the space between the eyes; in the Mackenzie system in BC known only from a spawning run into the lower Liard

Arctic cisco
Coregonus autumnalis

6 (1) Snout clearly overhangs mouth

7

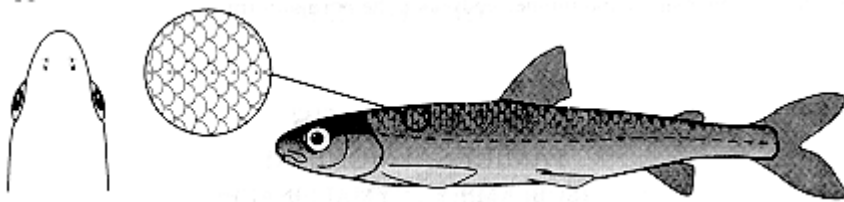


7 (8) Body deep, slab-sided; when viewed from side the ventral surface clearly curves downward; widespread in lakes and large rivers

Lake whitefish
Coregonus clupeaformis

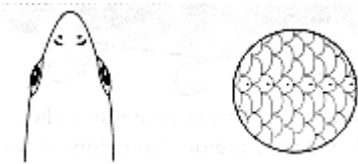
8 (7) Body slender, round in cross-section; when viewed from the side the ventral surface appears almost flat

9



9 (10) Viewed from above, snout blunt, rounded; anterior lateral line scales about the same size as scales immediately above and below the lateral line; usually in deep lakes but occasionally in rivers

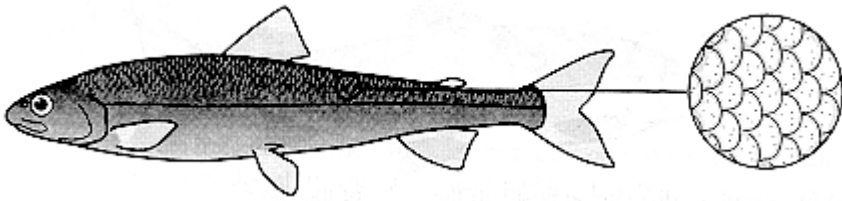
Pygmy whitefish*
Prosopium coulteri



10 (9) Viewed from above, snout pointed; anterior lateral line scales about half the size of scales immediately above and below lateral line

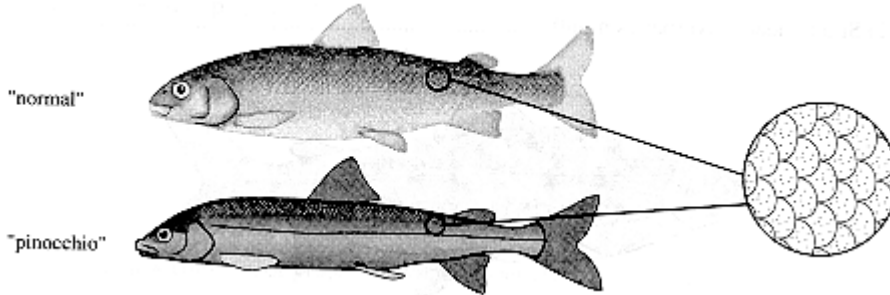
11

* Hybrids between *P. coulteri* and *P. williamsoni* occur in the Peace River system



11 (12) Adipose fin small, base almost equal to eye diameter; scales on flanks above lateral line noticeably edged with dark pigment; in lakes and streams throughout the Liard, apparently absent from the Peace

Round whitefish
Prosopium cylindraceum

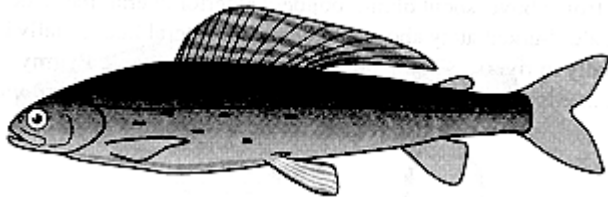


12 (11) Adipose fin large, base more than 1.5 times eye diameter; scales on flanks above lateral line not edged with dark pigment; common in the Peace but also in the Liard

Mountain whitefish**
Prosopium williamsoni

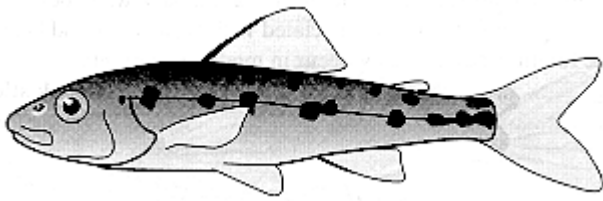
** There are two body forms in fluvial populations: normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

GRAYLINGS
FAMILY SALMONIDAE
(SUBFAMILY THYMALLINAE)



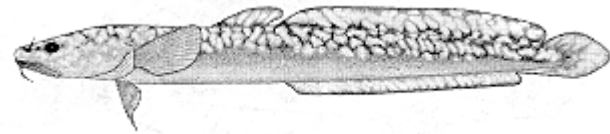
The Arctic grayling (*Thymallus arcticus*) is common in lakes and moderate to fast-flowing streams throughout the Mackenzie region. Sometimes juvenile grayling are easily confused with young *Prosopium*; however, juvenile grayling possess well developed jaw teeth while juvenile whitefish have, at best, weak teeth.

TROUT-PERCH
FAMILY PERCOPSIDAE



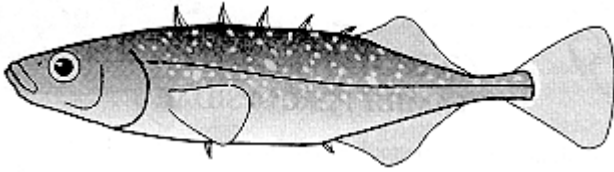
Trout-perch (*Percopsis omiscomaycus*) are common in turbid streams throughout the lower Peace and lower Liard. In life this small fish is almost transparent. In the Mackenzie system in BC, trout-perch also are known from Moberly (lower Peace) and Maxhamish (lower Liard) lakes.

CODS
FAMILY GADIDAE



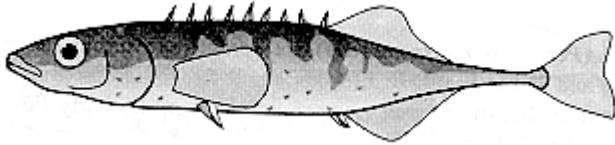
In the Mackenzie system in BC, adult and juvenile burbot (*Lota lota*) are common in both lakes and streams.

STICKLEBACKS
FAMILY GASTEROSTEIDAE



1 (2) Four to six isolated dorsal spines that fold straight back when depressed; lower Peace and lower Liard; typically associated with slow water and heavy vegetation but in some foothills streams they occur in moderate currents

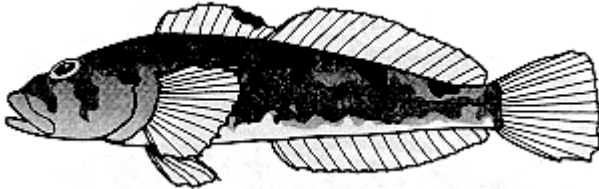
Brook stickleback
Culaea inconstans



2 (1) Seven to eleven isolated dorsal spines that fold alternately from side to side when depressed; in BC known only from a small stream, about three km downstream from Old Fort Nelson (lower Liard)

Ninespine stickleback
Pungitius pungitius

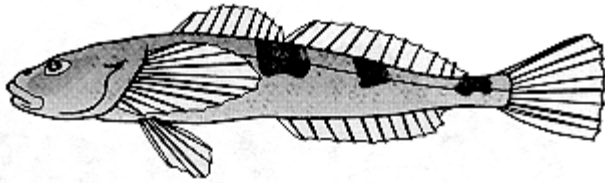
SCULPINS
FAMILY COTTIDAE



1 (2) Conspicuous dark spot at back of first dorsal fin; anal fin base distinctly longer than head length; in the BC portion of the Mackenzie system known only from the upper and lower Peace

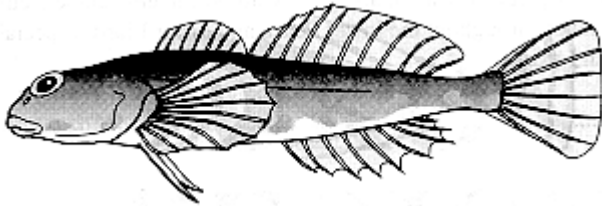
Prickly sculpin
Cottus asper

2 (1) No dark spot at back of first dorsal fin; anal fin base about equal to head length



3 (4) Viewed from above, head noticeably flattened; preopercular spines strongly hooked; lateral line complete; adults associated with fast water in both the lower Peace and upper and lower Liard

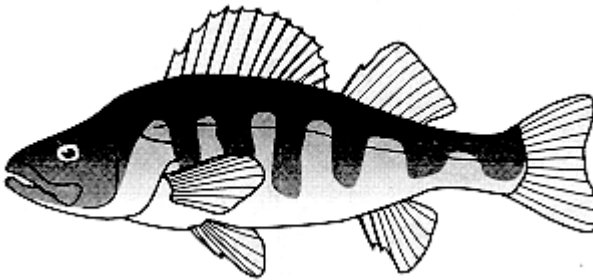
Spoonhead sculpin
Cottus ricei



4 (3) Viewed from above, head not flattened; preopercular spines not strongly hooked; lateral line incomplete; lakes and streams throughout the Mackenzie system

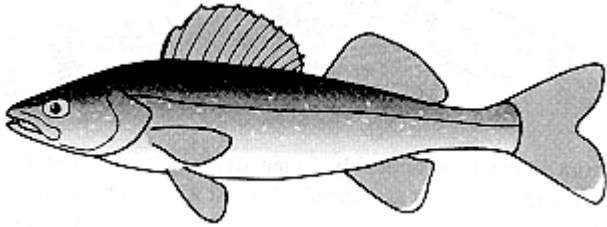
Slimy sculpin
Cottus cognatus

PERCHES
FAMILY PERCIDAE



1 (2) Sides in adults with 6 to 9 dark vertical bars; lower lobe of tail without a conspicuous white mark; jaws without prominent canine teeth; in the Mackenzie system in BC known from Swan Lake near Pouce Coupe and introduced into Charlie Lake near Fort St. John

Yellow perch
Perca flavescens



2 (1) Sides in adults without dark vertical bars (irregular bars in juveniles); lower lobe of tail with a conspicuous white mark; jaws with prominent canine teeth; sporadic in rivers and lakes throughout the lower peace and lower Liard (especially abundant in Maxhamish Lake)

Walleye
Stizostedion vitreum

YUKON



YUKON REGION

The Yukon is the smallest major river system in BC with a drainage basin of only about 25,000 sq km. Two major Yukon tributaries rise in BC: the Lewes and Teslin rivers (Fig.6). Three large lakes (Atlin, Teslin and Tagish) are the dominant features of the BC portion of the Yukon drainage.

Sixteen species occur in the Yukon system in BC (Table 5), and it is the only major drainage basin in the province without introduced species. Two Yukon species that survived glaciation in the Bering refuge and occur nowhere else in BC are the broad whitefish, *Coregonus nasus*, and the least cisco, *Coregonus sardinella*.

Species	Lewes	Teslin
<i>Couesius plumbeus</i>	+	-
<i>Catostomus catostomus</i>	+	+
<i>Esox lucius</i>	+	+
<i>Oncorhynchus keta</i>	-	?
<i>O. tshawytscha</i>	+	+
<i>Salvelinus confluentus</i>	-	+*
<i>S. namaycush</i>	+	+
<i>Coregonus clupeaformis</i>	+	+
<i>C. nasus</i>	-	+
<i>C. sardinella</i>	+	+
<i>Prosopium coulteri</i>	-	+*
<i>P. cylindraceum</i>	+	+
<i>Stenodus leucichthys</i>	-	+
<i>Thymallus arcticus</i>	+	+
<i>Lota lota</i>	+	+
<i>Cottus Cognatus</i>	+	+

Table 5

Distribution of fishes in the BC portion of the Yukon system.

* known only from Swan Lake, a Teslin tributary

+ = present

- = absent

? = uncertain record

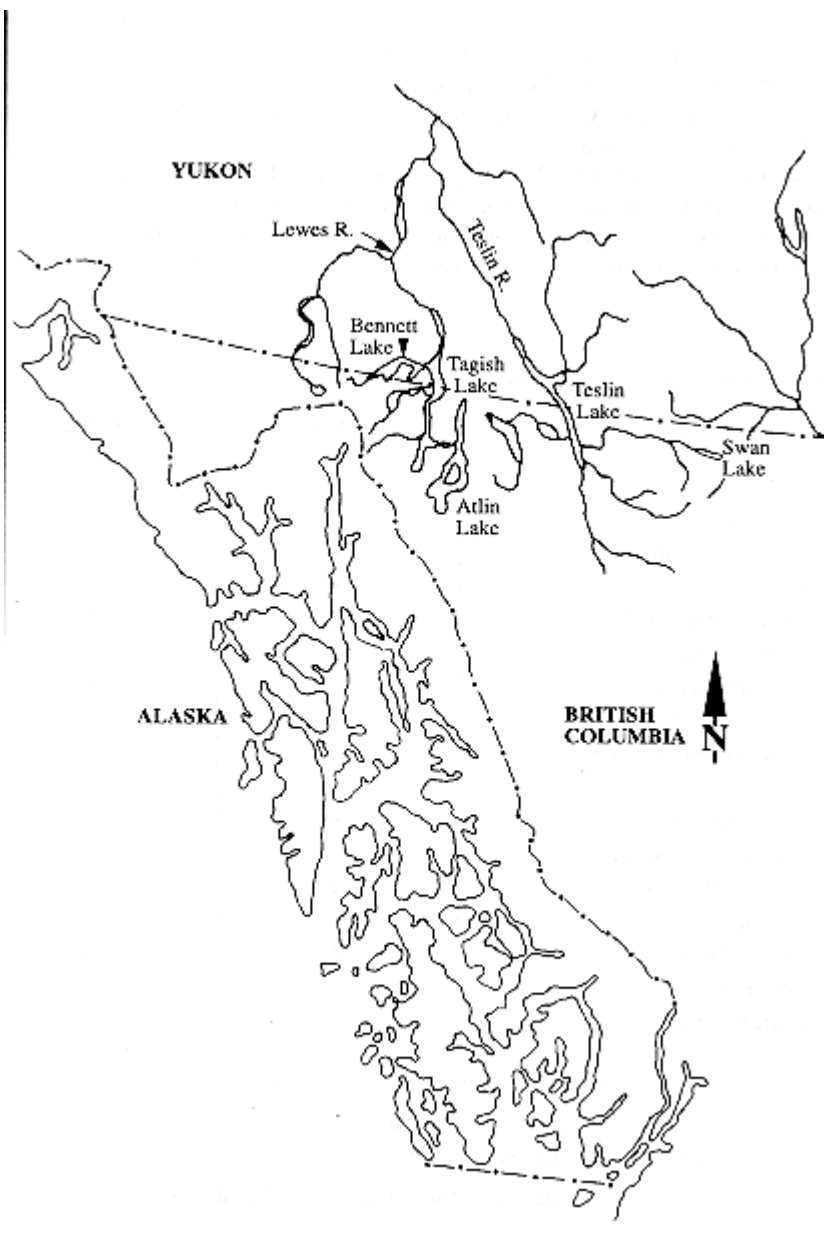


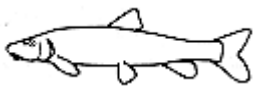
Figure 6
Yukon River system in British Columbia

Pictorial Key to Families



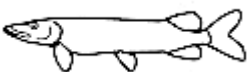
MINNOWS (CYPINIDAE)

118



SUCKERS (CATOSTOMIDAE)

118



PIKES (ESOCIDAE)

118



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

119



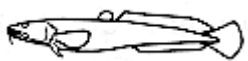
WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

121



GARYLINGS (SALMONIDAE)

123



CODS (GADIDAE)

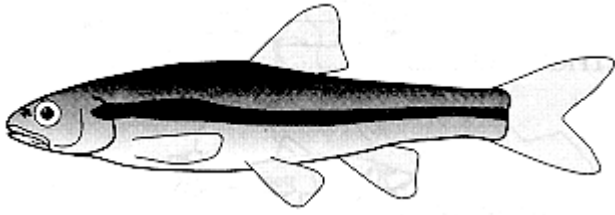
124



SCULPINS (COTTIDAE)

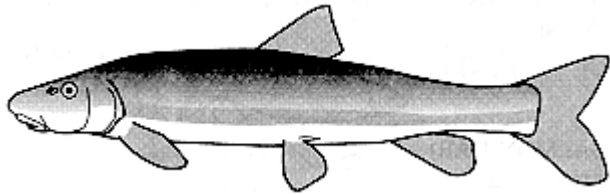
124

MINNOWS
FAMILY CYPINIDAE



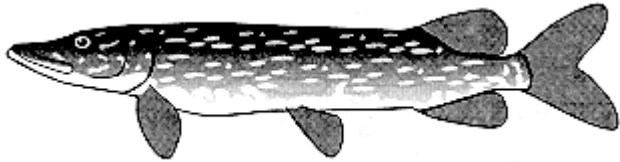
The lake chub (*Couesius plumbeus*) is the only cypinid found in the BC portion of the Yukon system. It occurs in Atlin and Tagish lakes but apparently is absent from Teslin Lake.

SUCKERS
FAMILY CATOSTOMIDAE



The only sucker in the Yukon system is the longnose sucker (*Catostomus catostomus*). It is abundant in lakes, rivers and streams throughout the region.

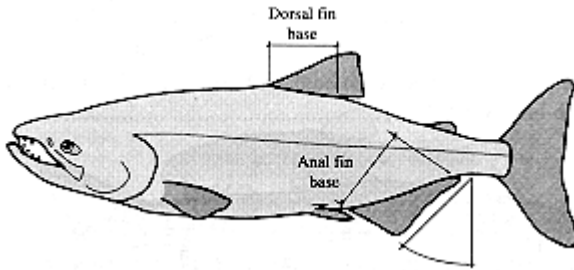
PIKES
FAMILY ESOCIDAE



The pike (*Esox lucius*) occurs in lakes and quiet streams throughout the upper Yukon system in BC.

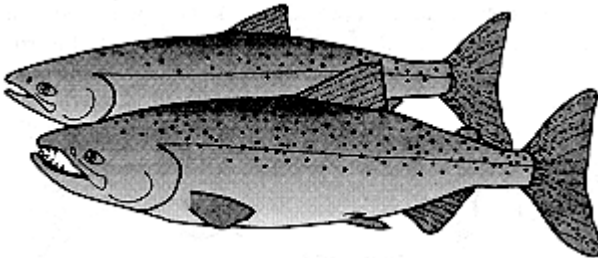
SALMON, TROUTS AND CHARS
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS



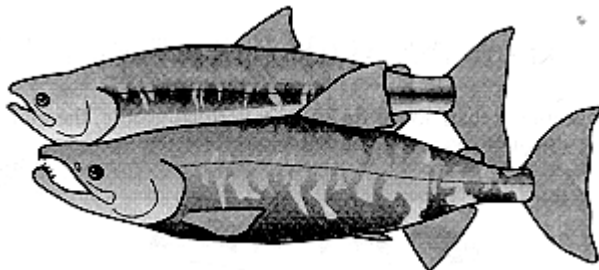
1 (4) Anal fin base longer than dorsal fin base; hind margin of anal fin slants backwards (not vertical)

2



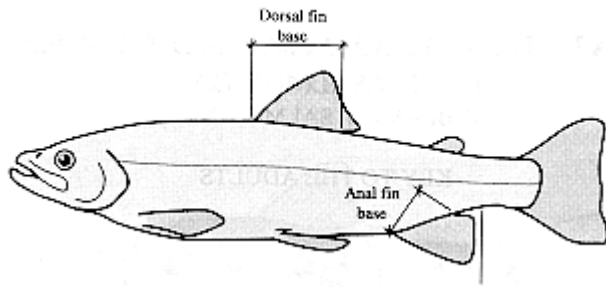
2 (3) Distinct spots on both upper and lower halves of tail; in BC portion of the Yukon this species spawns in tributaries of Bennett and Teslin lakes

Chinook salmon
Oncorhynchus tshawytscha



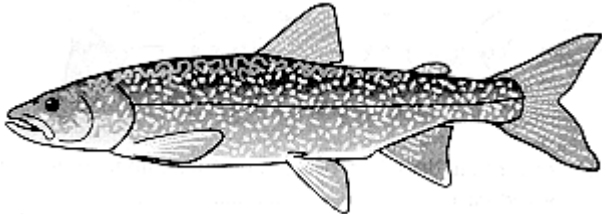
3 (2) No spots on tail; flanks in males pale with irregular red and black blotches, females with a purplish lateral stripe; early report from Teslin Lake is now in doubt (Lindsey *et al.* 1981)

Chum salmon
Oncorhynchus keta



4 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

5



5 (6) Tail deeply forked, light coloured spots both halves of tail; head and body covered in light irregular spots; abundant in the large lakes of the BC portion of the Yukon system

Lake trout

Salvelinus namaycush



6 (5) Tail not deeply forked; spots if present only on upper half of tail; known only from Teslin and Swan lakes in the BC portion of the Yukon system

Bull trout

Salvelinus confluentus

KEY TO YOUNG SALMONIDS (45 - 100 mm)

1 (4) Anal fin base longer than dorsal fin base; in vertical profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

Chinook salmon

Oncorhynchus tshawytscha



3 (2) Parr marks small, oval shaped, faint or absent below mid-line

Chum salmon
Oncorhynchus keta

4 (1) Anal fin base equal to or shorter than dorsal fin base; in profile hind margin of anal fin vertical

5



5 (6) Parr marks along mid-line are vertical bars with width of dark areas equal to or less than width of light areas; dorsal fin starts about middle of body (excluding tail)

Lake trout
Salvelinus confluentus



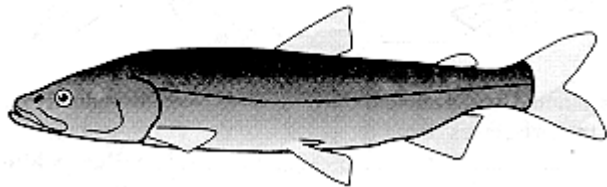
6 (5) Parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; dorsal fin starts in front of middle of body (excluding tail)

Bull trout
Salvelinus confluentus

WHITEFISH
FAMILY SALMONIDAE
(SUBFAMILY COREGONINAE)

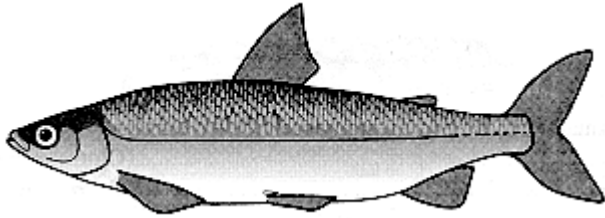
1 (4) Lower jaw projects beyond upper jaw when mouth closed

2



2 (3) Mouth larges; snout squarish when viewed from above; upper jaw reaches hind margin of eye; in the BC portion of the Yukon known only from Teslin Lake

Inconnu
Stenodus Leucichthys



3 (2) Mouth moderate; snout pointed when viewed from above; upper jaw does not reach hind margin of eye; in the BC portion of the Yukon known only from Atlin, Teslin and Swan lakes

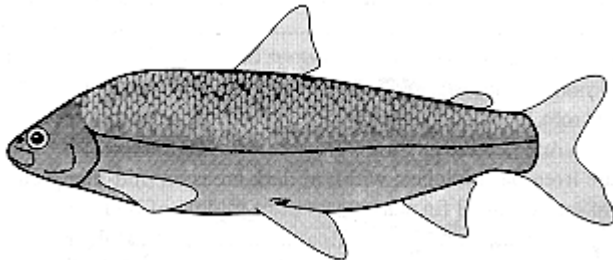
Least cisco
Coregonus sardinella

4 (1) When mouth closed, snout clearly overhangs upper jaw

5

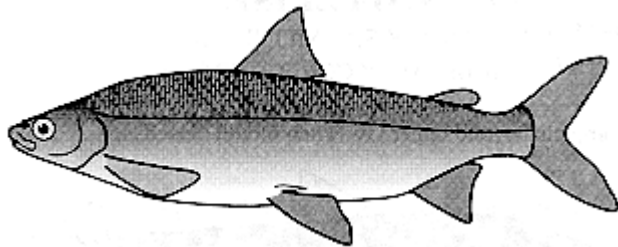
5 (8) Body deep, slab-sided in cross section

6



6 (7) Snout blunt ("sheep-nosed"), brow rounded when viewed from side; in the BC portion of the Yukon known only from Teslin Lake

Broad whitefish
Coregonus nasus

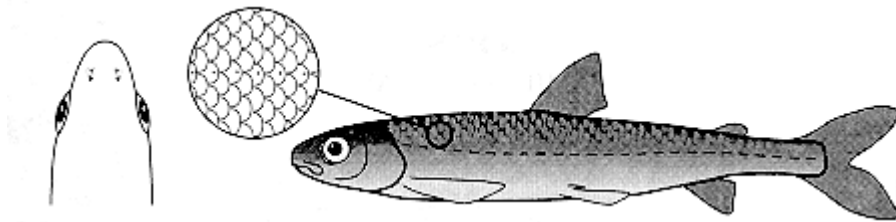


7 (6) snout more pointed, when viewed from side brow slopes gradually backwards; abundant in the large lakes of the BC portion of the Yukon system

Lake whitefish
Coregonus clupeaformis

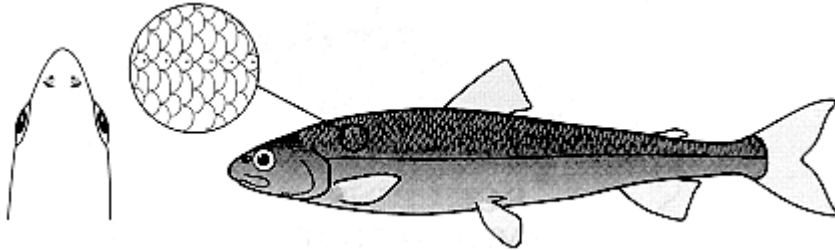
8 (5) Body slender, round in cross section

9



9 (10) Viewed from above snout blunt, rounded; anterior lateral line scales almost as large as the scales immediately above and below the lateral line; in the BC portion of the Yukon known only from Teslin and Swan lakes

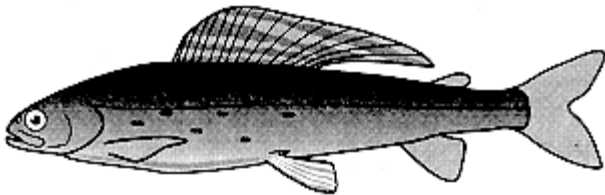
Pygmy whitefish
Prosopium coulteri



10 (9) Viewed from above snout pointed; anterior lateral line scales noticeably smaller than the scales immediately above and below the lateral line; abundant in the large lakes of the BC portion of the Yukon system

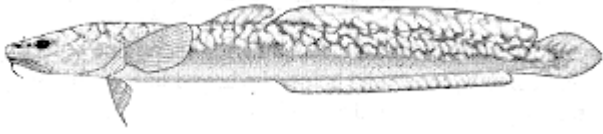
Round whitefish
Prosopium cylindraceum

GRAYLINGS
FAMILY SALMONIDAE
(SUBFAMILY THYMALLINAE)



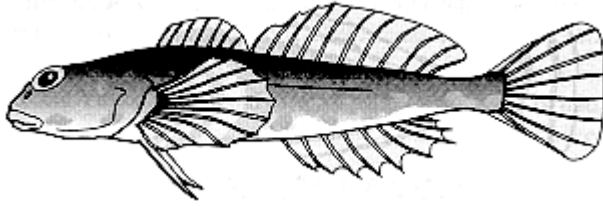
The Arctic grayling (*Thymallus arcticus*) is abundant in lakes and streams throughout the Yukon system in BC.

CODS
FAMILY GADIDAE



In The BC portion of the Yukon system, burbot (*Lota lota*) are common inhabitants of both lakes and streams

SCULPINS
FAMILY COTTIDAE



In the BC portion of the Yukon system there is only one species of sculpin (the slimy sculpin, *Cottus cognatus*). It is abundant in both lakes and streams.

NORTH COAST



A detailed map of the North Coast region of British Columbia, Canada, showing the coastline, major rivers, and islands. Overlaid on the map are several illustrations of fish species, including salmon and trout, swimming in the water. The title 'NORTH COAST REGION' is prominently displayed in the center-left of the map.

NORTH COAST REGION

MINISTRY OF EXPLORATION

Three large rivers are grouped together as north coast drainages. These are the Alsek, Taku and the Iskut-Stikine rivers (Fig. 7). The Alsek River and its major tributary, the Tatshenshini, flow through the extreme northwestern part of the province. They are wild, high gradient rivers still very much affected by local glaciers. The Taku is similar except that it rises entirely in BC on the Taku Plateau and flows west through the Coast Range to enter the sea near Juneau, Alaska. The Iskut-Stikine is the largest of the three north coast rivers. It rises at an elevation of about 1200 m on the southern end of the Spatsizi Plateau and flows about 800 km to enter the sea near Wrangell, Alaska.

Thirty-two species occur in the north coast rivers (Table 6). Eighteen of these species regularly enter the sea, and are widespread along the entire north coast. These euryhaline (salt tolerant) species dominate the lower reaches of the north coast rivers. In contrast, the majority of the purely freshwater species are confined to the upper reaches of the Taku and Stikine rivers. They are of mixed origins. Some, like Arctic grayling (*Thymallus arcticus*); pike (*Esox lucius*), and round whitefish, (*Prosopium cylindraceum*), clearly are of Yukon origin; while the mountain whitefish (*Prosopium williamsoni*) and bull trout (*Salvelinus confluentus*) are of Columbia origin. Others, like lake whitefish (*Coregonus clupeaformis*), burbot (*Lota lota*), and slimy sculpin (*Cottus cognatus*) probably are of Yukon origin.

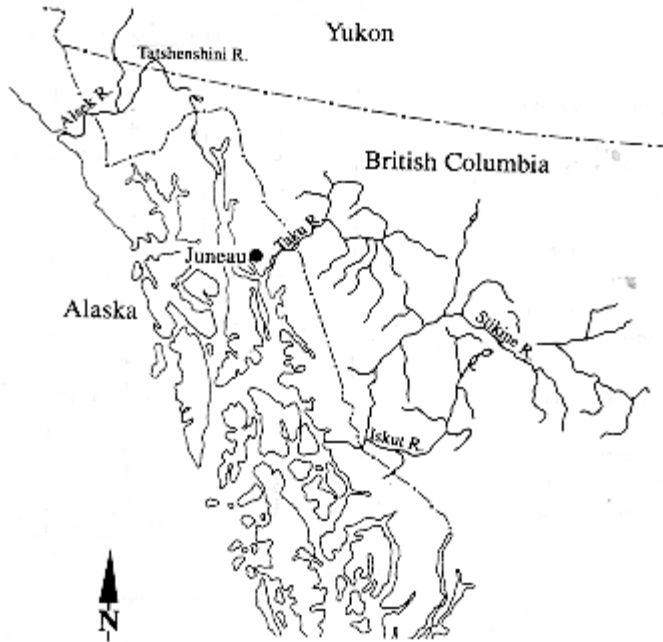


Figure 7
North Coast River systems

Species	Stikine	Taku	Alsek
<i>Lampetra ayresi</i>	+	-	-
<i>L. richardsoni</i>	+	-	-
<i>L. tridentata</i>	+	?	?
<i>Acipenser medirostris</i>	+	+	?
<i>A. transmontanus</i>	?	?	?
<i>Alosa sapidissima</i>	I	I	I
<i>Couesius plumbeus</i>	+	-	-
<i>Catostomus catostomus</i>	+	+	+
<i>Esox lucius</i>	-	+	+
<i>Osmerus dentex</i>	+	?	?
<i>Spirinchus Thaleichthys</i>	?	+	?
<i>Thaleichthys pacificus</i>	+	+	+
<i>Oncorhynchus clarki clarki</i>	+	+	?
<i>O. gorbuscha</i>	+	+	+
<i>O. keta</i>	+	+	+
<i>O. kisutch</i>	+	+	+
<i>O. mykiss</i>	+	+	+
<i>O. nerka</i>	+	+	+
<i>O. tshawytscha</i>	+	+	+
<i>Salvelinus confluentus</i>	+	+	-
<i>S. malma</i>	+	+	+
<i>S. namaycush</i>	+	+	+
<i>Coregonus clupeaformis</i>	-	-	+
<i>Prosopium coulteri</i>	-	-	+
<i>P. cylindraceum</i>	-	+	+
<i>P. williamsoni</i>	+	-	-
<i>Thymallus arcticus</i>	+	+	+
<i>Lota lota</i>	+	-	+
<i>Gasterosteus aculeatus</i>	+	+	+
<i>Cottus aleuticus</i>	+	+	?
<i>C. asper</i>	+	+	?
<i>C. cognatus</i>	+	+	+
<i>Leptocottus armatus</i>	E	E	E
<i>Platichthys stellatus</i>	E	E	E
Table 6 Distribution of fishes in North Coast drainages.			
+ = present - = absent	I = introduced ? = uncertain record	E = estuarine	

Pictorial key to Families



LAMPREYS (PETROMYZONTIDAE)

130



STURGEONS (ACIPENSERIDAE)

132



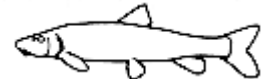
HERRINGS (CLUPEIDAE)

133



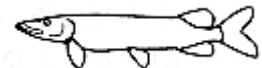
MINNOWS (CYPINIDAE)

133



SUCKERS (CATOSTOMIDAE)

134



PIKES (ESOCIDAE)

134



SMELTS (OSMERIDAE)

135



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

136



WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

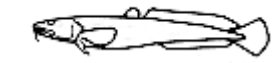
143



GARYLINGS (SALMONIDAE)
(SUBFAMILY THYMALLINAE)

145

Pictorial Key to Families



CODS (GADIDAE)

145



STICKLEBACKS (GASTERTOSTEIDAE)

146



SCULPINS (COTTIDAE)

146



FLOUNDERS (PLEURONECTIDAE)

148

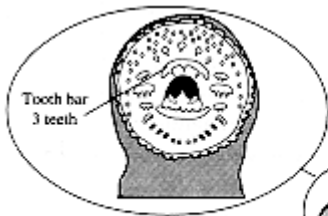
LAMPREYS FAMILY PETROMYZONTIDAE



1 (6) Mouth in form of a sucking disk; teeth and eyes present

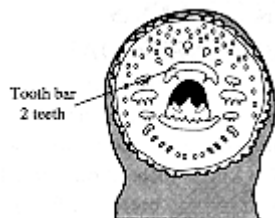
adult or transforming lampreys

2



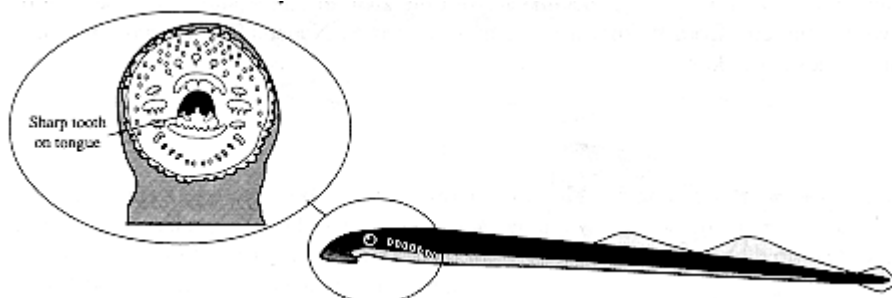
2 (3) Tooth bar immediately above mouth has three teeth; ascends the lower reaches of most north coast rivers in the spring

Pacific lamprey
Lampetra tridentata



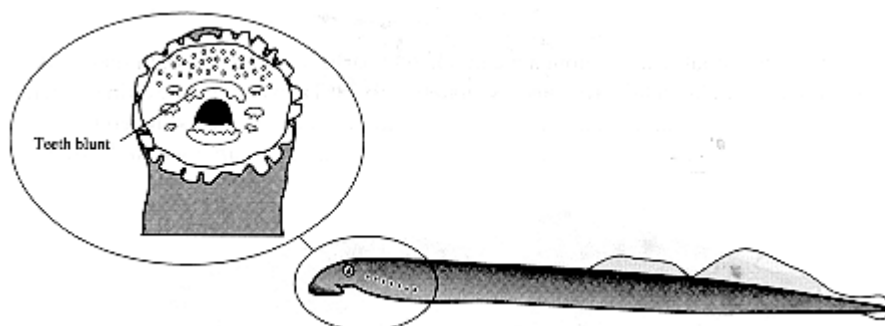
3 (2) Tooth bar immediately above mouth has two teeth

4



4 (5) Teeth sharp and well developed; center pair of lateral teeth with three points; sharp tooth on center of tongue; adults usually longer than 200 mm; known from the sea near the mouth of the Taku River

River lamprey
Lampetra ayresi



5 (4) Teeth blunt, poorly developed; center pair of side teeth with only two points; no sharp tooth on tongue; adults usually less than 160 mm; one record from southeastern Alaska just south of the Iskut-Stikine system

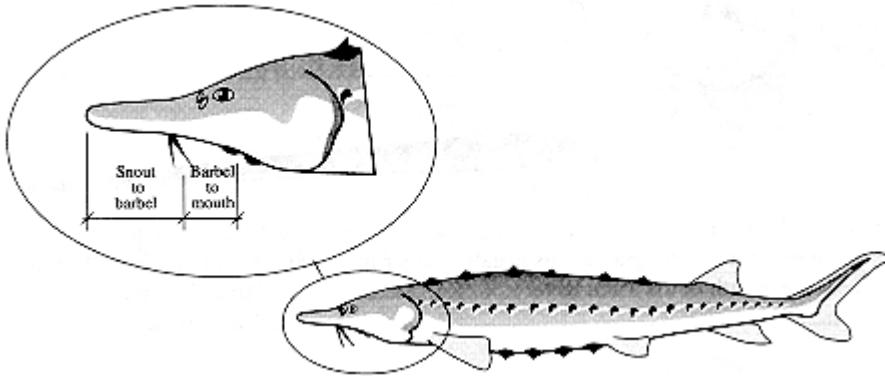
Western brook lamprey
Lampetra richardsoni

6 (1) Eyes absent or poorly developed; teeth absent; mouth not modified into a sucking disk

Ammocoetes or larval lampreys
(see key in appendix, page 199).

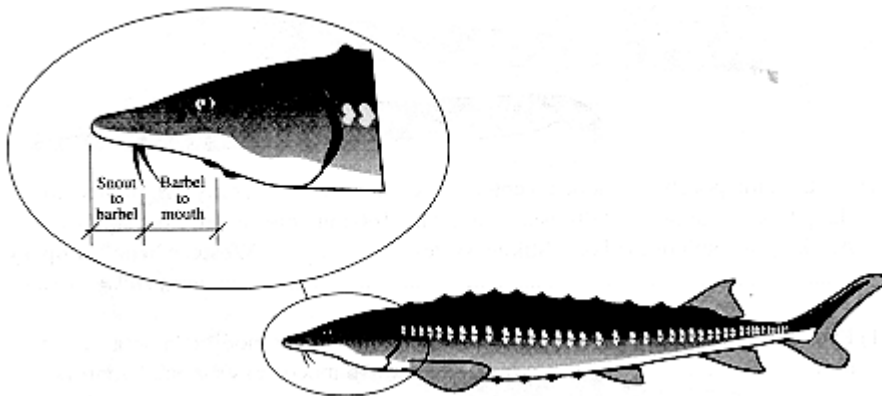
STURGEONS
FAMILY ACIPENSERIDAE

Two species of sturgeon are reported from river mouths along the north coast (green sturgeon and white sturgeon). Both species are morphologically variable and some of this variability may be associated with sex. We know little about their life histories along the north coast, but in other areas the white sturgeon is mainly a freshwater species while the green sturgeon is more common in the sea. Since all north coast records are from tidal waters, and the only museum specimens from the area are green sturgeons, the records of white sturgeon from the north coast may be errors. Nonetheless we have included both species in our key.



1 (2) Back green; snout usually elongate and narrow; barbels nearer to mouth than to tip of snout; sporadic in tidal regions associated with the Takyu and Iskut-Stikine systems

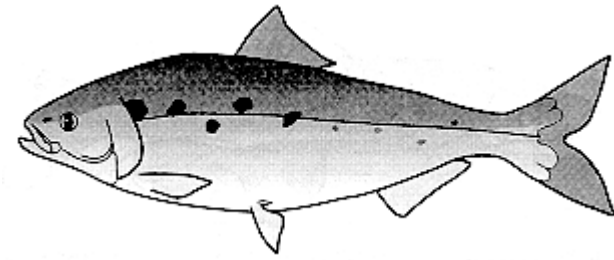
Green sturgeon
Acipenser medirostris



2 (1) Back dark grey to black; snout short and broad (except in some specimens less than 250 mm in standard length); barbels nearer to tip of snout than to mouth; rare, or perhaps absent, in the lower reaches of north coast rivers

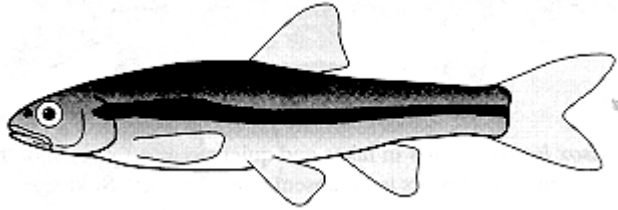
White sturgeon
Acipenser transmontanus

HERRINGS
FAMILY CLUPEIDAE



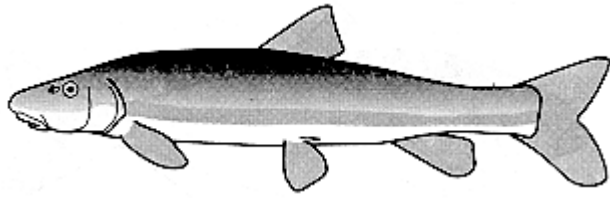
The shad (*Alosa sapidissima*) was introduced to the Pacific coast of North America in 1871. It spread rapidly and by the turn of the century was recorded from the sea as far north as the Gulf of Alaska. In our area, shad were redorded near the mouth of the Stikine in 1891 but have not been seen in recent years.

MINNOWS
FAMILY CYPINIDAE



The only minnow recorded from north coast rivers is the lake chub (*Couesius plumbeus*). In this area it is restricted to the upper Stikine River. It appears to be absent from the Taku and Alsek river systems.

SUCKERS
FAMILY CATOSTOMIDAE



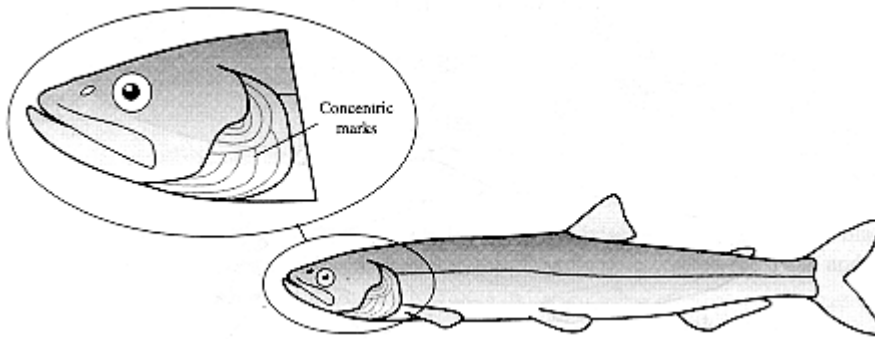
The only sucker recorded from north coast rivers is the longnose sucker (*Catostomus catostomus*). It is abundant in lakes, rivers and streams throughout the upper reaches of the Alsek, Taku and Iskut-Stikine river systems.

PIKES
FAMILY ESOCIDAE



The pike (*Esox lucius*) occurs in lakes and quiet streams throughout the upper Alsek and Taku river systems. It appears to be absent from the Iskut-Stikine system.

SMELTS
FAMILY OSMERIDAE

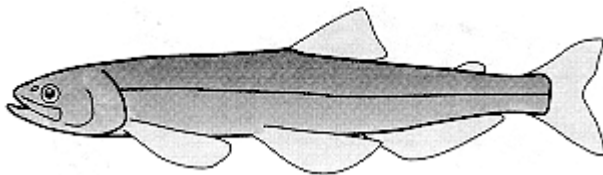


1 (2) Concentric marks on operculum; seasonally abundant in the lower Taku and Iskut-Stikine river systems

Eulachon
Thaleichthys pacificus

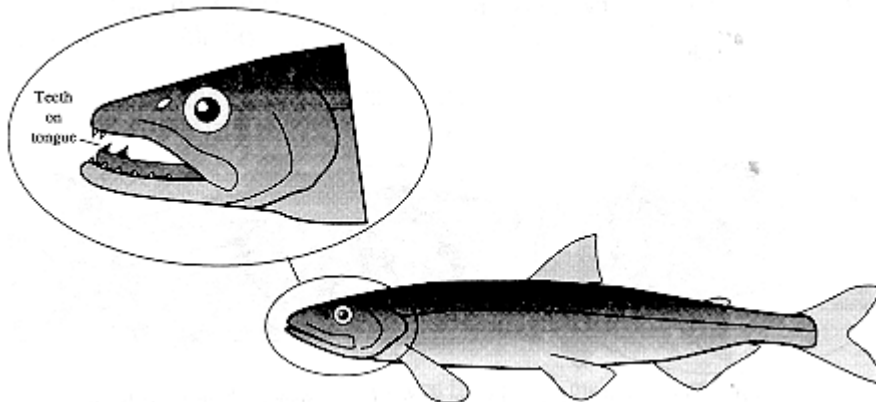
2 (1) No concentric marks on operculum

3



3 (4) Pectoral fin longer than head; no prominent teeth on tongue; one record from the Taku estuary

Longfin smelt
Spirinchus thaleichthys

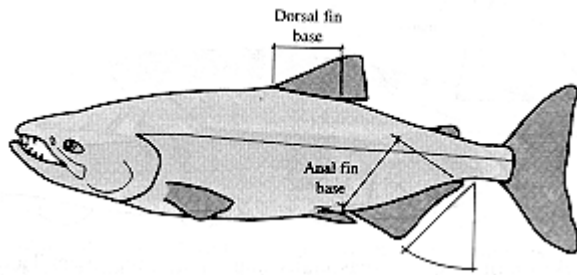


4 (3) Pectoral fin smaller than head; 1 or 2 prominent curved canine teeth on tongue; rare, one record from the Stikine estuary

Rainbow smelt
Osmerus dentex

SALMON, TROUTS, AND CHARS
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS

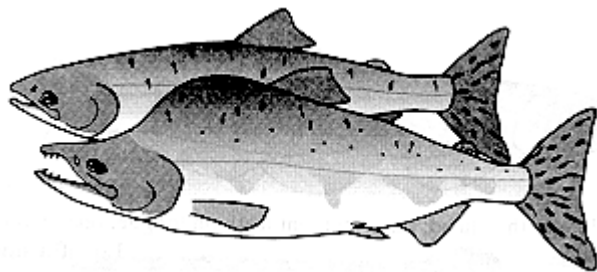


1 (10) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

2

2 (7) Distinct spots on tail

3



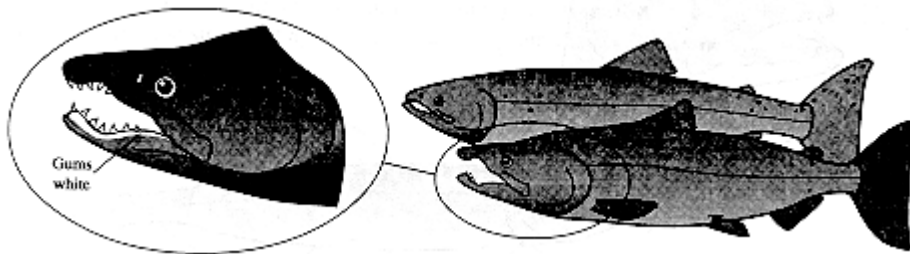
3 (4) Tail spots oblong (not round); small runs of pinks spawn in the lower reaches of the Alsek, Taku and Iskut-Stikine systems

Pink salmon

Oncorhynchus gorbuscha

4 (3) Tail spots round (not oblong)

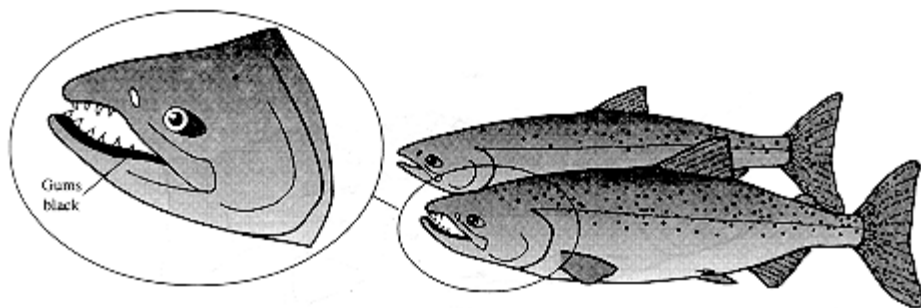
5



5 (6) Tail spotted on upper half; gums at base of teeth in lower jaw white; substantial runs of coho spawn in the Taku and Iskut-Stikine systems

Coho salmon

Oncorhynchus kisutch



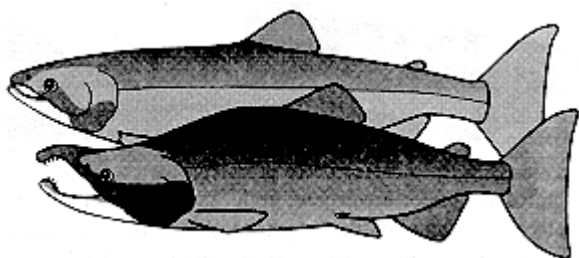
6 (5) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black; substantial numbers of chinook spawn in the Canadian portions of the Taku and Iskut-Stikine systems, and smaller numbers in the Alsek

Chinook salmon

Oncorhynchus tshawytscha

7 (2) No spots on tail, but occasionally some fine speckles

8

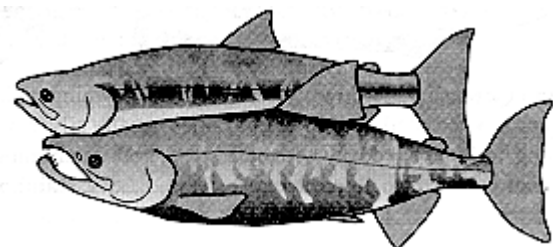


8 (9) Adults occur in freshwater both as migratory spawners (sockeye) and as residents (kokanee); flanks are uniformly coloured (silver in non-breeding kokanee, usually red in breeding sockeye and kokanee); a small run of sockeye spawn in the Tatshenshini River (Aalsek system) and larger runs enter the Taku and Iskut-Sstikine systems; in the latter system there are sockeye that rear in side channels rather than in lakes

Sockeye salmon

(Kokanee)

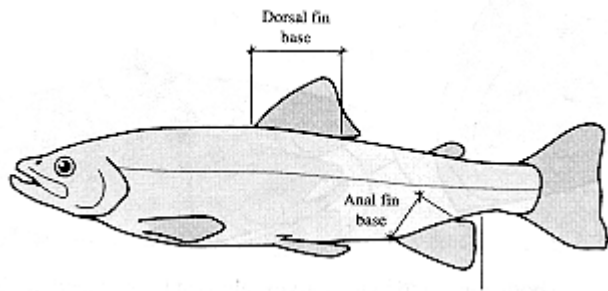
Oncorhynchus nerka



9 (8) Adults in fresh water only as spawners; flanks pale, males with irregular red and black blotches, females with a purplish lateral stripe; chum spawn in the lower reaches of all the north coast rivers

Chum salmon

Oncorhynchus keta

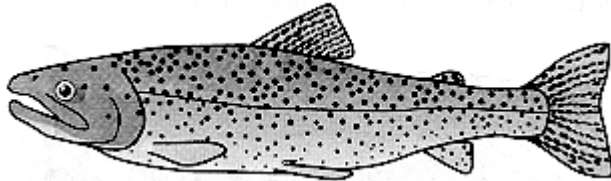


10 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

11

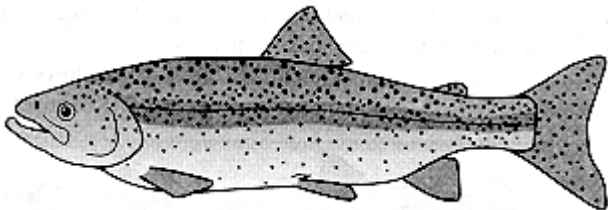
11 (14) Background colour on flanks light (silver or golden) with dark spots

12



12 (13) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots; cutthroat trout are known from the lower and middle reaches of all north coast rivers except the Alsek where they have probably been overlooked

Coastal cutthroat trout
Oncorhynchus clarki clarki

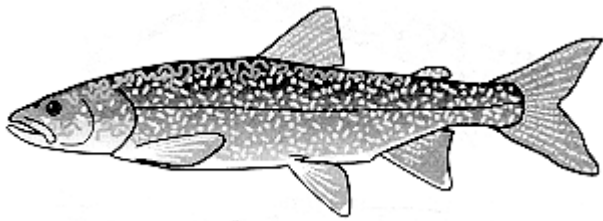


13 (12) No red or orange slash under lower jaw; except in spawning males upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots; both anadromous (steelhead) and resident populations occur in all north coast rivers

Rainbow trout
Oncorhynchus mykiss

14 (11) Background colour on sides dark with light or coloured spots

15



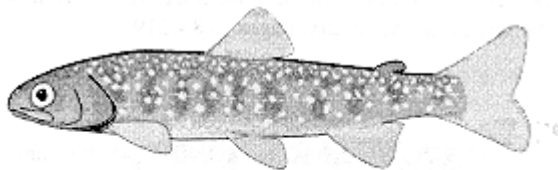
15 (16) Tail deeply forked, light coloured spots on both halves of tail; head and body covered in light irregular spots; headwater lakes in teh Iskut-Stikine, Taku and Alsek systems

Lake trout

Salvelinus namaycush

16 (15) Tail not deeply forked; usually no spots on tail, but if spots present then only on upper half of tail

17

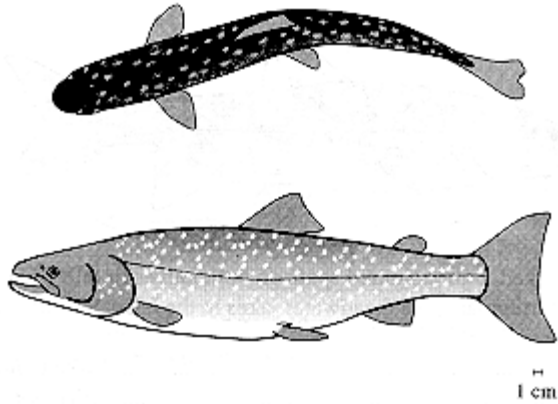


1 cm

17 (18) When viewed from the side snout is blunt; viewed from above spots on back are small and crowded together; upper jaw short (barely reaches hind margin of eye); lower reaches of the Iskut-Stikine, Taku and Alsek systems

Dolly Varden*

Salvelinus malma



18 (17) When viewed from the side snout is more pointed; viewed from above spots on back are large and well separated; upper jaw long (reaches well past hind margin of eye); headwaters of the Iskut-Stikine and Taku systems, apparently absent from the Alsek system.

Bull trout*

Salvelinus confluentus

* These species are difficult to distinguish except where they coexist. In sympatry, Dolly Varden usually mature at less than 200 mm and retain parr marks into adult life; whereas, bull trout rarely mature at less than 300 mm and do not retain parr marks into adult life. Both species reported from Winter Creek in the Stikine system. If in doubt about identification use the key in the Appendix, pages 218-219.

KEY TO YOUNG SALMONIDS (45 - 100 mm)

1 (10) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish usually less than 50 mm long in fresh water

Pink salmon

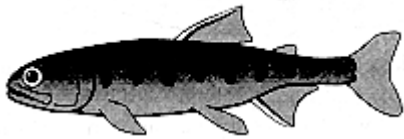
Oncorhynchus gorbuscha

3 (2) Parr marks on flanks

4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

5



5 (6) Adipose fin uniformly pigmented; parr marks variable but the spaces between marks usually wider than the marks themselves; anal fin sickle-shaped with a conspicuous white leading edge that contrasts sharply with dark pigment behind

Coho salmon

Oncorhynchus kisutch



6 (5) Adipose fin with a clear unpigmented "window"; spaces between parr marks usually wider than the marks themselves; anal fin not sickle-shaped. White leading edge not sharply contrasting with dark pigment behind

Chinook salmon

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye

8



8 (9) Size in fresh water to over 100 mm; parr marks divided roughly in half by mid-line; combined width of parr marks much less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line

Sockeye salmon

(Kokanee)

Oncorhynchus nerka



9 (8) Size in fresh water less than 50 mm; back mottled green, sides silvery, with a faint green iridescence below mid-line; combined width of dark areas along mid-line more than half the combined width of the light areas; parr marks faint or absent below mid-line

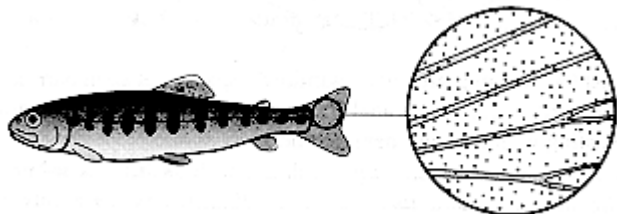
Chum salmon
Oncorhynchus keta

10 (1) Dorsal fin base equal to or longer than anal fin base; in profile hind margin of anal fin vertical

11

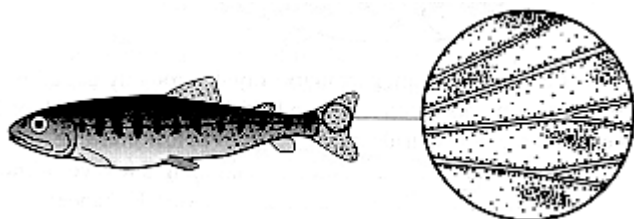
11 (14) Numerous distinct dark spots on dorsal fin; in very small specimens the first dorsal ray may be black

12



12 (13) On fish below 50 mm melanophores are evenly distributed over entire tail; few or no spots on tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye

Rainbow trout
Oncorhynchus mykiss



13 (12) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye

Coastal cutthroat trout
Oncorhynchus clarki clarki

14 (11) Dorsal fin without dark spots; first dorsal ray not black

15



15 (16) Parr marks along mid-line are vertical bars, width of dark areas equal to or less than width of light areas; dorsal fin starts about middle of body (excluding tail)

Lake trout

Salvelinus namaycush



Dolly Varden



Bull trout

16 (15) Parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; dorsal fin starts in front of middle of body (excluding tail)

Dolly Varden and Bull trout*

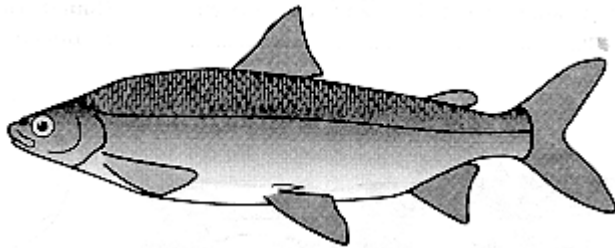
Salvelinus malma or *S. confluentus*

* Small specimens of these two species cannot be differentiated easily in the field (use Appendix key, pages 223).

WHITEFISH

FAMILY SALMONIDAE

(SUBFAMILY COREGONINAE)

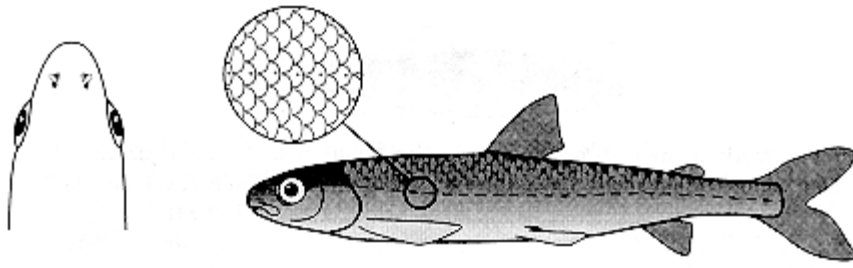


1 (2) Body deep, slab-sided in cross section; among the north coast rivers this species is apparently confined to the Alsek system

Lake whitefish

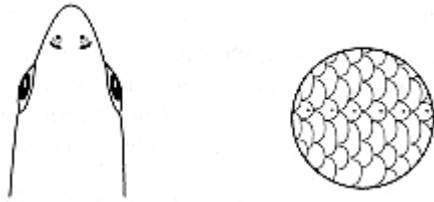
Coregonus clupeaformis

2 (1) Body slender, round in cross section



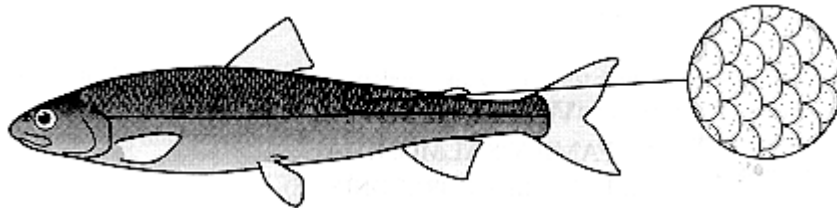
3 (4) Viewed from above, snout blunt, rounded; anterior lateral line scales about the same size as scales immediately above and below lateral line

Pygmy whitefish
Prosopium coulteri



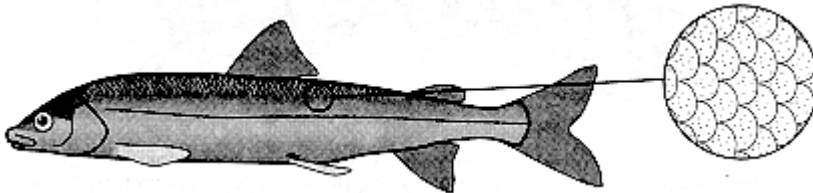
4 (3) Viewed from above, snout pointed; anterior lateral line scales noticeably smaller than scales immediately above and below lateral line

5



5 (6) Adipose fin small, base almost equal to eye diameter; scales on flanks above lateral line edged in dark pigment; Taku and Alesk systems

Round whitefish
Prosopium cylindraceum

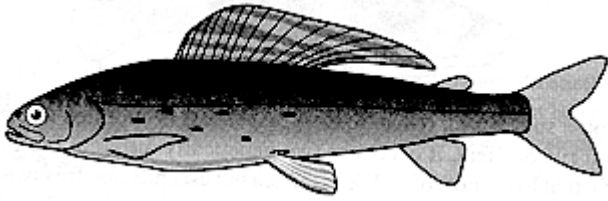


6 (5) Adipose fin large, base mre than 1.5 times eye diamter; scales on flanks above lateral line not edged in dark pigment; Iskut-Stikine systems.

Mountain whitefish*
Prosopium williamsoni

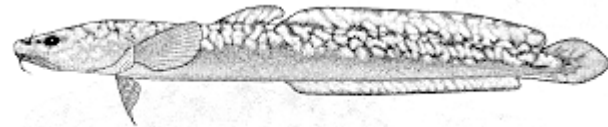
* Fluvial populations of this species often contain two body forms: normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

GRAYLINGS
FAMILY SALMONIDAE
(SUBFAMILY THYMALLINAE)



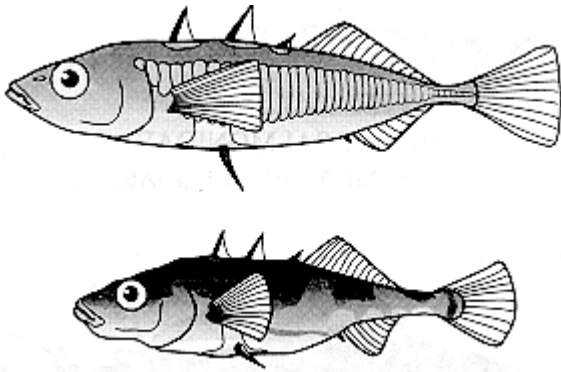
The Arctic grayling (*Thymallus arcticus*) is abundant in the headwaters of the Iskut-Stikinem Taku and Alsek rivers.

CODS
FAMILY GADIDAE



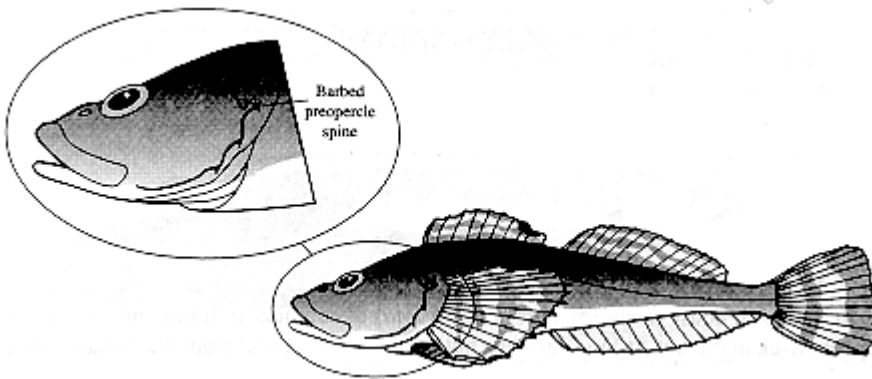
In the north coast rivers the burbot (*Lota lota*) is common in lakes and streams in the upper Alsek and Iskut-Stikine systems, but is apparently absent from the Taku system.

STICKLEBACKS
FAMILY GASTEROSTEIDAE



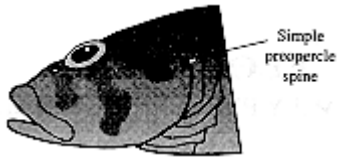
The threespine stickleback (*Gasterosteus aculeatus*) is confined to the lower reaches of the north coast rivers. Here, it occurs as two genetically different life-history types: an anadromous form that lives most of its life in the sea but ascends into freshwater in the spring to spawn, and as a permanent freshwater resident. In north coast rivers the migratory marine form predominates, but in some lowland lakes (e.g. Twin Glacier Lake, Taku system) anadromous and freshwater residents breed alongside one another and still maintain themselves as discrete entities.

SCULPINS
FAMILY COTTIDAE



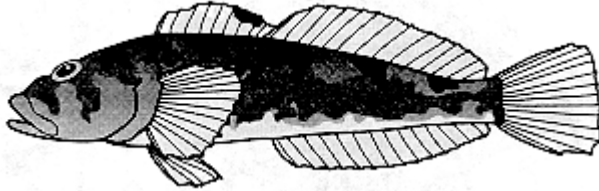
1 (2) Underside dead white; spine on preopercle with obvious hooks; pectoral fins with alternating yellow and dark bands of approximately equal width; only in estuaries or areas under tidal influence

Pacific staghorn sculpin
Leptocottus armatus



2 (1) Underside light or dusky but not dead white; spine on preopercle simple; pectoral fins speckled without broad dark bands; rivers, streams, lakes and estuaries

3

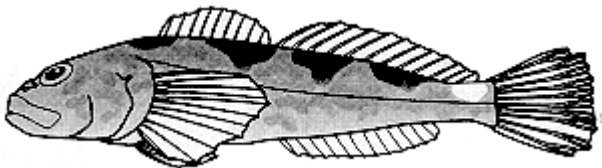


3 (4) First dorsal fin with a conspicuous black spot; anal fin base distinctly longer than head length; typically in low gradient streams, also common in lakes and estuaries; known from the lower reaches of the Iskut-Stikine and Taku systems, probably also in the lower Alsek

Prickly sculpin
Cottus asper

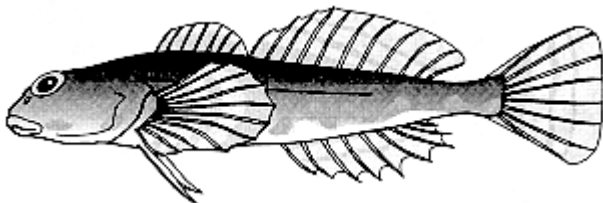
4 (3) First dorsal fin without a conspicuous black spot; anal fin base about equal to head length

5



5 (6) Usually a conspicuous light mark on back just in front of caudal fin; lateral line complete; adults typically in riffles, although occasionally in lakes; common in the lower reaches of the Iskut-Stikine and Taku systems, probably also in the lower Alsek

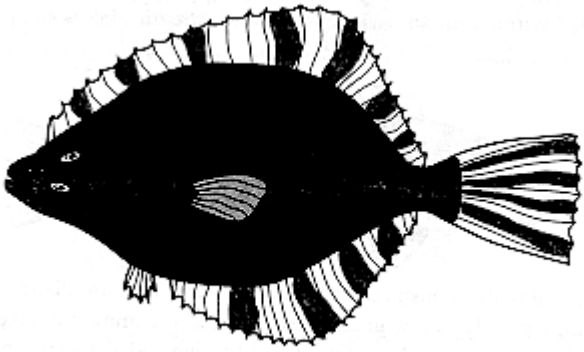
Coastrange sculpin
Cottus aleuticus



6 (5) No conspicuous light mark on back just in front of caudal fin; lateral line incomplete; common throughout the middle and upper reaches of all north coast drainages

Slimy sculpin
Cottus cognatus

FLOUNDERS
FAMILY PLEURONECTIDAE



The starry flounder (*Platichthys stellatus*) is common in north coast estuaries, but rarely penetrates rivers above tide-waters.

A detailed black and white line map of the Queen Charlotte Islands region, showing the intricate coastline of the islands and the surrounding waters. The map is oriented with North at the top.

QUEEN CHARLOTTE ISLANDS REGION



QUEEN CHARLOTTE ISLANDS

The Queen Charlotte Archipelago lies about 150 km off the north coast of BC (Fig. 8). There are two main islands: Graham and Moresby. The Queen Charlotte Ranges, an extension of the Vancouver Island mountain system, run along the west side of the islands. To the east of the ranges lies the Skidegate Plateau and, on Graham Island, the Queen Charlotte Lowlands lie to the east of the plateau. The climate is relatively mild and wet. In the ranges and on the plateau, most of the rivers are short and have high gradients, while the lakes are clear. In the lowlands, most waters are highly stained and stream gradients are low.

Northcote et al. (1989) list 14 species of freshwater fishes from the islands (Table 7). In addition, four inshore marine species regularly enter streams in the lowlands: two of these (staghorn sculpin, *Leptocottus armatus*, and starry flounder, *Platichthys stellatus*) are common in the upper reaches of estuaries and sometimes penetrate above the region of tidal influence. The other two species (sharpnose sculpin *Clinocottus acuticeps* and tidepool sculpin *Oligocottus maculosus*) are rare in areas above tidal influence but are common in the upper reaches of estuaries.

Not surprisingly, all the freshwater species on the Queen Charlotte Islands are salt tolerant, and probably reached the islands by dispersing through the sea. Nonetheless, the northeast corner of Graham Island is one of the few areas in BC that escaped the last (Fraser) glaciation (Warner et al. 1982). Thus, this area may retain remnants of a pre-glacial fauna. Certainly, the area contains a remarkable diversity of sticklebacks including a population in Boulton Lake that contains a high frequency of completely

Species	Queen Charlotte Islands
<i>Lampetra richardsoni</i>	+
<i>L. tridentata</i>	+
<i>Oncorhynchus clarki clarki</i>	+
<i>O. gorbuscha</i>	+
<i>O. keta</i>	+
<i>O. kisutch</i>	+
<i>O. mykiss</i>	+
<i>O. nerka</i>	+
<i>O. tshawytscha</i>	+
<i>Salvelinus malma</i>	+
<i>Thaleichthys pacificus</i>	+
<i>Gasterosteus aculeatus</i>	+
<i>Cottus aleuticus</i>	+
<i>C. asper</i>	+
<i>Clinocottus acuticeps</i>	T
<i>Leptocottus armatus</i>	T
<i>Oligocottus maculosus</i>	T
<i>Platichthys stellatus</i>	T
Table 7: Species list of Queen Charlotte Islands	
+= present	T = areas under tidal influence

unarmoured individuals (Moodie and Reimchen 1976, Reimchen et al. 1985), and there is genetic evidence that some of these may be pre-glacial relicts (O' Reilly 1991). Thus, although fish diversity on the islands appears to be low, this may be an illusion. If sticklebacks survived the last glaciation on Graham Island, perhaps other fish did as well and there still may be diversity to be uncovered.

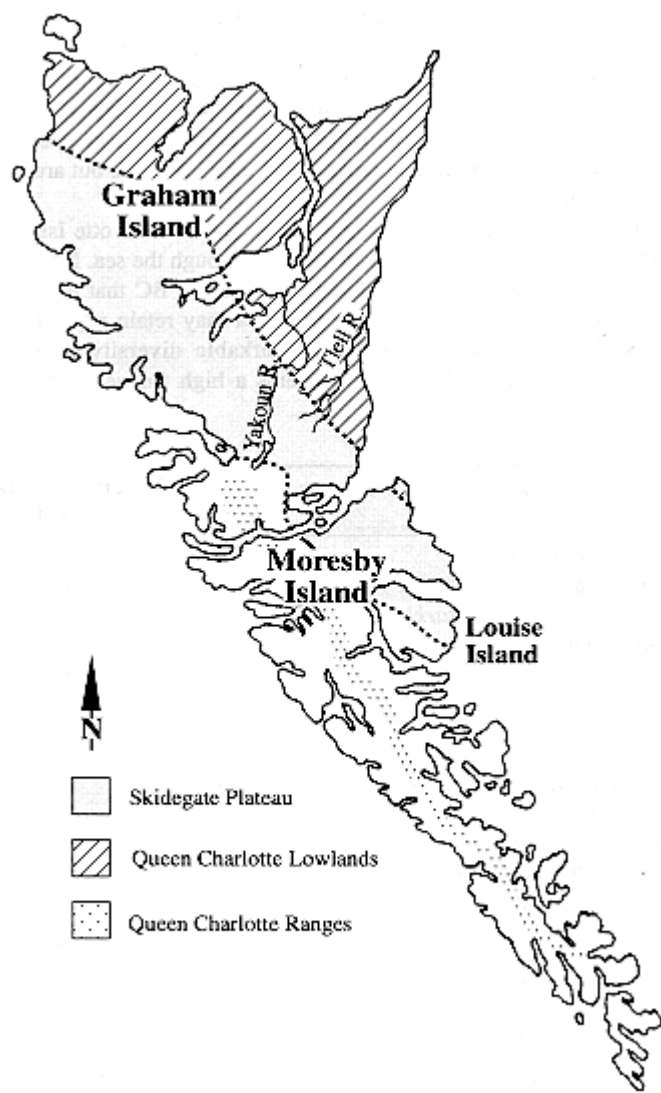


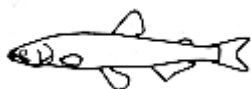
Figure 8
Queen Charlotte Islands

Pictorial Key to Families



LAMPREYS (PETROMYZONTIDAE)

154



SMELTS (OSMERIDAE)

155



SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

155



STICKLEBACKS (GASTEROSTEIDAE)

161



SCULPINS (COTTIDAE)

162



FLOUNDERS (PLEURONECTIDAE)

164

LAMPREYS

FAMILY PETROMYZONTIDAE

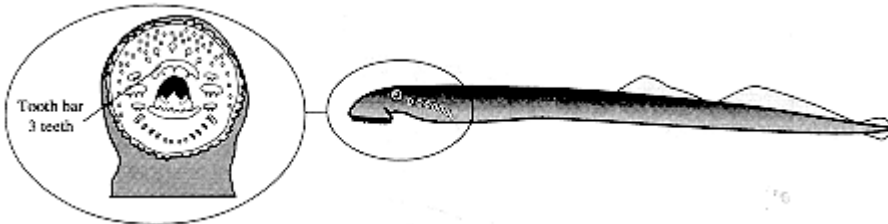
Lampreys are not easy to identify. Their morphology changes with each of three distinctive life-history stages: filter-feeding ammocoetes, newly transformed "macrophthalmic" juveniles, and adults. For adults, tooth patterns and body size provide reliable field guides (a hand-lens is useful here), but for ammocoetes and newly transformed juveniles positive identifications require morphometric and meristic comparisons. Ammocoetes usually are associated with slow currents and soft, mud bottoms. Transformation takes place from late summer through early autumn, and the macrophthalmic juveniles move into faster water over gravel substrates. In anadromous species (Pacific lamprey), the seaward migration of young adults occurs in the spring. Spawning also usually occurs in the spring but in the non-parasitic brook lamprey spawning can extend into summer. On the Queen Charlotte Islands, adult Pacific lamprey appear to return from the sea in the fall and over-winter in fresh water before spawning the next spring.



1 (4) Mouth a sucking disk; teeth and eyes present

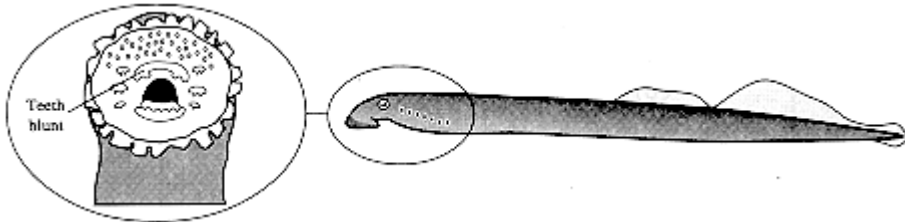
adult or transforming lampreys

2



2 (3) Tooth bar immediately above mouth has three teeth; adults larger than 200 mm; teeth sharp; present in most of the rivers on the islands

Pacific lamprey
Lampetra tridentata



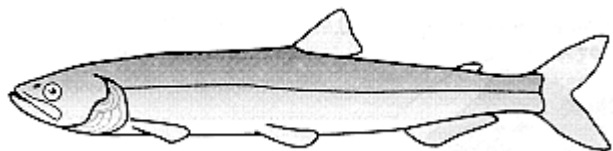
3 (2) Tooth bar immediately above mouth has two teeth; adults less than 160 mm in length; teeth blunt; most common in tributaries of the Yakoun and Tlell systems, Graham Island

Western brook lamprey
Lampetra richardsoni

4 (1) Eyes absent or poorly developed; teeth absent; muth not modified into a sucking disk

ammocoetes or larvel lampreys
(see lamprey key in appendix, page 195)

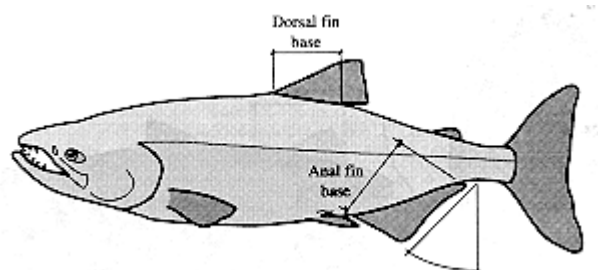
SMELTS
FAMILY OSMERIDAE



The eulachon (*Thaleichthys pacificus*) is the only smelt recorded from fresh waters on the Queen Charlotte Islands. Here, the species is not abundant and occurs only sporadically in the Yakoun system on Graham Island.

SALMON, TROUTS AND CHARS
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

KEY TO THE ADULTS

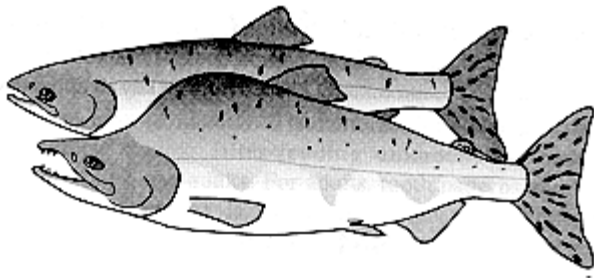


1 (10) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

2

2 (7) Distinct spots on tail

3

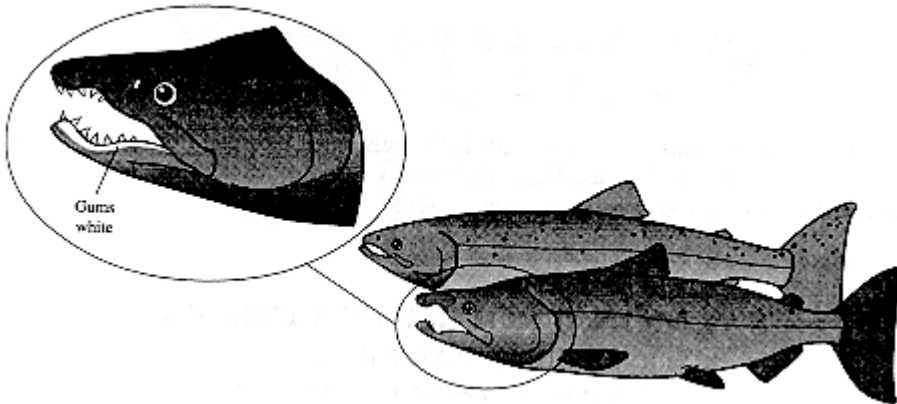


3 (4) Tail spots oblong (not round)

4 (3) Tail spots round (not oblong)

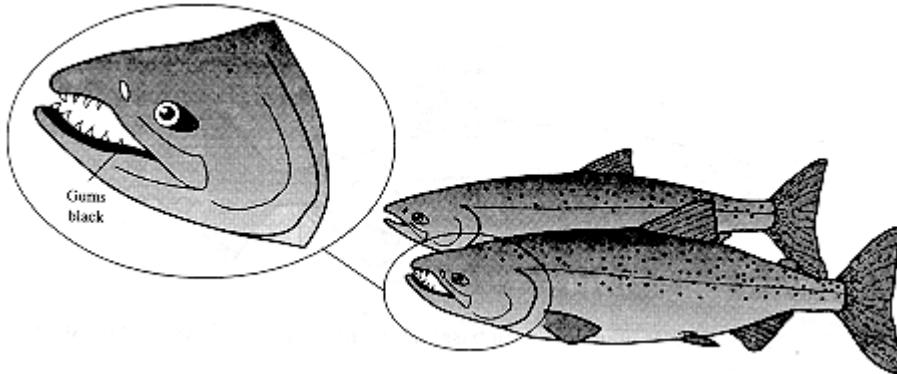
Pink salmon
Oncorhynchus gorbuscha

5



5 (6) Tail spotted on upper half; gums at base of teeth in lower jaw white

Coho salmon
Oncorhynchus kisutch

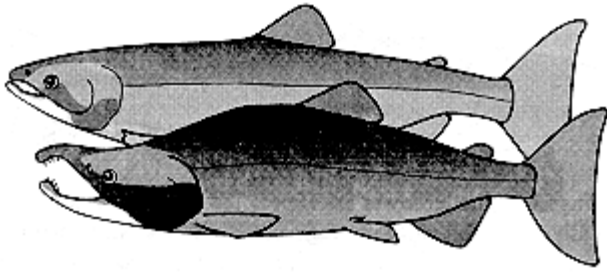


6 (5) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black

Chinook salmon
Oncorhynchus tshawytscha

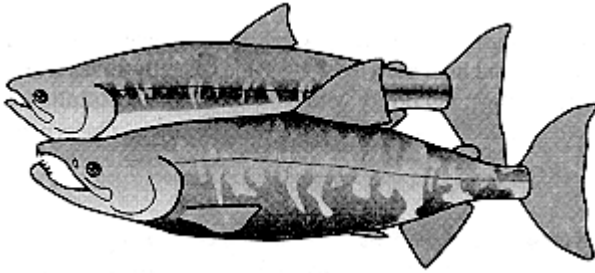
7 (2) No spots on tail, but occasionally some fine speckles

8



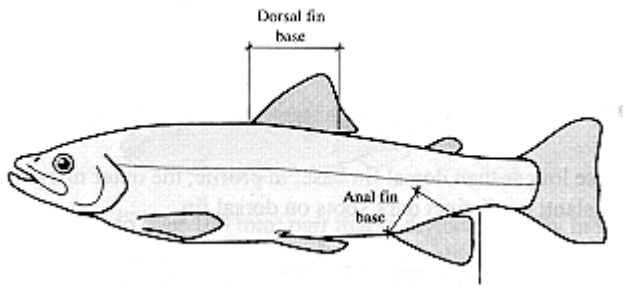
8 (9) Adults occur in freshwater both as migratory spawners (sockeye) and as residents (kokanee); flanks are uniformly coloured (silver in non-breeding kokanee, red in breeding sockeye and kokanee)

Sockeye salmon
(Kokanee)
Oncorhynchus nerka



9 (8) Adults only in freshwater as spawners; flanks in males pale with irregular red and black blotches, females with purplish lateral stripe

Chum salmon
Oncorhynchus keta

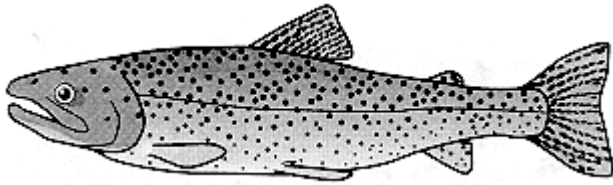


10 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

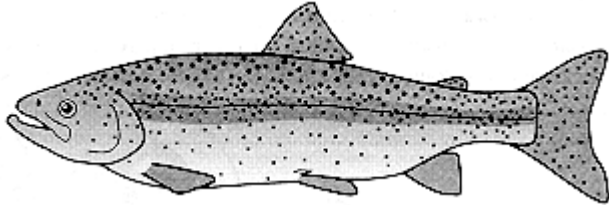
11

11 (14) Background colour on flanks light (silver or golden) with dark spots

12

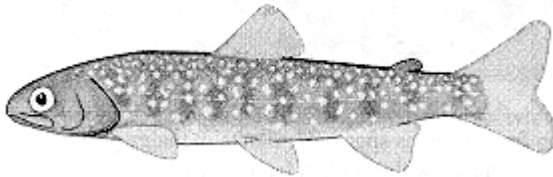


12 (13) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots
Coastal cutthroat trout
Oncorhynchus clarki clarki



13 (12) No red or orange slash under lower jaw; except in spawning males upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots

Rainbow trout
Oncorhynchus mykiss



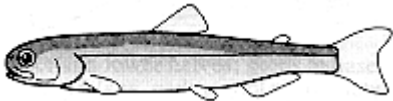
14 (11) Background colour on sides dark with light or coloured spots

Dolly Varden
Salvelinus malma

KEY TO YOUNG SALMONIDS (45 -100mm)

1 (10) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Sides silvery; no par marks; back iridescent greenish-blue; length usually less than 50 mm in fresh water; widespread throughout the islands

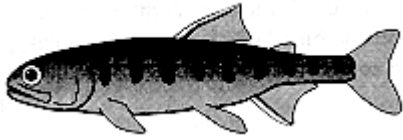
Pink Salmon
Oncorhynchus gorbuscha

3 (2) Parr marks on flanks

4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

5



5 (6) Adipose fin uniformly pigmented; parr marks variable but in Queen Charlotte populations the spaces between marks are usually wider than the marks themselves; anal fin sickle-shaped, with a conspicuous white leading edge contrasting sharply with the dark pigment behind; common throughout the islands.

Coho Salmon

Oncorhynchus kisutch



6 (5) Adipose fin with a clear unpigmented "window"; spaces between parr marks usually wider than the marks themselves; anal fin not sickle-shaped, white leading edge of anal fin not conspicuously contrasting with the dark pigment behind; common only in the Yakoun system

Chinook salmon

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye

8



8 (9) Size in fresh water to over 100 mm; parr marks divided roughly in half by mid-line; combined width of parr marks less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line; rare in the ranges, more common on the Plateau and in lowland systems with suitable rearing lakes

Sockeye salmon

(Kokanee)

Oncorhynchus nerka



9 (8) Size in fresh water usually less than 50 mm; back mottled green, sides silvery, with a faint green iridescence below mid-line; combined width of dark areas along mid-line more than half the combined width of the light areas; parr marks faint or absent below mid-line; most common in the Ranges

Chum salmon

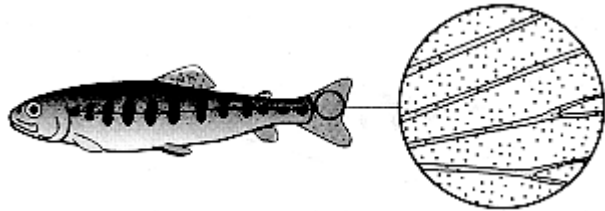
Oncorhynchus

10 (1) Dorsal fin base equal to or longer than anal fin base; in profile, hind margin of anal fin vertical

11

11 (14) Numerous distinct dark spots on dorsal fin; in very small specimens the first dorsal ray may be black

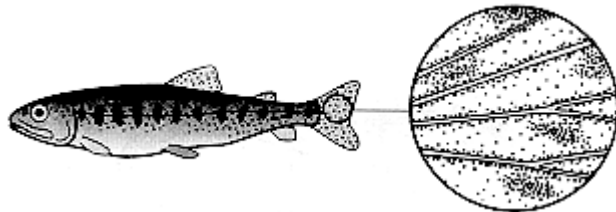
12



12 (13) On fish below 50 mm melanophores are evenly distributed over entire tail; no red or yellow marks under chin; hind margin of upper jaw not reaching hind margin of eye; the only trout present on most of the west coast of Graham Island and all of the west coast of Moresby Island

Rainbow trout*

Oncorhynchus mykiss



13 (12) Usually black spots on tail, even on fish less than 50 mm melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); often red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye; appears to be absent from the Ranges, but present on the Plateau on Graham, Moresby and Louise islands, and abundant in the lowlands on Graham Island.

Coastal cutthroat trout*

Oncorhynchus clarki clarki

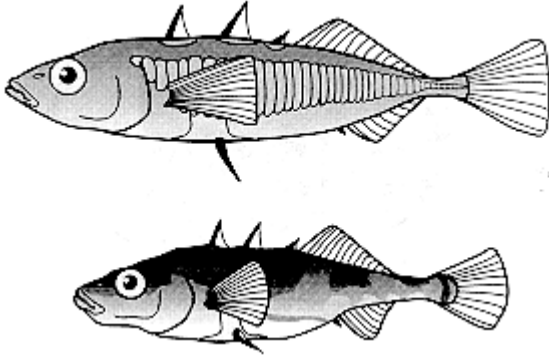


14 (11) Dorsal fin without dark spots; first dorsal ray not black; parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; abundant throughout the islands, often the only species above barriers

Dolly Varden
Salvelinus malma

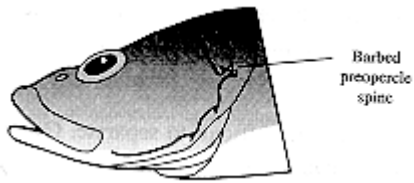
* The young of these species are difficult to separate. Generally, cutthroat are more heavily pigmented on the underside than rainbow, and have smaller eyes and longer upper jaws. In several areas on Graham and Moresby islands identification is made even more difficult by persistent hybridization between the species.

STICKLEBACKS FAMILY GASTEROSTEIDAE



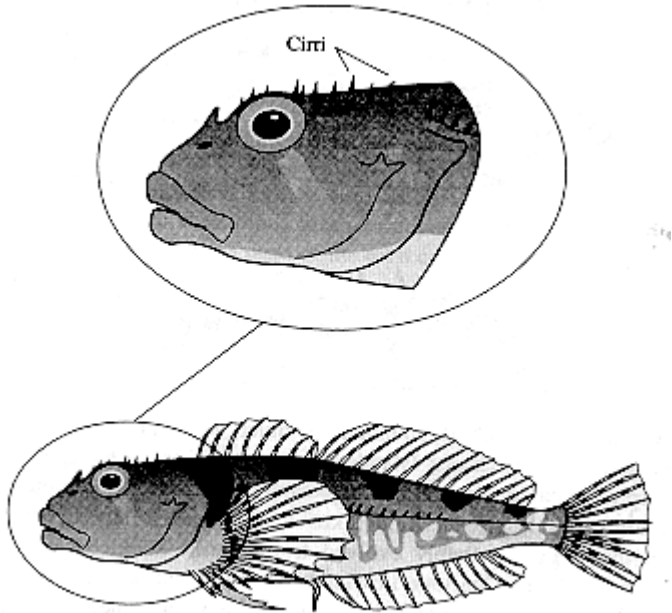
The threespine stickleback is abundant in quiet, lowland waters throughout the archipelago. On the Queen Charlotte Islands, this notoriously variable species exists as a complex of morphological, ecological and behavioural forms. It is common in the sea, in estuaries and low altitude streams and lakes of all sizes. Many of the freshwater populations on the islands probably evolved from marine sticklebacks after the last glaciation, but on the Queen Charlotte Lowlands some populations may pre-date the last glaciation (O' Reilly 1991). There are two situations on the islands where divergent forms of *Gasterosteus* coexist. 1) Anadromous populations ascend freshwater streams in the spring and breed alongside freshwater resident populations. This situation appears to be less common on the Queen Charlotte Islands than it is on the mainland. 2) In Drizzle and Mayer lakes on Graham Island there are distinctly different lake and stream sticklebacks. The two forms are ecologically and morphologically differentiated and rarely interbreed (Stinson 1982; Reimchen *et al.* 1985).

SCULPINS
FAMILY COTTIDAE



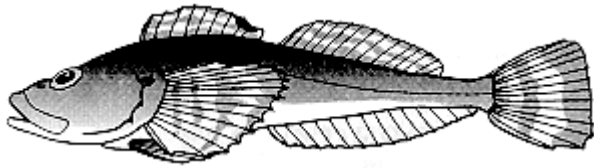
1 (4) Spine on preopercle with 2 to 4 obvious hooks

2



2 (3) Cirri on head and lateral line; body size less than 100 mm

Tidepool sculpin
Oligocottus maculosus



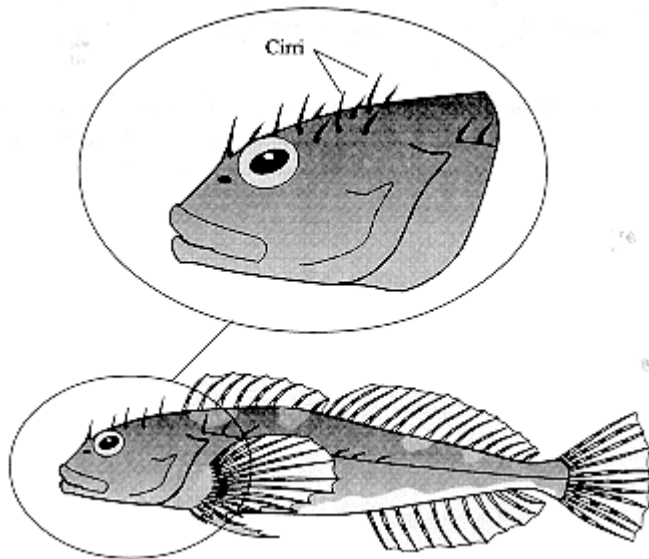
3 (2) No cirri on head or lateral line; body size to 300 mm

Pacific staghorn sculpin
Leptocottus armatus



4 (1) Spine on preopercle simple

5

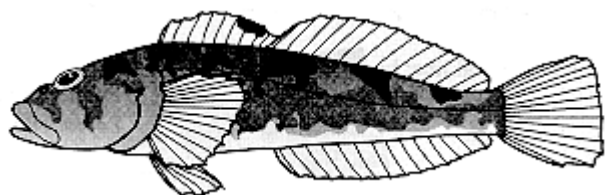


6 (5) Cirri on head and lateral line

Sharpnose sculpin
Clinocottus acuticeps

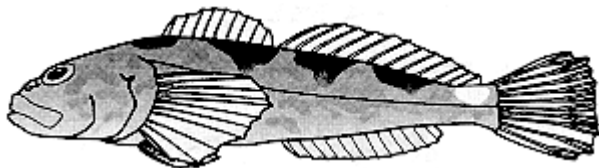
6 (5) no cirri on head or lateral line

7



7 (8) First dorsal with a distinct black spot (except in breeding males); anal fin base distinctly longer than head

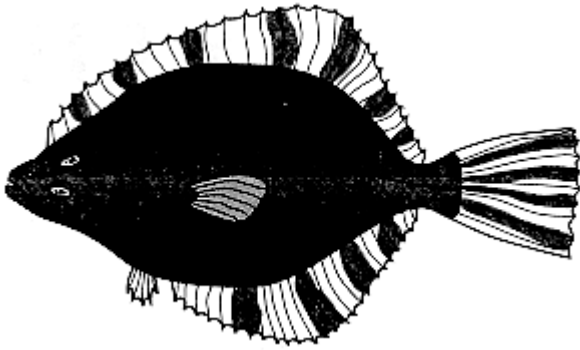
Prickly sculpin
Cottus asper



8 (7) First dorsal fin without distinct black spot; anal fin base about equal to head length

Coastrange sculpin
Cottus aleuticus

FLOUNDERS
FAMILY PLEURONECTIDAE



The starry flounder (*Platichthys stellatus*) is a common inshore marine species. Juveniles are especially abundant in estuaries and regularly penetrate low gradient rivers up to the limits of tidal influence.

CENTRAL COAST REGION

CENTRAL COAST



Like the north coast, the central coast is characterized by a series of relatively short, high- gradient rivers that rise east of the Coast Range and flow westward through the mountains to the sea (Fig.9). The central coast rivers fall into two natural groups: to the north, the Nass and Skeena rivers rise at about 1000 m in the Skeena Mountains, and to the south, a series of shorter rivers (the Dean, Bella Coola, Klinaklini, and Homathko) rise on the Interior Plateau and flow through the mountains to the sea.

There are 32 species of fish in the Skeena and 27 in the Nass. In their lower reaches they share a salt-tolerant fauna common to most coastal rivers, but in their upper and middle reaches both rivers are dominated by Columbia species (Table 8). Indeed, it is the presence of Columbia species (*e.g.* largescale sucker, *Catostomus macrocheilus*; reidside shiner, *Richardsonius balteatus*; peamouth, *Mylocheilus caurinus*, and squawfish *Ptychocheilus oregonensis*) that set the central coast rivers apart from the north coast rivers. In addition, the upper Skeena contains seven species (lake trout, *Salvelinus namaycush*; lake whitefish, *Coregonus clupeaformis*; pygmy whitefish, *Prosopium coulteri*; lake chub, *Couesius plumbeus*; longnose dace, *Rhinichthys cataractae*; white sucker, *Catostomus commersoni*, and burbot, *Lota lota*) that apparently are absent from the Nass. Of these, the white sucker is unquestionably of eastern North American origin, but lake trout and lake whitefish may also have entered the Skeena from the east by way of glacial connections between the Skeena, Fraser and Peace rivers.

The other central coast rivers (the Dean, Bella Coola, Klinaklini, and Homathko rivers) rise on the relatively flat Interior Plateau close to Fraser River tributaries.

Typically, the headwaters of these rivers are isolated from their lower reaches by canyons and cataracts, and contain some Columbia species derived from the Fraser. In contrast, the lower reaches of these same rivers contain mainly salt-tolerant coastal species (Table 8).

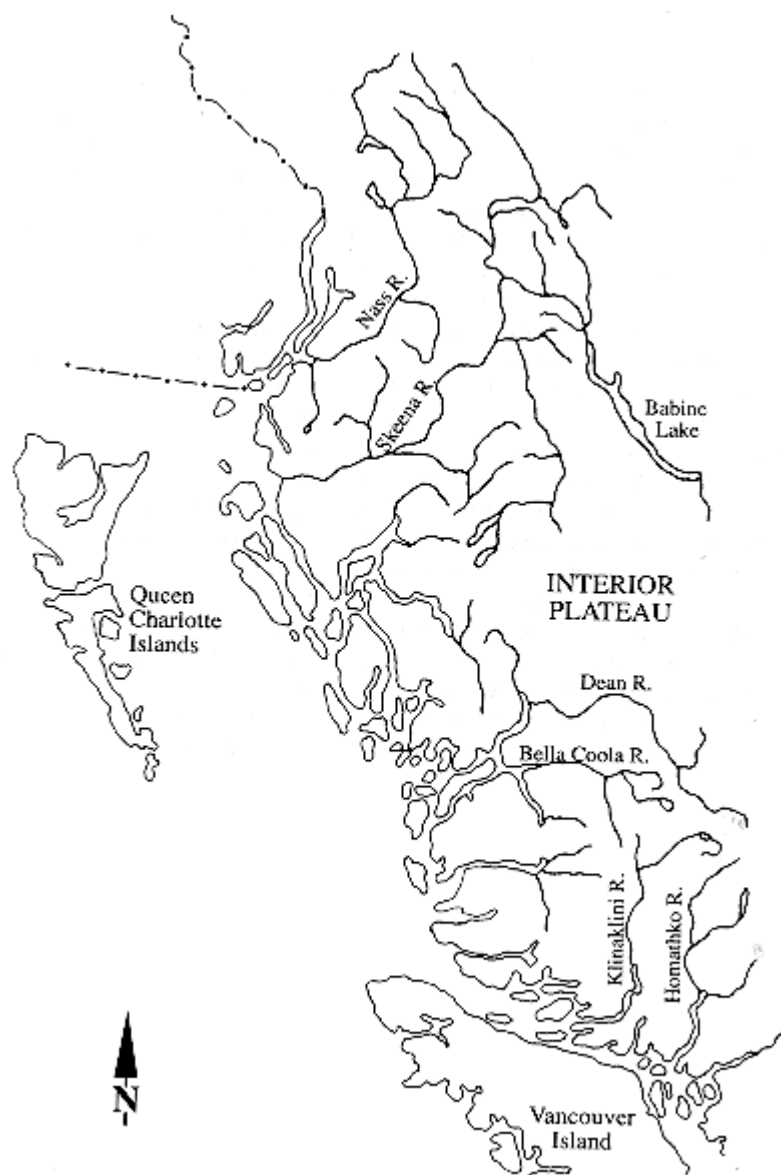


Figure 9
Central coast river systems

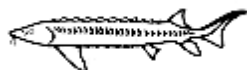
Species	Skeena	Nass	Dean	Bella Coola	Klinaklini	Homathako
<i>Lampetra ayresi</i>	+	?	?	?	?	?
<i>L. richardsoni</i>	+	?	?	+	?	?
<i>L. tridentata</i>	+	+	+	+	+	+
<i>Acipenser medirostris</i>	+	+	?	?	?	?
<i>A. transmontanus</i>	?	?	?	?	?	?
<i>Alosa sapidissima</i>	I	I	I	I	I	I
<i>Couesius plumbeus</i>	+	+	+	-	-	-
<i>Mylocheilus caurinus</i>	+	+	+	+	+	?
<i>Ptychocheilus oregonensis</i>	+	+	+	-	+	-
<i>Rhinichthys cataractae</i>	+	-	?	+	+	-
<i>Richardsonius balteatus</i>	+	+	+	+	+	+
<i>Catostomus catostomus</i>	+	+	+	+	+	+
<i>C. commersoni</i>	+	-	-	-	-	-
<i>C. macrocheilus</i>	+	+	+	?	+	-
<i>Osmerus dentex</i>	?	?	?	?	?	?
<i>Spirinchus thaleichthys</i>	+	?	?	?	?	?
<i>Thaleichthys pacificus</i>	+	+	+	+	+	+
<i>Oncorhynchus clarki clarki</i>	+	+	+	+	+	+
<i>O. gorboscha</i>	+	+	+	+	+	+
<i>O. keta</i>	+	+	+	+	+	+
<i>O. kisutch</i>	+	+	+	+	+	+
<i>O. mykiss</i>	+	+	+	+	+	+
<i>O. nerka</i>	+	+	+	+	+	+
<i>O. tshawytscha</i>	+	+	+	+	+	+
<i>Salvelinus confluentus</i>	+	+	+	+	+	+
<i>S. malma</i>	+	+	+	+	+	+
<i>S. namaycush</i>	+	-	-	-	-	-
<i>Coregonus clupeaformis</i>	+	-	-	-	-	-
<i>Prosopium coulteri</i>	+	-	-	-	-	-
<i>P. williamsoni</i>	+	+	+	+	+	+
<i>Lota lota</i>	+	+	-	-	-	-
<i>Gasterosteus aculeatus</i>	+	+	+	+	+	+
<i>Cottus aleuticus</i>	+	+	+	+	+	+
<i>C. asper</i>	+	+	+	+	+	+
<i>Leptocottus armatus</i>	E	E	E	E	E	E
<i>Platichthys stellatus</i>	E	E	E	E	E	E
Table 8						
Distribution of fishes in Central coast drainages.						
+ = present - = absent		I = introduced ? = uncertain record		E = estuarine		

Pictorial Key to Families



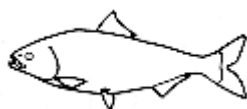
LAMPREYS (PETROMYZONTIDAE)

171



STURGEONS (ACIPENSERIDAE)

172



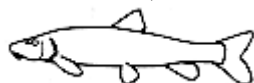
HERRINGS (CLUPEIDAE)

174



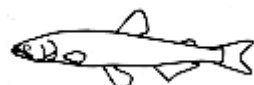
MINNOWS (CYPINIDAE)

174



SUCKERS (CATOSTOMIDAE)

176



SMELTS (OSMERIDAE)

177



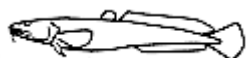
SALMON, TROUT, CHAR (SALMONIDAE)
(SUBFAMILY SALMONINAE)

178



WHITEFISH (SALMONIDAE)
(SUBFAMILY COREGONINAE)

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CODS (GADIDAE)

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STICKLEBACKS (GASTEROSTEIDAE)

187

Pictorial Key to Families



SCULPINS (COTTIDAE)

187



FLOUNDERS (PLEURONECTIDAE)

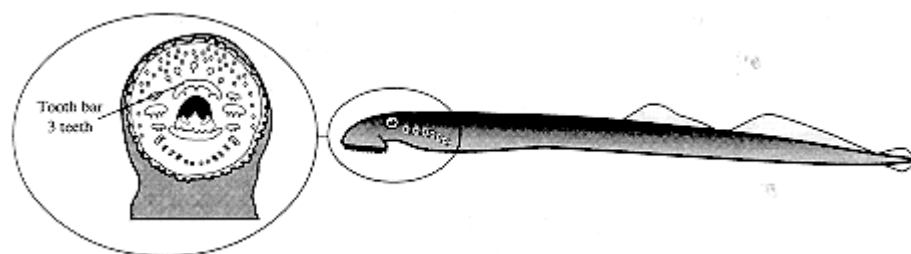
189

LAMPREYS FAMILY PETROMYZONTIDAE



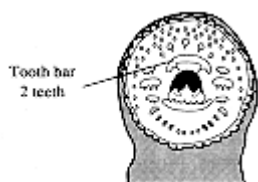
1 (6) Mouth in form of a sucking disk; teeth and eyes present

adult or transforming lampreys
2

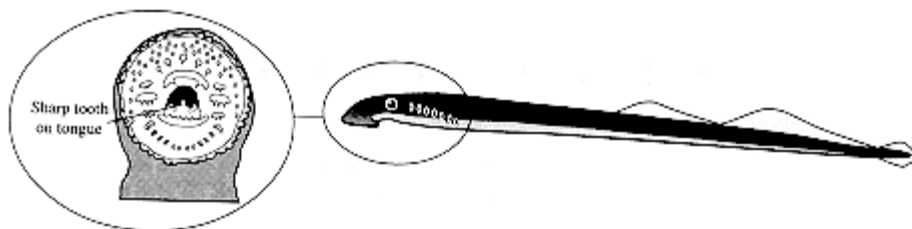


2 (3) Tooth bar immediately above mouth has three teeth; spawning adults ascend most central coast rivers in the late spring

Pacific lamprey
Lampetra tridentata

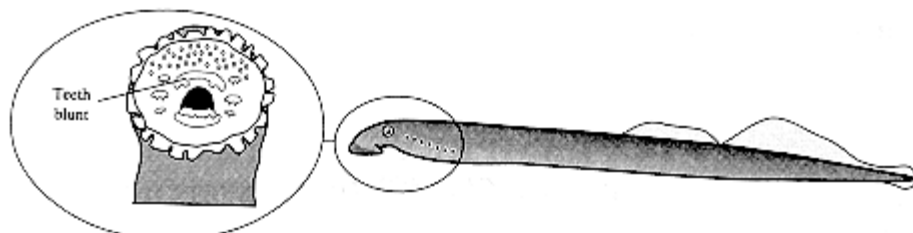


3 (2) Tooth bar immediately above mouth has two teeth



4 (5) Teeth sharp and well developed; center pair of lateral teeth with three points; sharp tooth on center of tongue; adults usually longer than 200 mm; on the central coast known only from the lower Skeena but probably more widely distributed

River lamprey
Lampetra ayresi



5 (4) Teeth blunt, poorly developed; center pair of side teeth with only two points; no sharp tooth on tongue; adults usually less than 160 mm; on the central coast known from the lower Skeena and King Island (near Bella Coola)

Western brook lamprey
Lampetra richardsoni

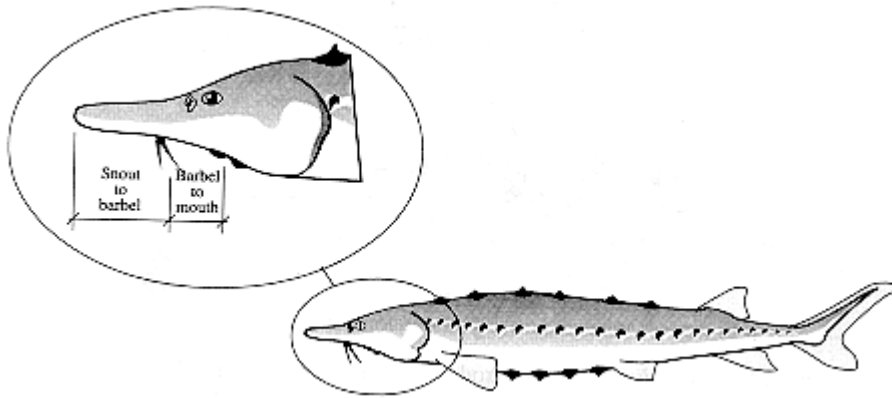
6 (1) Eyes absent or poorly developed; teeth absent; mouth not modified into a sucking disk

Ammocoetes or larval lampreys
(see key in appendix, page 199).

STURGEONS

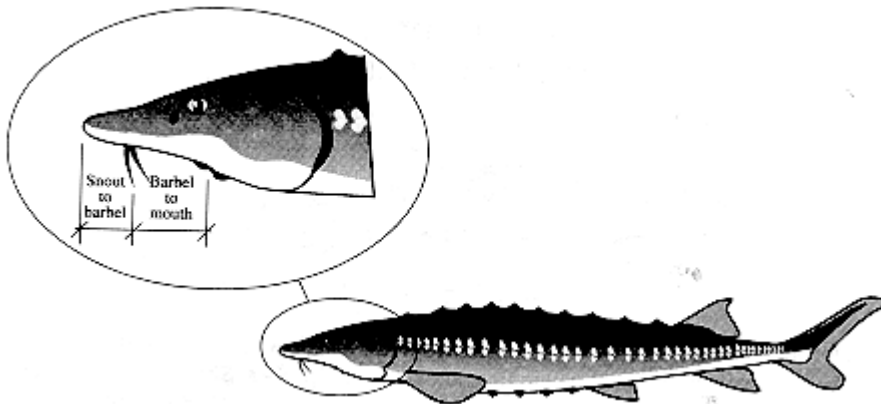
FAMILY ACIPENSERIDAE

Two species of sturgeon are reported from river mouths along the central coast (green sturgeon and white sturgeon). Both of these species are morphologically variable and, perhaps some of this variability is associated with sex. We know little about sturgeon life histories along the coast, but in other areas white sturgeon are mainly found in fresh water while green sturgeon are more common in the sea. Since all coastal records are from tidal waters, and the only verified specimens are all green sturgeons, the records of white sturgeon from the central coast may be errors. Nonetheless, we've included both species in the key.



1 (2) Back green; snout usually elongate and narrow; barbels nearer to mouth than to tip of snout; sporadic in tidal regions associated with the Skeena and Nass estuaries

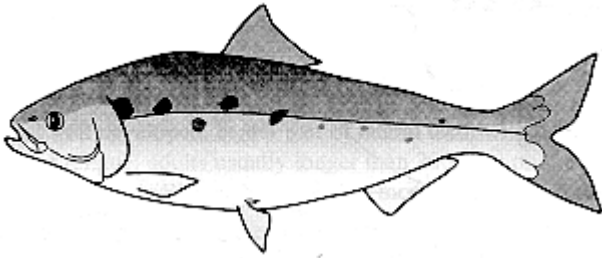
Green sturgeon
Acipenser medirostris



2 (1) Back dark grey to black; snout and broad (except in some specimens less than 250 mm in standard length); barbels nearer to tip of snout than to mouth; rare, or even absent, in the lower reaches of central coast rivers

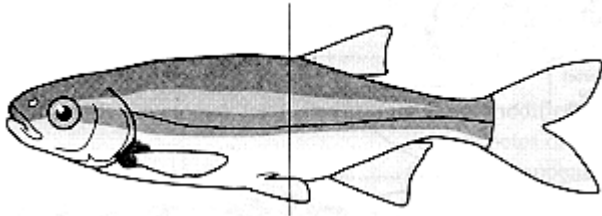
White sturgeon
Acipenser transmontanus

HERRINGS
FAMILY CLUPEIDAE



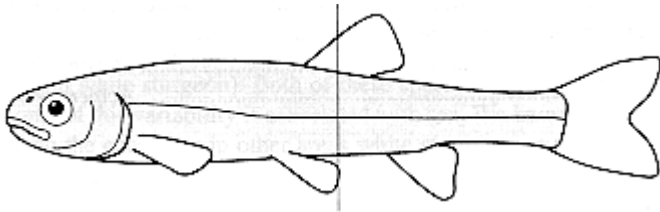
The shad (*Alosa sapidissima*) was introduced to the Pacific coast of North America in 1871. It spread rapidly and by the turn of the century was recorded from the sea as far north as the Gulf of Alaska. In the early 1900's shad were recorded from a number of sites along thje central coast but there are no recent records from this area.

MINNOWS
FAMILY CYPRINIDAE

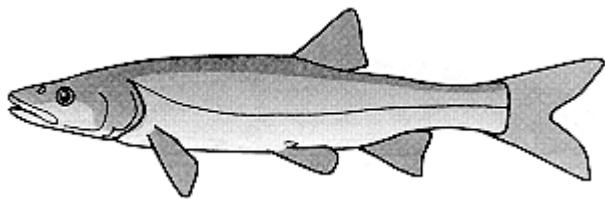


1 (2) Dorsal fin set far back on body, viewed from the side its origin is almost directly above the posterior tips of pelvic tips of pelvic fins; known from the Nass, Skeena, Klinaklini and Homathko rivers

Redside shiner
Richardsonius balteatus



2 (1) Dorsal fin originates at abut middle of the body, viewed from the side the prosterior tips of the pelvic fins extend well beyond the dorsal origin

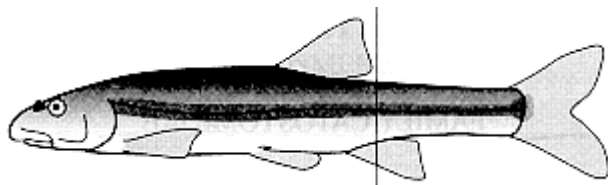


3 (4) Mouth large, upper jaw extends beyond anterior margin of eye; adults up to 450 mm; on the central coast reported from the Nass, Skeena, Dean and Klinaklini rivers

Northern squawfish
Ptychocheilus oregonensis

4 (3) Mouth small, upper jaw does not extend beyond anterior margin of eye

5

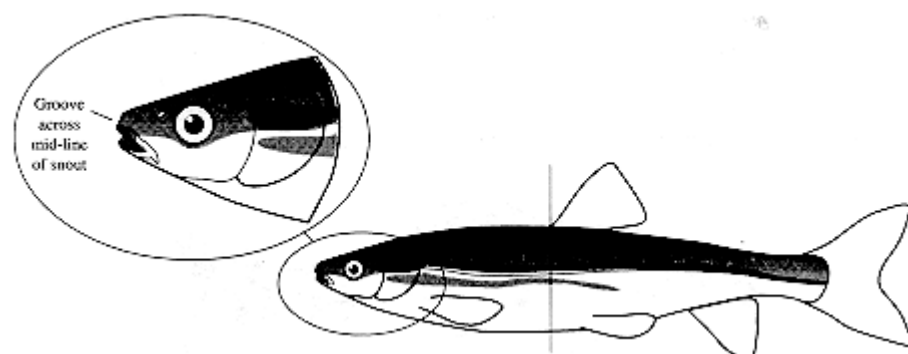


5 (6) Viewed from the side, hind margin of dorsal fin clearly overlaps anal fin; snout directly attached to upper lip; upper jaw not protractile; eyes exceptionally small, their diameter usually less than one third snout length; some individuals with a conspicuous dark lateral stripe; length usually less than 120 mm; on the central coast known from the Skeena, Klinaklini and Bella Coola rivers

Longnose dace
Rhinichthys cataractae

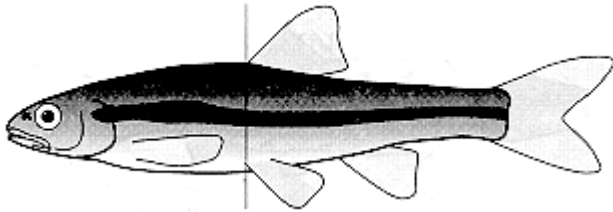
6 (5) Viewed from the side, hind margin of dorsal fin does not overlap anal fin; snout separated from upper lip by a groove across mid-line of snout; eyes normal, their diameter about half snout length

7



7 (8) Origin of dorsal fin anterior to origin of pelvic fins; two dark horizontal stripes on side of body; length to 250 mm; on the central coast known from the Nass, Skeena, Dean and Klinaklini rivers

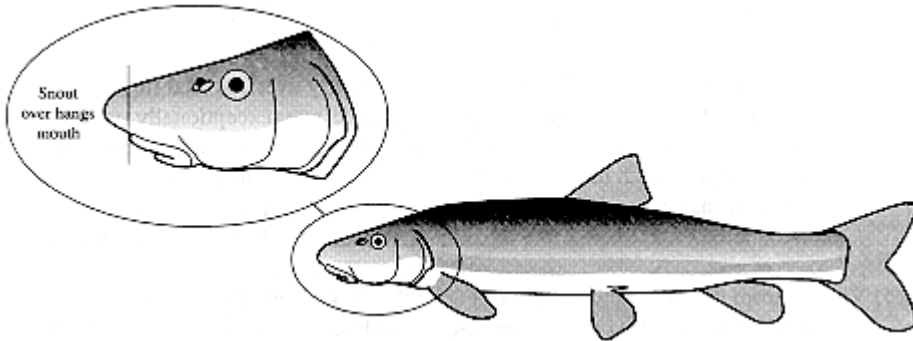
Peamouth
Mylocheilus caurinus



8 (7) Origin of dorsal fin directly above origin of pelvic fins; no dark mid-lateral stripe except in specimens less than 80 mm; adults usually less than 100 mm in length; along the central coast reported only from the Skeena and Dean rivers

Lake chub
Couesius plumbeus

SUCKERS FAMILY CATOSTOMIDAE



1 (2) Snout long and pointed, noticeably overhangs the mouth; scales fine (just behind the head they are barely visible with the naked eye); Nass, Skeena, Dean, Klinaklini and Homathko rivers

Longnose sucker
Catostomus catostomus

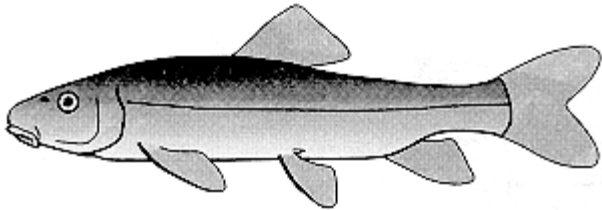
2 (1) Snout short and rounded, not overhanging the mouth; scales large

3



3 (4) Caudal peduncle narrow its least depth half, or less than half, the dorsal fin base; breeding fish with a dark lateral stripe; Nass, Skeena, Dean and Klinaklini rivers

Largescale sucker
Catostomus macrocheilus

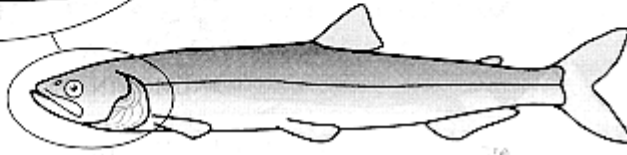
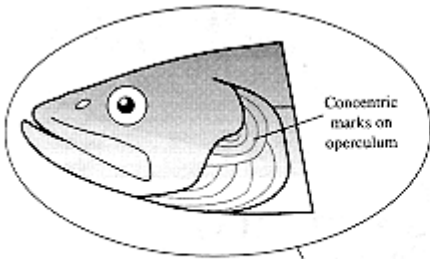


4 (3) Caudal peduncle deeper, its depth almost equal to dorsal fin base; breeding fish with a bronze cast, no dark lateral stripe; among the central coast rivers known only from the Skeena

White sucker

Catostomus commersoni

SMELTS
FAMILY OSMERIDAE



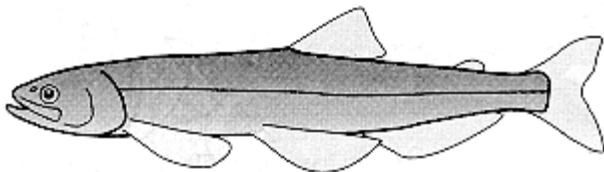
1 (2) A series of concentric marks on gill cover; in spring, large runs into the lower reaches of most central coast rivers

Eulachon

Thaleichthys pacificus

2 (1) No concentric marks on gill covers

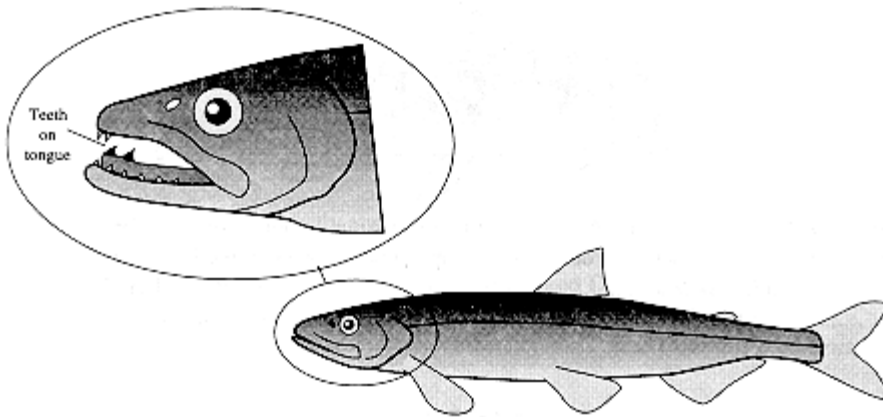
3



3 (4) Pectoral fin longer than head; no prominent teeth on tongue; no records from freshwater on the central coast but known from the Skeena estuary and from rivers to the north and south of this area

Longfin smelt

Spirinchus thaleichthys

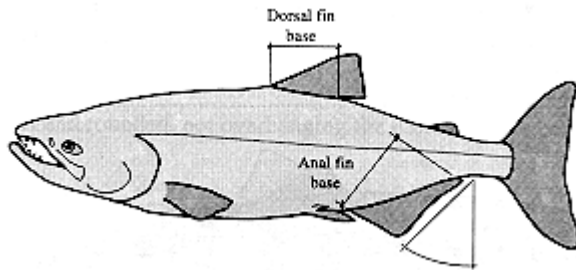


4 (3) Pectoral fin smaller than head; 1 to 2 prominent curved canine teeth on tongue; no records from central coast rivers but the species occurs to the north and south of this area

Rainbow smelt
Osmerus dentex

SALMON, TROUT AND CHARS
FAMILY SALMONIDAE
(SUBFAMILY SALMONINAE)

Key to the Adults

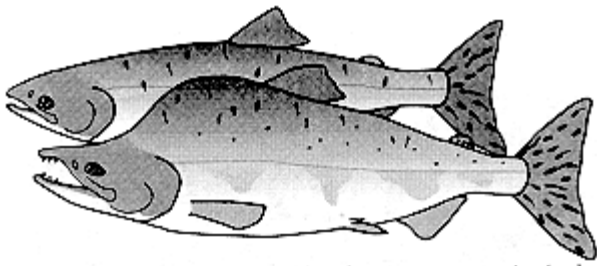


1 (10) Anal fin base longer than dorsal fin base; in profile, hind margin of anal fin slants backwards (not vertical)

2

2 (7) Distinct spots on tail

3



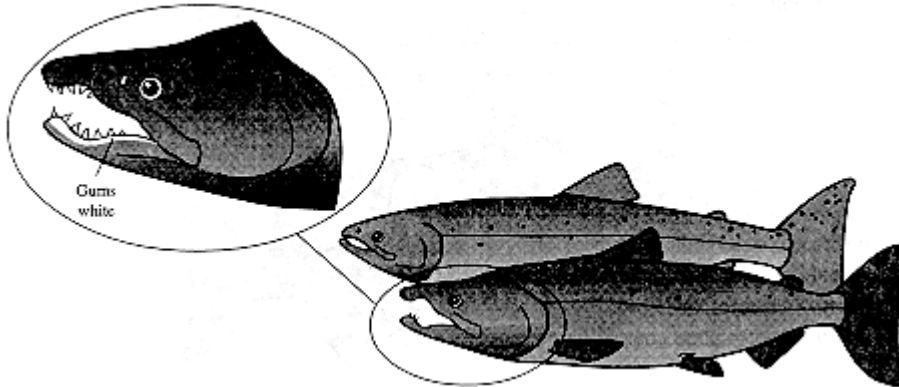
3 (4) Tail spots oblong (not round); both odd and even year runs in the lower reaches of many central coast rivers; in the Skeena system the odd year penetrates as far inland as the lower Babine river

Pink salmon

Oncorhynchus gorbuscha

4 (3) Tail spots round (not oblong)

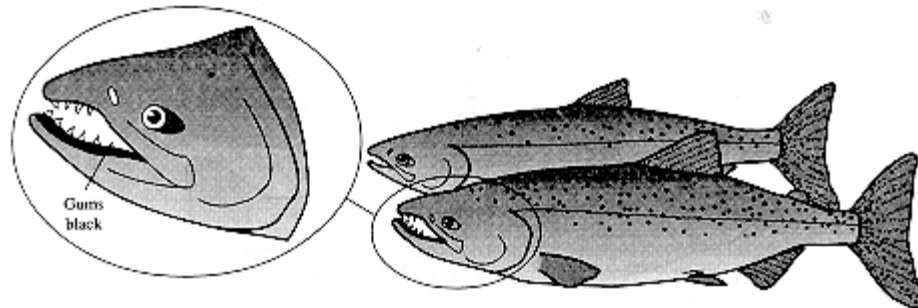
5



5 (6) Tail spotted on upper half; gums at base of teeth in lower jaw white; substantial runs in most central coast rivers; in the Skeena coho penetrate as far inland as the upper Babine and upper Near rivers

Coho salmon

Oncorhynchus kisutch



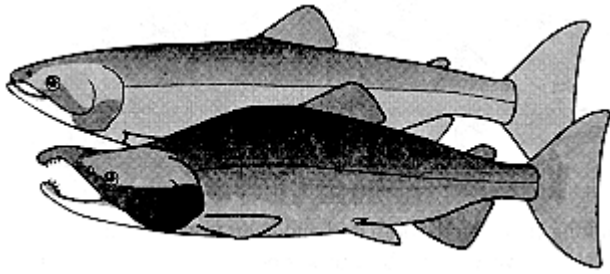
6 (5) Tail spotted on both upper and lower halves; gums at base of teeth in lower jaw black; substantial runs in most central coast rivers; in the Skeena chinook penetrate as far inland as the upper Babine and upper Bear rivers.

Chinook salmon

Oncorhynchus tshawytscha

7 (2) No spots on tail, but occasionally some fine speckles

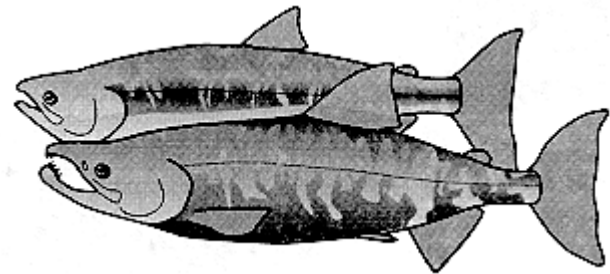
8



8 (9) Adults occur in fresh water both as migratory spawners (Sockeye) and as residents (Kokanee); flanks are uniformly coloured (silver in non-breeding Kokanee, usually red in breeding Sockeye and Kokanee); the Skeena and Nass rivers, as well as Owikeno and Long lakes (tributary to Rivers and Smith inlets), are the major sockeye producers on the central coast

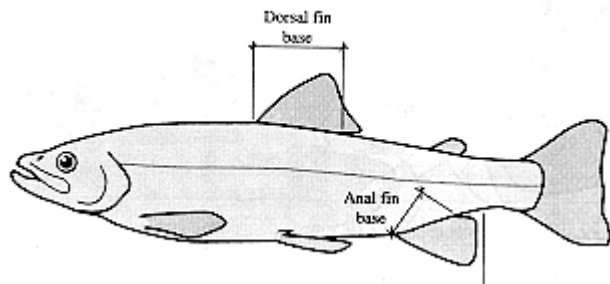
Sockeye salmon
(Kokanee)

Oncorhynchus nerka



9 (8) Adults in fresh water only as spawners; flanks in males pale, with irregular red and black blotches, females with purplish lateral stripe; abundant in the lower reaches of central coast rivers starting in mid-July and extending into September

Chum salmon
Oncorhynchus keta

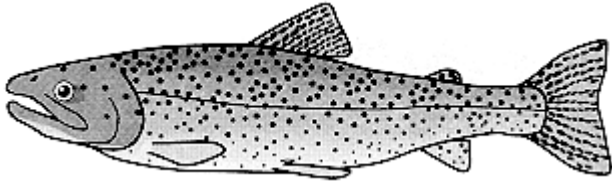


10 (1) Base of dorsal fin equal to, or longer than, anal fin base; in profile, hind margin of anal fin is vertical (no backward slant)

11

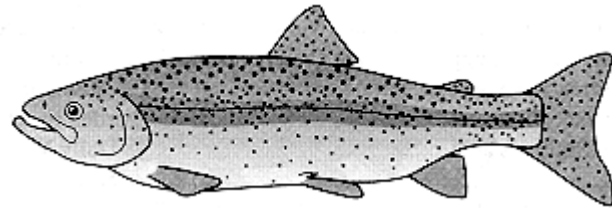
11 (14) Background colour on flanks light (silver or golden) with dark spots

12



12 (13) Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots; abundant in the lower reaches of most central coast rivers; in the Skeena cutthroat penetrate as far inland as the upper Babine river

Coastal cutthroat trout
Oncorhynchus clarki clarki

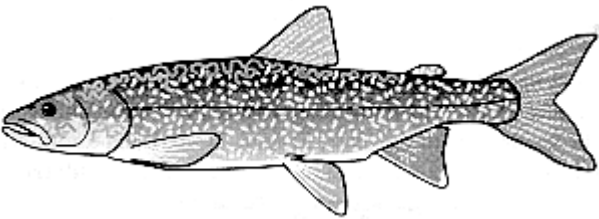


13 (12) No red or orange slash under lower jaw; except in spawning males upper jaw does not extend back beyond hind margin of eye; sides usually silver with a pink hue extending along midline; tail dusky with dark spots; resident rainbow trout are common in lakes and rivers throughout the central coast drainages; anadromous (steelhead) populations are also common, and in the Skeena penetrate to the absolute headwaters of the system

Rainbow trout
Oncorhynchus mykiss

14 (11) Background colour on sides dark with light or coloured spots

15

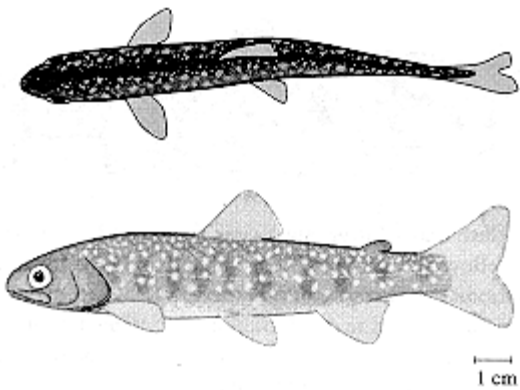


15 (16) Tail deeply forked, light coloured spots on both halves of tail; head and body covered in light irregular spots; restricted on the central coast to large lakes in the upper Skeena system

Lake trout
Salvelinus namaycush

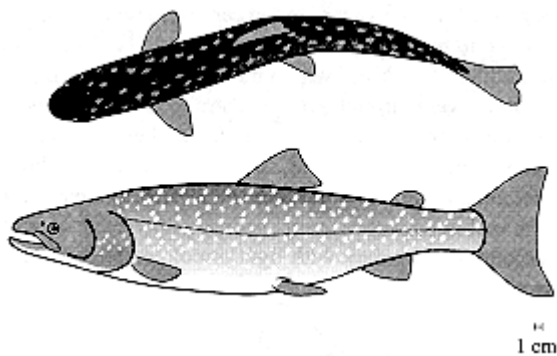
16 (15) Tail not deeply forked; usually no spots on tail, but if spots present then only on upper half of tail

17



17 (18) Viewed from the side snout is blunt; viewed from above spots on back are small and crowded together; upper jaw short (barely reaches hind margin of eye); common in the lower reaches of most central coast rivers but usually absent in their upper reaches, an exception is the Skeena system where Dolly Varden penetrate upstream as far as the Smithers area

Dolly Varden*
Salvelinus malma



18 (17) Viewed from the side snout is more pointed; viewed from above spots on back are large and well separated; upper jaw long (reaches well past hind margin of eye); present in the headwaters of the Nass, Skeena, Dean, Bella Coola, Klinaklini and Homathko rivers

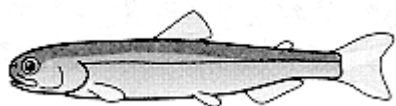
Bull trout*
Salvelinus confluentus

* These species are difficult to distinguish except where they coexist. In sympatry, Dolly Varden usually mature at less than 200 mm and typically retain parr marks into adult life; whereas, bull trout rarely mature at less than 300 mm and do not retain parr marks into adult life. On the central coast they coexist in lakes and streams in the Nass and Skeena systems. For a more reliable identification use the key in the Appendix, pages 218-219.

KEY TO YOUNG SALMONIDS (45 - 100 mm)

1 (10) Anal fin base longer than dorsal fin base; in profile, the outer margin of anal fin has a backward slant; no distinct dark spots on dorsal fin

2



2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish usually less than 50 mm long in fresh water

Pink salmon

Oncorhynchus gorbuscha

3 (2) Parr marks on flanks

4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter

5



5 (6) Adipose fin uniformly pigmented; parr marks variable but the spaces between marks usually wider than the marks themselves; anal fin sickle-shaped with a conspicuous white leading edge that contrasts sharply with dark pigment behind

Coho salmon

Oncorhynchus kisutch



6 (5) Adipose fin with a clear unpigmented "window"; spaces between parr marks usually wider than the marks themselves; anal fin not sickle-shaped, white leading edge not sharply contrasting with dark pigment behind

Chinook salmon

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye

8

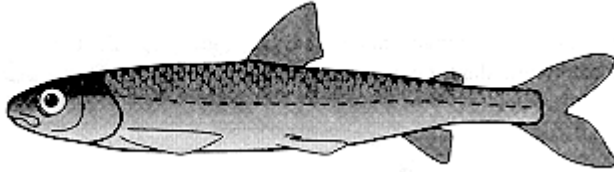


8 (9) Size in fresh water to over 100 mm; parr marks divided roughly in half by mid-line; combined width of parr marks much less than half the combined width of light areas along the side; no greenish iridescence on sides below mid-line

Sockeye salmon

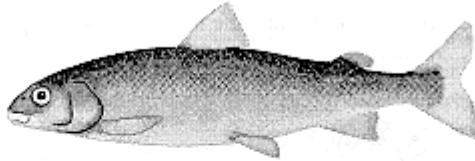
(Kokanee)

Oncorhynchus nerka

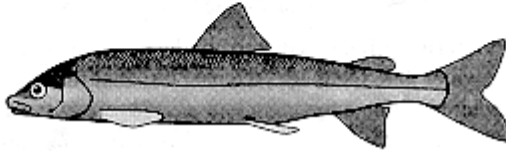


3 (4) Viewed from above, snout blunt, rounded; adipose fin small, base about equal to eye; on the central coast known only from the Skeena system

Pygmy whitefish
Prosopium coulteri



"normal"



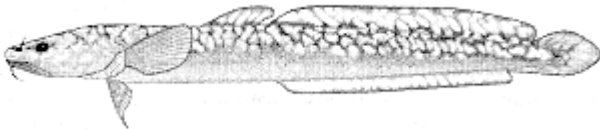
"pinocchio"

4 (3) Viewed from above, snout pointed; adipose fin large, more than 1.5 times eye diameter; Nass, Skeena, Dean, Bella Coola, Klimaklini and Homoathko systems

Mountain whitefish*
Prosopium williamsoni

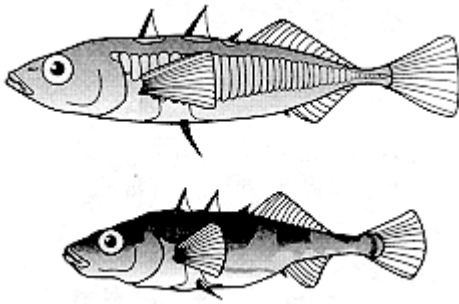
* Fluvial populations often contain two body forms: normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

CODS **FAMILY GADIDAE**



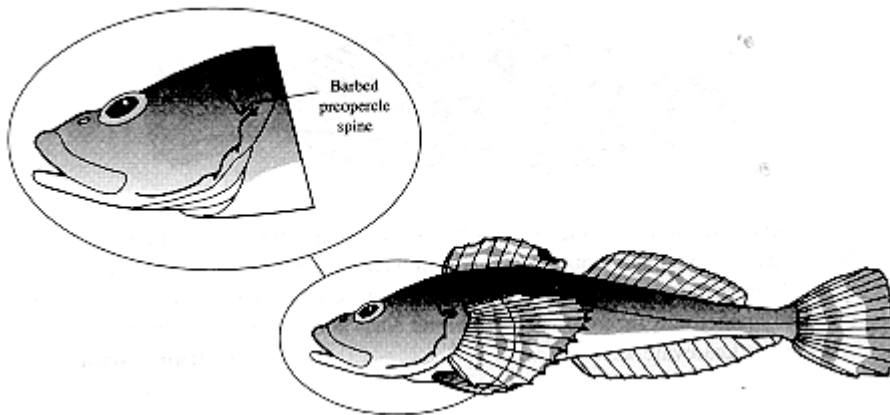
On the central coast, the burbot (*Lota lota*) occurs in lakes in the Nass and Skeena systems.

STICKLEBACKS
FAMILY GASTEROSTEIDAE



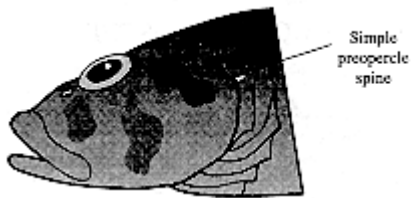
The threespine stickleback is abundant in estuaries, the lower reaches of streams and in lowland lakes throughout the central coast. Usually, it does not penetrate more than 100 km inland. On the central coast the threespine stickleback (*Gasterosteus aculeatus*) occurs in two genetically different life-history forms: a migratory form that lives most of its life in the sea but ascends fresh water in the spring to spawn, and a form that is a permanent resident of freshwater.

SCULPINS
FAMILY COTTIDAE



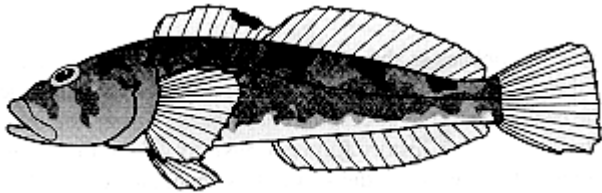
1 (2) Underside dead white; spine on preopercle with obvious hooks; pectoral fins with alternating yellow and dark bands of approximately equal width; only in estuaries or areas under tidal influence

Pacific staghorn sculpin
Leptocottus armatus



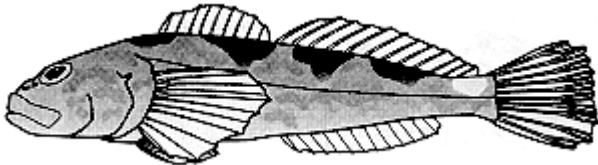
2 (1) Underside light or dusky but not dead white; spine on preopercle simple; pectoral fins speckled without broad dark bands; rivers, streams, lakes and estuaries

3



3 (4) First dorsal fin with a conspicuous black spot; anal fin base distinctly longer than head length; common along the entire central coast; in streams, typically in quiet water; common in lakes and estuaries; in the Skeena the prickly sculpin penetrates to the headwaters of the system

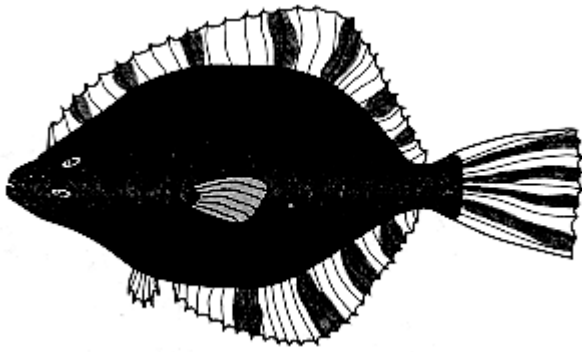
Prickly sculpin
Cottus asper



4 (3) First dorsal fin without a conspicuous black spot; anal fin base about equal to head length; usually a conspicuous light mark on back just in front of caudal fin; adults typically in riffles, although occasionally in lakes; common along the central coast but rarely penetrates far inland except in the Nass and Skeena systems where it reaches the headwaters

Coastrange sculpin
Cottus aleuticus

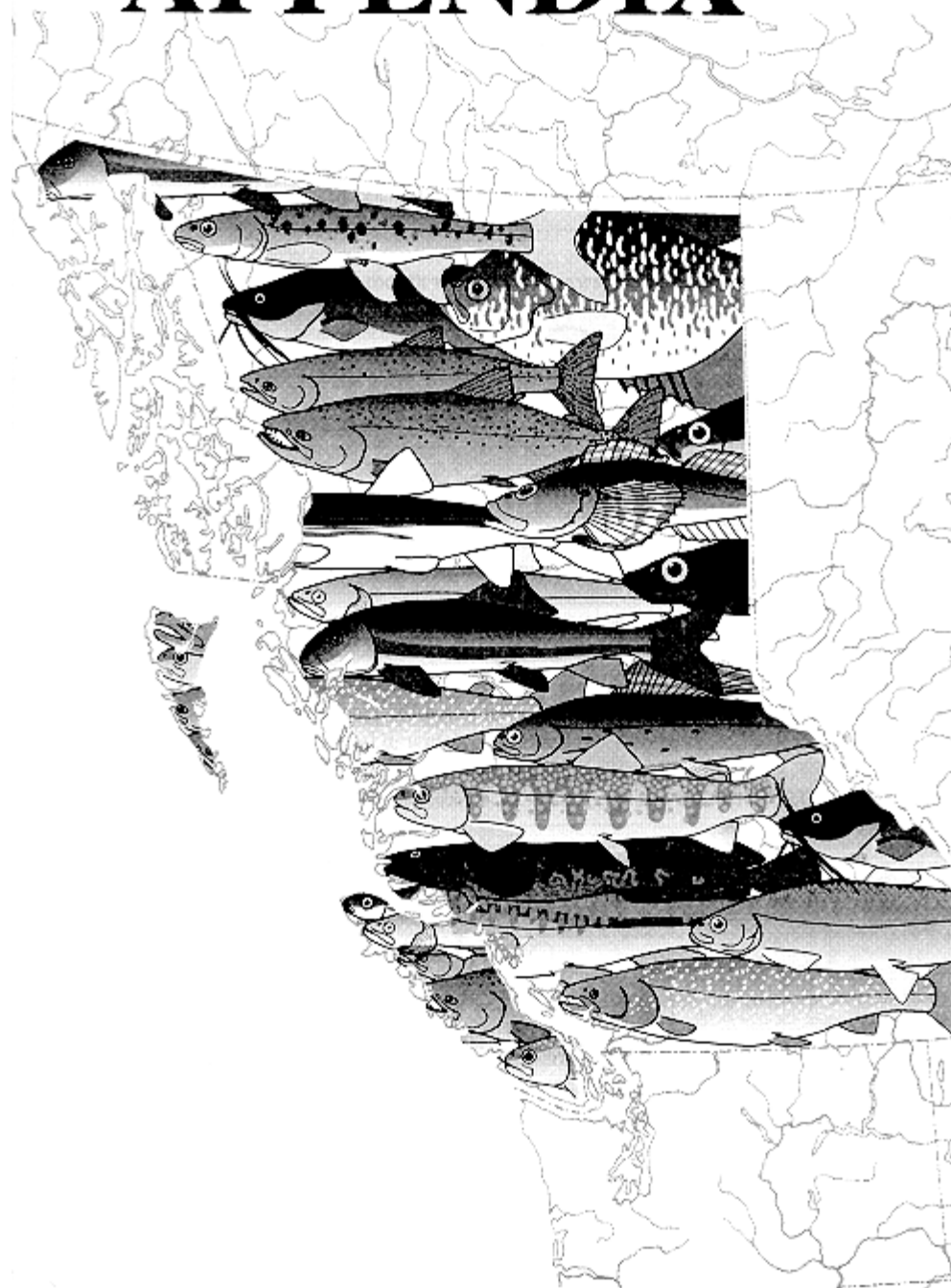
FLOUNDERS
FAMILY PLEURONECTIDAE



The starry flounder (*Platichthys stellatus*) is common in estuaries along the central coast, but rarely penetrates rivers much above tide-waters.

APPENDIX

APPENDIX



Key for use on Preserved Specimens
(Includes all families and species known from BC freshwaters)

Key to Families

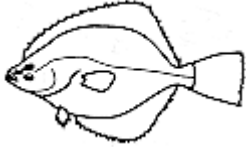


1 (2) Paired fins absent (no pectoral or pelvic fins); mouth in the form of a sucking disk; seven external gill openings

Lampreys
(PETROMYZONTIDAE)

2 (1) Paired fins present; mouth with normal jaws; a single external gill slit

3



3 (4) Body flat; eyes on same side of head

Flounders
(PLEURONECTIDAE)

4 (3) Body normal; eyes normal, one on each side of head

5



5 (6) Tail heterocercal (upper lobe much longer than lower lobe); scales in the form of bony scutes arranged in widely separated rows on back and sides

Sturgeons
(ACIPENSERIDAE)

6 (7) Tail no heterocercal; scales either normal or absent

7

7 (18) Adipose fin present

8



8 (9) Body without scales; 4 pairs of long barbels around mouth

Catfish
(ICTALURIDAE)

9 (8) Body with scales; no barbels around mouth

10

Key to Families



10 (11) Tips of pectoral fins extend well past origin of pelvic fins

Trout-perches
(PERCOPSIDAE)

11 (10) Tips of pectoral fins do not reach origin of pelvic fins

12

12 (17) Axillary process (small, fleshy spear-like tab at base of pelvic fin) present

13



13 (14) Dorsal fin base large, dorsal origin in front of posterior tips of pectoral fins

Graylings
(SALMONIDAE; SUBFAMILY THYMALLINAE)

14 (13) Dorsal fin base small, dorsal origin is well behind posterior tips of pectoral fins

15



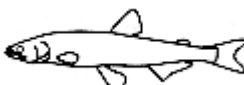
15 (16) Scales small, difficult to count with nakedeye; well developed teeth in jaws.

Salmon, Trout, Chars
(SALMONIDAE; SUBFAMILY SALMONINAE)



16 (15) Scales large, could be counted with naked eye; teeth in jaws absent or very weakly developed

Whitefish
(SALMONIDAE; SUBFAMILY COREGONINAE)



17 (12) No axillary process at base of pelvic fins

Smelts
(OSMERIDAE)

18 (7) Adipose fin absent

19

Key to Families



19 (20) Separate spines (usually 3 or more) in front of soft dorsal fin

Sticklebacks
(GASTEROSTEIDAE)

20 (19) Spines in dorsal fin not separate but interconnected by a continuous membrane

21

21 (26) Two or more spines (may be soft spines) clearly visible in dorsal fin

22

22 (25) Body covered with ctenoid (rough to the touch) scales; 2 or more spines in anal fin; dorsal spines strong, sharp to the touch.

23



23 (24) Two dorsal fins (spinous and soft dorsals separated at their base)

Perches
(PERCIDAE)



24 (23) One dorsal fin (it may be indented); anal fin with 3 to 9 spines

Sunfish, Bass
(CENTRARCHIDAE)



25 (22) Body without scales (small prickles may be present); no spines in anal fin; dorsal spines weak, soft to the touch

Sculpins
(COTTIDAE)

26 (21) No spines in dorsal fin (except for 1 in the carp)

27

Key to Families



27 (28) Scales on the belly in the form of a sharp saw-like keel

Herrings, Shad
(CLUPEIDAE)

28 (27) Scales on belly normal (no saw-like keel)

27



29 (30) anal fin base more than twice as long as dorsal fin base

Goldeye
(HIODONTIDAE)

30 (29) Anal fin base less than twice as long as dorsal fin base

31

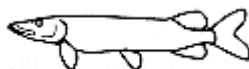
31 (32) Teeth in jaws

34



32 (33) Dorsal and anal fin bases long (at least half the length of the body); single barbel at tip of chin

Cods
(GADIDAE)

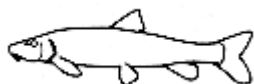


33 (32) Dorsal and anal fin bases short (much less than half the body length); snout shaped like a duck's bill

Pike
(ESOCIDAE)

34 (31) No teeth in jaws

35



35 (36) Mouth turned down; lips thick, covered with tiny papillae; distance from snout to anus over 2.5 times distance from anus to caudal fin base

Suckers
(CATOSTOMIDAE)

Key to Families



36 (35) Mouth usually not turned down; lips thin, without tiny papillae; distance from snout to anus less than 2.5 time distance from anus to caudal fin base

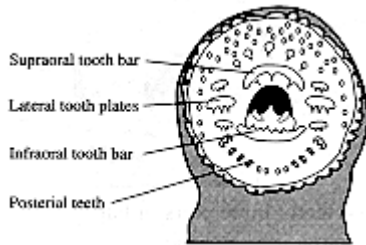
Minnows
(CYPRINIDAE)

LAMPREYS FAMILY PETROMYZONTIDAE



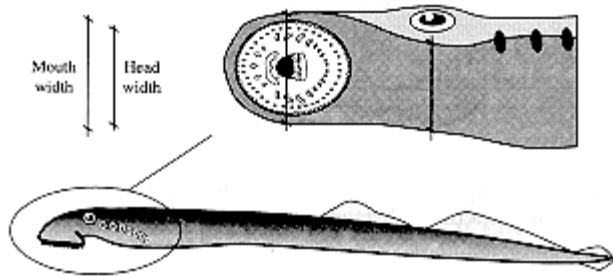
1 (8) Mouth forms a sucking disk; teeth present; eyes present

adult or transforming lampreys
2



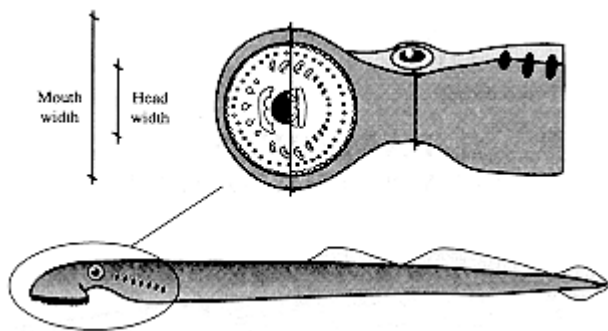
2 (5) Supraoral tooth bar with three teeth; four pairs of lateral tooth plates; semicircular row of small teeth below infraoral tooth bar; length up to 500 mm

3



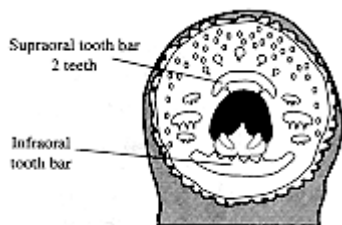
3(4) Diameter of mouth not noticeably wider than head or body; usually anadromous

Pacific lamprey
Lampetra tridentata



4 (3) Diameter of mouth noticeably wider than head; a parasitic, freshwater lamprey known only from Cowichan and Mesachie lakes on Vancouver Island

Cowichan lamprey
Lampetra macrostoma



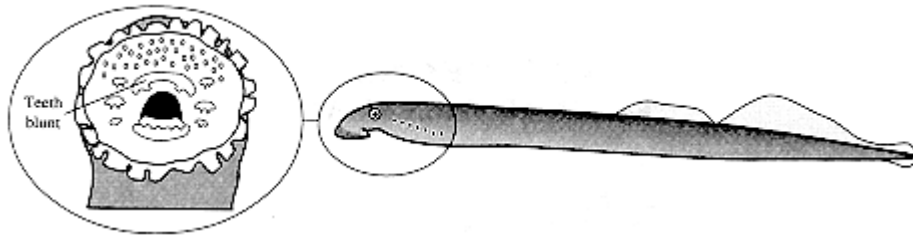
5 (2) Supraoral tooth bar with two teeth; three pairs of lateral tooth plates; no semi-circular row of small teeth below infraoral tooth bar

6



6 (7) Teeth sharp and well developed; center pair of lateral teeth with three points; parasitic and anadromous

River lamprey
Lampetra ayresi



7 (6) Teeth blunt, poorly developed; center pair of lateral teeth with only two points; non-parasitic, permanent resident in fresh water

Western brook lamprey

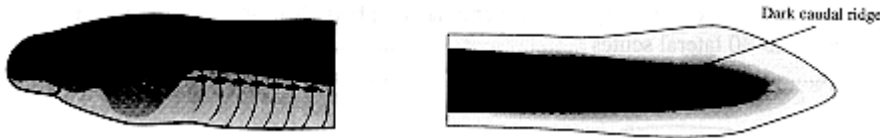
Lampetra richardsoni

8 (1) Eyes poorly developed; teeth absent; mouth not modified into a sucking disk...untransformed lampreys (ammocoetes)*

9

9 (12) Extensive dark pigment on head and body; area surrounding precursor of tongue has moderate to heavy dark pigmentation

10



10 (11) Uniform dark pigmentation on caudal ridge of tail

Western brook lamprey

Lampetra richardsoni



11 (10) Caudal ridge of tail lightly pigmented, pigment not uniformly distributed across caudal ridge

Lampetra tridentata or *Lampetra macrostoma***



12 (9) Head (prebranchial, branchial and suborbital regions) lightly pigmented; a conspicuous thin dark streak radiating anteriorly and posteriorly from eye spot area surrounding precursor of tongue structure unpigmented

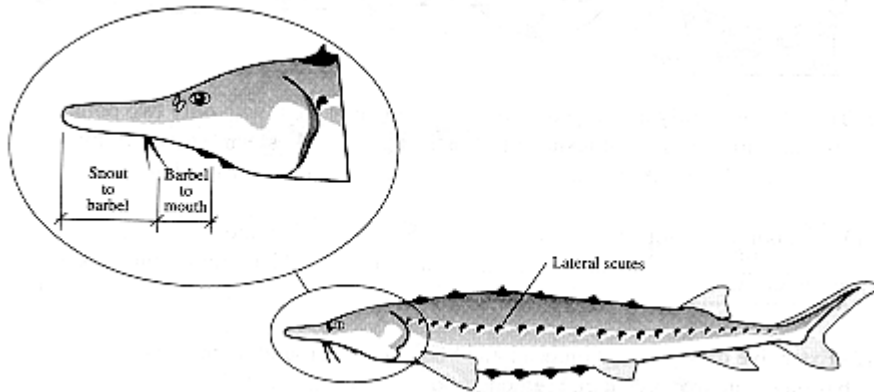
River lamprey

Lampetra ayresi

* Ammocoete key from Richards et al., 1982.

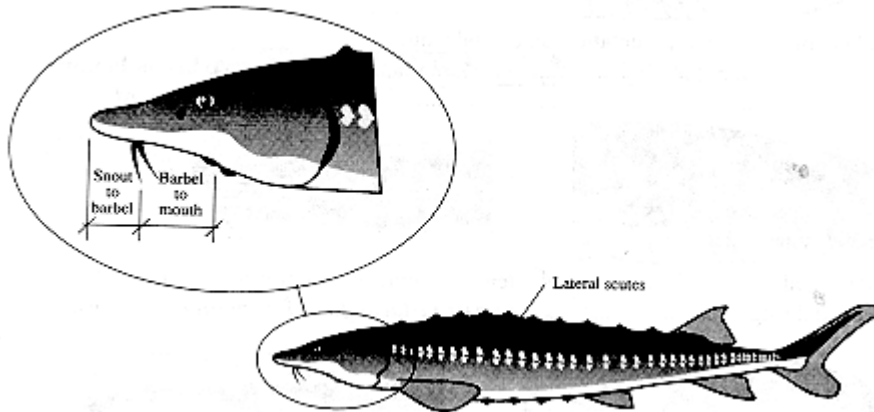
** Apparently no reliable characters have been found that distinguish ammocoetes of *L. tridentata* and *L. macrostoma*

STURGEONS
FAMILY ACIPENSERIDAE



1 (2) Back green; snout usually elongate and narrow; barbels nearer to mouth than tip of snout; 23-30 lateral scutes

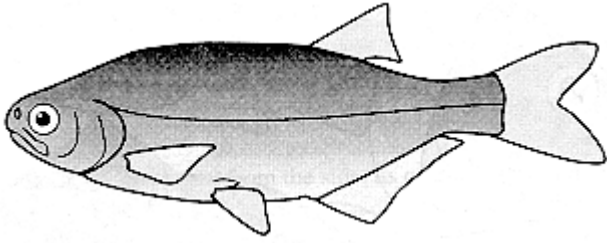
Green sturgeon
Acipenser medirostris



2 (1) Back dark grey to black; snout short and broad (except in individuals less than 250 mm. In length; barbels nearer to tip of snout than to mouth; 38-48 lateral scutes

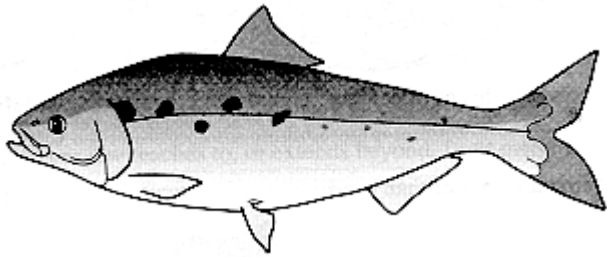
White sturgeon
Acipenser transmontanus

GOLDEYES
FAMILY HIODONTIDAE



Goldeye
Hiodon alosoides

HERRINGS
FAMILY CLUPEIDAE

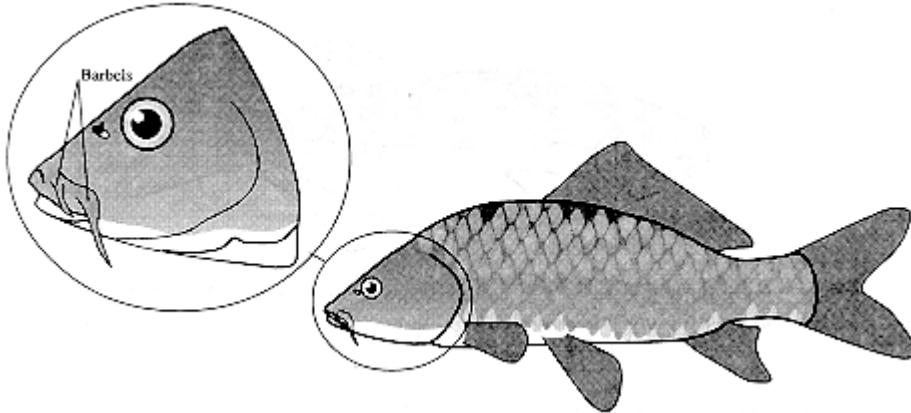


American shad
Alosa sapidissima

MINNOWS
FAMILY CYRINIDAE

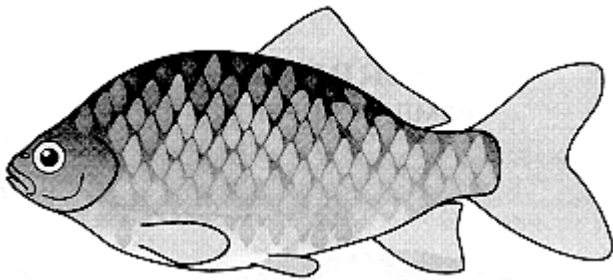
1 (4) Dorsal fin base much longer than head

2



2 (3) Two pairs of barbels on sides of upper jaw

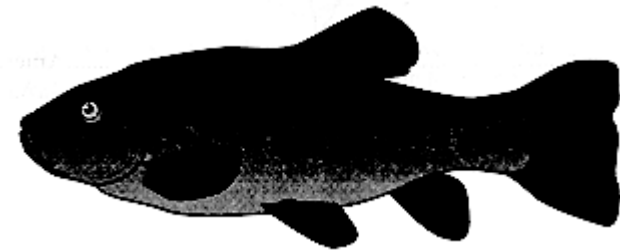
Carp
Cyrinus carpio



3 (2) No barbels on sides of upper jaw

Goldfish
Carassius auratus

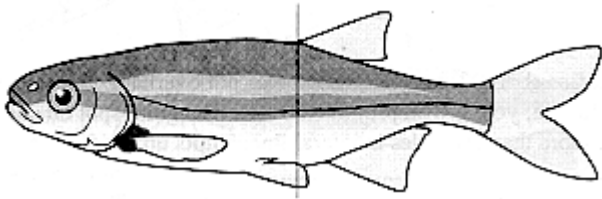
4 (1) Dorsal fin base shorter than head



5 (6) Caudal peduncle deep, its depth more than half head length; all fins dark; 93-107 scales in lateral line

Tench
Tinca tinca

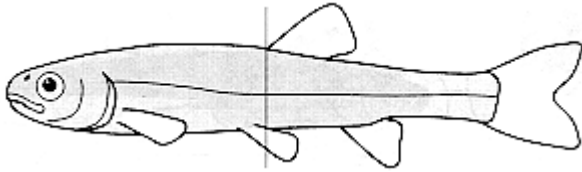
6 (5) Caudal penduncle slender, its depth less than half a head length; not all fins dark fewer than 90 scales in lateral line



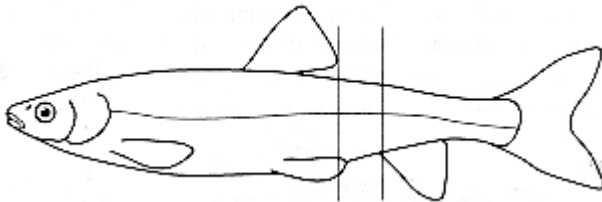
7 (6) Dorsal fin far back on body; viewed from the side, its origin is almost directly above tips of pelvic fins

Redside shiner

Richardsonius balteatus

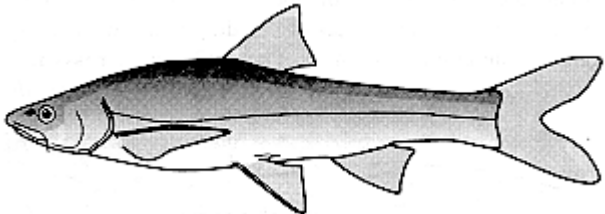


8 (7) Dorsal fin starts at mid-body; viewed from the side, tips of pelvic fins extend well past origin of dorsal fin



9 (16) Viewed from the side, hind margin of dorsal fin does not overlap anal fin

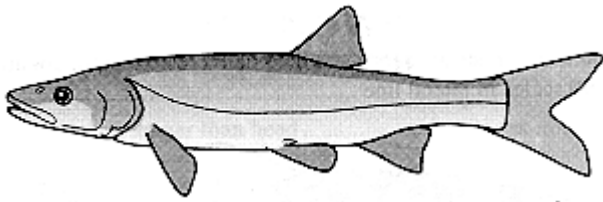
10 (13) Mouth large, upper jaw reaches to, or extends beyond, front margin of eye



11 (12) Outer pectoral rays long, equal to head length and nearly reaching pelvic fins; top of head flat; snout overhangs mouth; prominent barbels at corner of mouth fewer than 60 scales in lateral line

Flathead chub

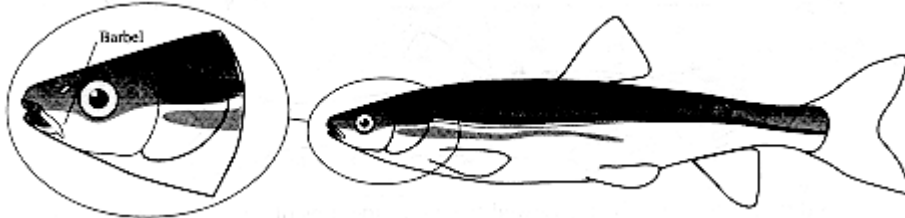
Platygobio gracilis



12 (11) Pectoral fins shorter than head; snout does not overhang mouth; no barbels at corner of mouth; young with prominent black triangular spot on each end of caudal peduncle; more than 60 scales in lateral line; adults up to 450 mm

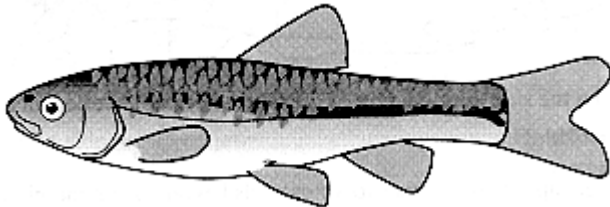
Northern squawfish
Ptychocheilus oregonensis

13 (10) Mouth small, upper jaw does not reach eye



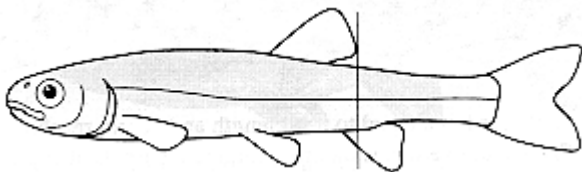
14 (15) A small barbel at the corners of mouth; mouth almost terminal; two dark horizontal stripes on the side of body; breeding adults with red lips and fin axils; more than 60 scales in lateral line; length greater than 250 mm

Peamouth
Mylocheilus caurinus



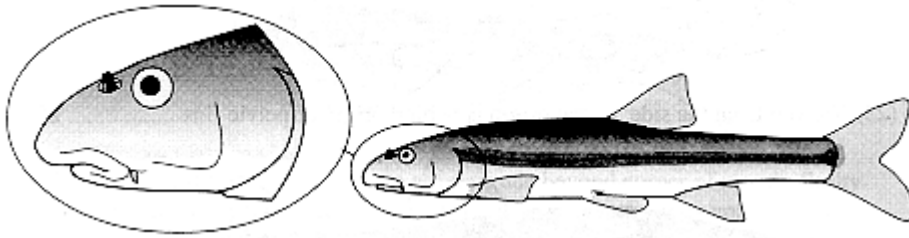
15 (14) No barbels at corner of mouth; snout overhangs mouth; no continuous horizontal bands, although there may be an indistinct dark band running from back of dorsal fin to the beginning of the tail; flanks of breeding males with brassy cast; fewer than 45 scales in lateral line; length less than 200 mm

Brassy minnow
Hybognathus hankinsoni



16 (9) Viewd from the side, hind margin of dorsal fin clearly overlaps anal fin

17 (20) Snout directly attached to upper lip, no groove separating snout from upper lip; upper jaw not protractile

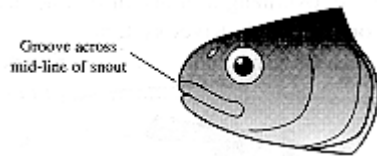


18 (19) Lateral line scales 58-70 (usually more than 60)

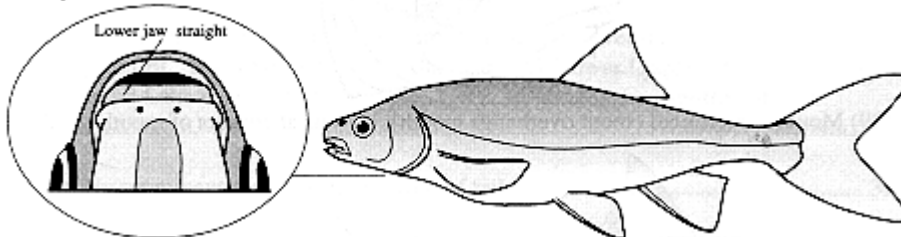
Longnose dace
Rhinichthys cataractae

19 (20) Lateral line scales (usually fewer than 58)

Nooksack dace
Rhinichthys Sp.



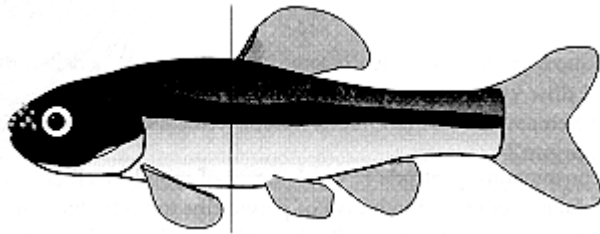
20 (17) Snout separate from upper lip by a groove across mid-line of snout; upper jaw protractile



21 (22) Lower jaw chisel-like, nearly straight in adults; 9-10 anal rays

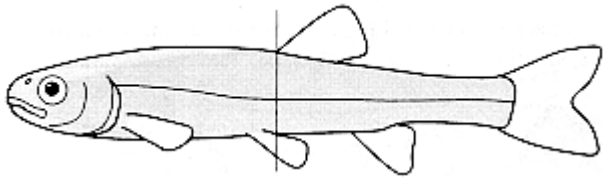
Chiselmouth
Acrocheilus alutaceus

22 (21) Lower jaw normal; 7 or 8 anal rays

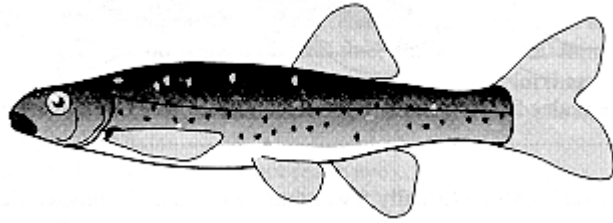


23 (24) Viewed from the side, dorsal origin is directly above, or slightly in front of origin of pelvic fins

Fathead minnow
Pimephales promelas

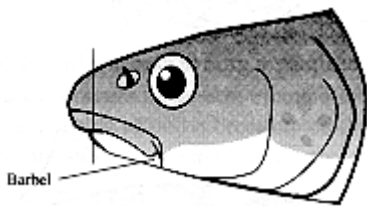


24 (23) Viewed from the side, dorsal origin is behind origin of pelvic fins

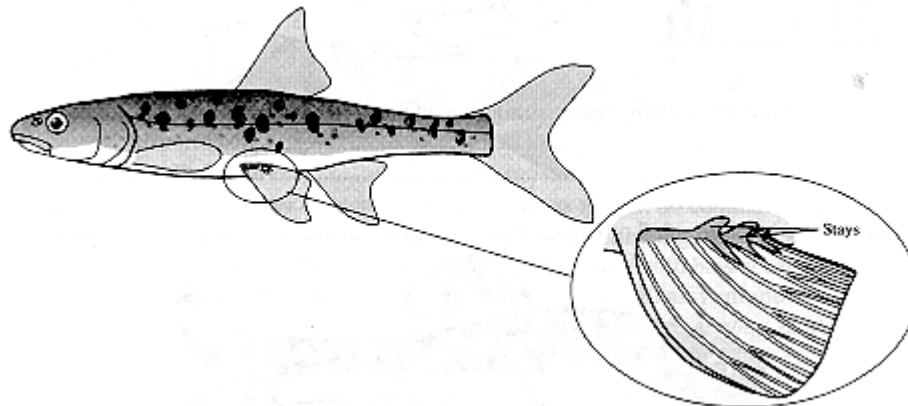


25 (26) Mouth terminal (snout does not overhang mouth); in BC, no barbels at corner of mouth; in BC, known only from the Kettle River system

Speckled dace
Rhinichthys osculus

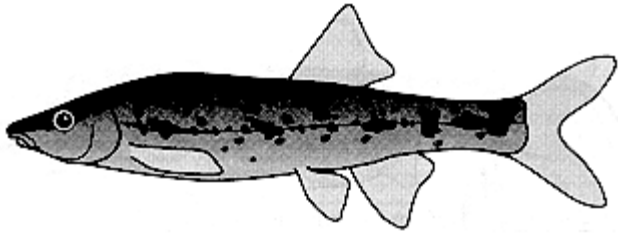


26 (29) Mouth subterminal (snout overhangs mouth); barbels at corner of mouth



27 (28) Barbels conspicuous, protrude beyond corner of mouth; well developed fleshy membranes (stays) connect inner rays of pelvic fins to body; base of pelvic fin longer than free portion of last ray; flanks with conspicuous irregular dark blotches; caudal peduncle depth only slightly wider than interorbital width; lateral line scales usually less than 60

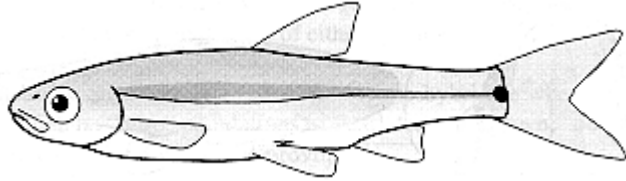
Leopard dace
Rhinichthys falcatus



28 (27) Barbels inconspicuous, they do not protrude beyond corner of mouth; fleshy membranes (stays) connecting inner rays of pelvic fins to body are not well developed; caudal peduncle depth conspicuously wider than interorbital width; lateral line scales usually more than 60

Umatilla dace
Rhinichthys umatilla

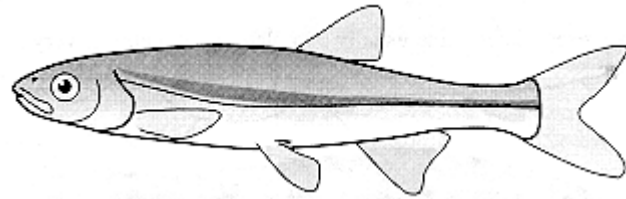
29 (26) Mouth terminal or supraterrminal, snout does not overhang lower jaw



30 (31) Prominent black spot directly in front of tail fin; silver mid-lateral band; 7-8 anal rays; in BC, known only from Maxhamish Lake (lower Liard) but introduced into Charlie Lake near Fort St. John

Spottail shiner
Notropis hudsonius

31 (30) No prominent spot diorectly in front of tail

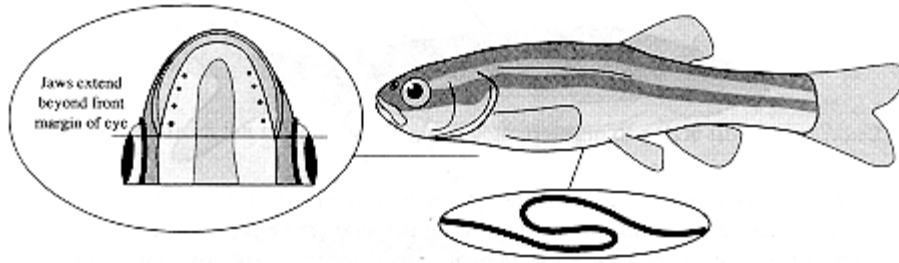


32 (33) Body yellowish silver with a prominent silver band running from back of gill cover along the sides to start of tail fin; anal fin long, usually with 11 rays (10-12); in BC, known only from a small stream about 3 km downstream of Old Fort Nelson

Emerald shiner
Notropis atherinoides

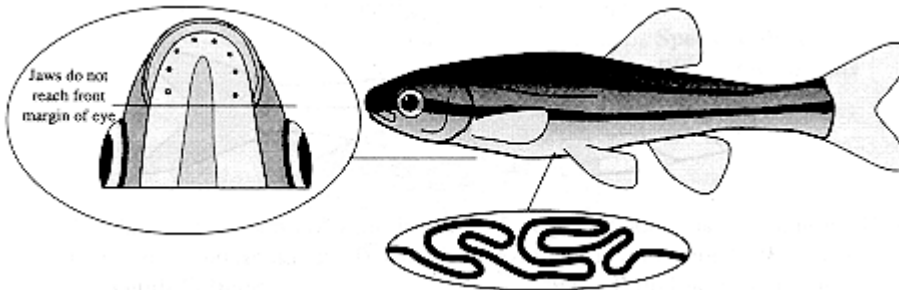
33 (32) No silver band on sides of body; anal fin short, usually with 8 rays (7-9)

34 (37) Barbels absent; lateral line incomplete; peritineum black



35 (36) Viewd from below, jaws extend beyond front margin of eye; single dark lateral stripe; intestine with a single loop

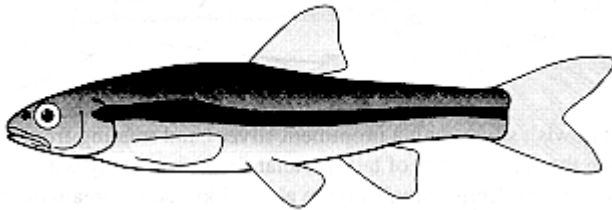
Finescale dace
*Phoxinus neogaeus**



36 (35) Viewd from below, jaws do not reach front margin of eye; two dark lateral stripes (one often indistinct); intestine with several loops

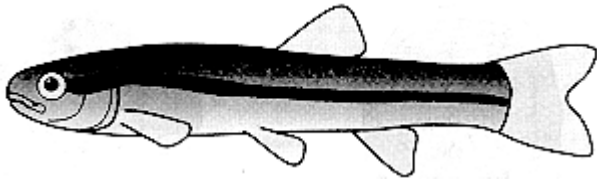
Northern redbelly dace
*Phoxinus eos**

37 (34) Barbels present; lateral line usually complete; peritoneum silvery



38 (39) Conical barbels usually visible at the posterior corner of the mouth (occasionally missing from one or both sides); snout moderately pointed; usually fewer than 70 lateral line scales

Lake chub
Couesius plumbeus



39 (38) Flap-like barbel slightly in front of corner of mouth rarely visible to naked eye (occasionally missing from one or both sides); snout blunt; usually more than 70 lateral line scales

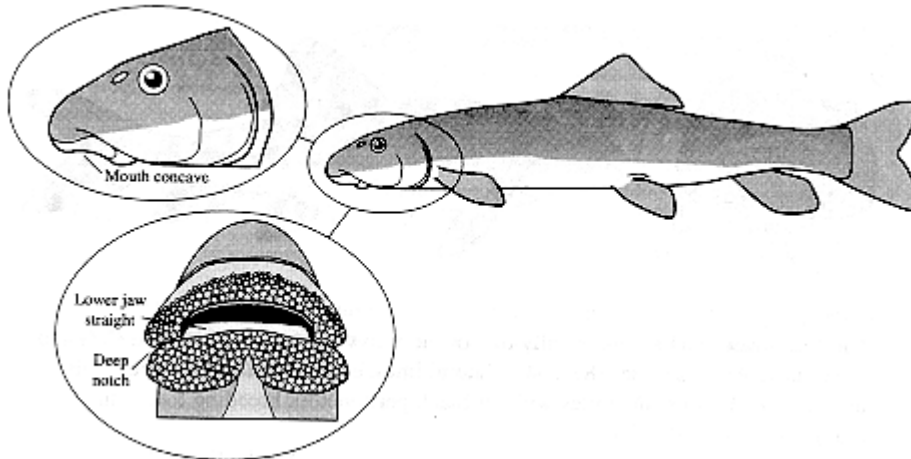
Peal dace

*Margariscus margarita***

* Positive identification of *Phoxinus* is difficult in British Columbia. In BC, the two species hybridize extensively where they co-exist, and no "pure" population of *Phoxinus eos* is known; however, *Phoxinus neogaeus* often occurs without *Phoxinus eos*. Unfortunately, *Phoxinus neogaeus* also hybridizes with *Margariscus margarita* and again, it is not clear if there are any "pure" populations of either species in BC.

** *Couesius plubeus* and *Margariscus margarita* also hybridize wherever they coexist in BC and, although no "pure" populations of Pearl dace are known, "pure" populations of lake chub are widespread within the province.

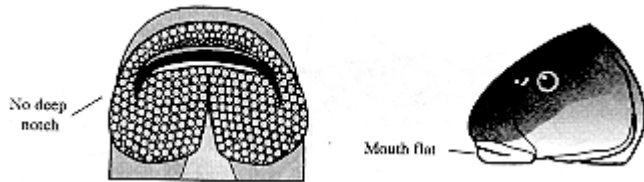
SUCKERS **FAMILY CATOSTOMIDAE***



1 (2) Deep notch between upper and lower lips at corners of mouth; viewed from below lower jaw is almost straight; viewed from the side, the mouth is slightly concave; a small species (usually less than 250 mm)

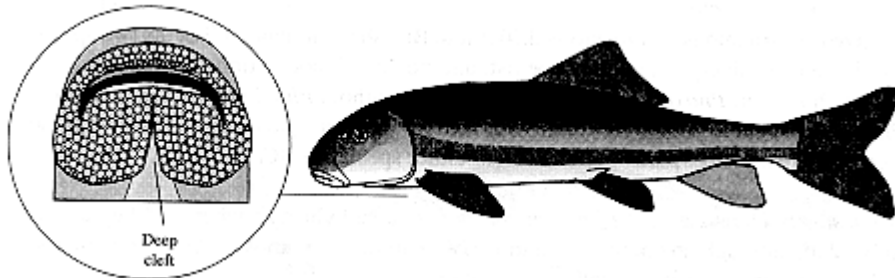
Mountain sucker

Catostomus platyrhynchus



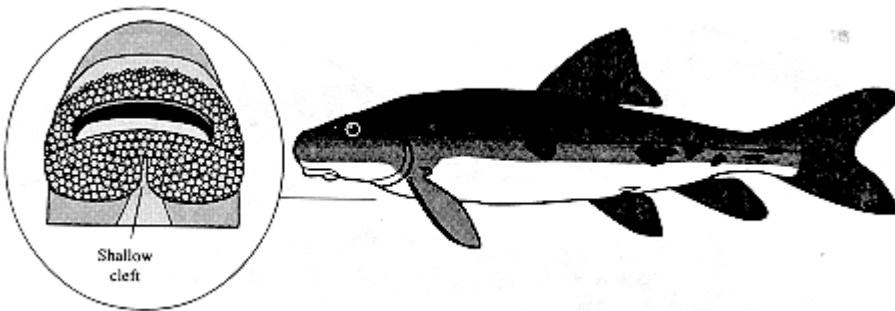
2 (1) No deep notches between upper and lower lips at outer corners of mouth; viewed from below, lower jaw is curved' viewed from the side, the mouth is flat

3 (6) Caudal peduncle narrow, its least depth half, or less than half, dorsal fin base



4 (5) Cleft in lower lip deep, usually no papillae between cleft and lower jaw; scales large (62-83 in lateral line), on adults even those near the head are clearly visible to naked eye; juveniles with light coloured peritoneum; breeding fish with a dark stripe

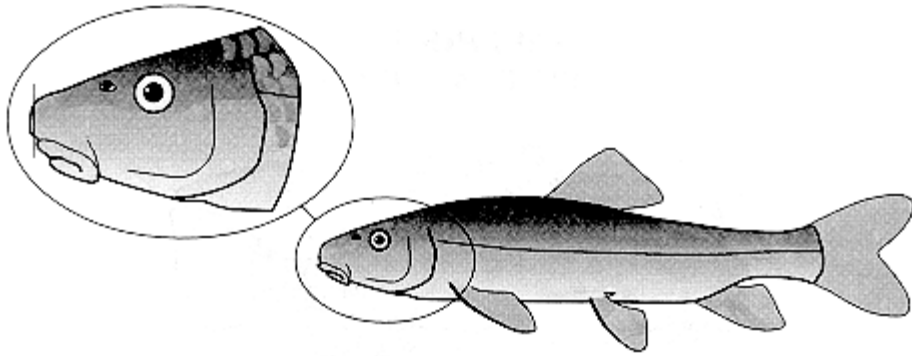
Largescale sucker
Catostomus macrocheilus



5 (4) Cleft in lower lip shallow, usually two or more rows of papillae between cleft and lower jaw; scales smaller (87-104 in lateral line), even on adults those near the head are hard to see; juveniles with jet black peritoneum; breeding fish with orangish-red lateral stripe

Bridgelip sucker
Catostomus columbianus

6 (3) Caudal peduncle deep, its least depth much more than half dorsal fin base

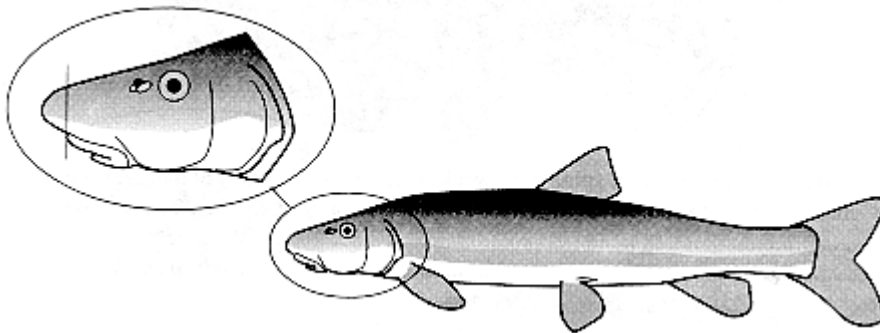


7 (8) Scales large (those behind the head clearly visible to naked eye); 60 -74 scales along lateral line, 9-11 diagonal rows of scales from front of dorsal fin to lateral line; snout short and blunt; mouth not strongly subterminal (snout barely overhangs mouth); breeding fish with a bronze cast

White sucker

Catostomus commersoni

8 (7) Scales small (those behind head are crowded, barely visible to naked eye); 90-120 scales along the lateral line, 16-21 diagonal rows of scales from front of dorsal fin to lateral line



9 (10) Snout long and pointed; mouth strongly subterminal (snout clearly overhangs mouth); mouth large, length of mouth usually much greater than eye diameter; usually more than 100 scales in lateral line

Longnose sucker

Catostomus catostomus

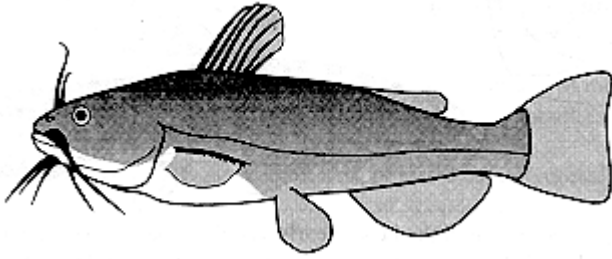
10 (9) Snout short and blunt; mouth not strongly subterminal (snout barely overhangs mouth); mouth extremely small, length of mouth usually about equal to eye; unusually fewer than 100 scales in lateral line

Salish sucker

Catostomomus sp.

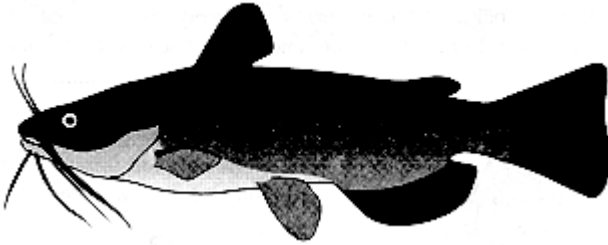
* Where they coexist in disturbed environments, sucker species often hybridize; this can make identification difficult.

CATFISH
FAMILY ICTALURIDAE



1 (2) Hind margin of pectoral spine with strong hooks near the tip; membranes between dorsal rays dusky; usually more than 21 anal rays

Brown catfish
Ameiurus nebulosus



2 (1) Hind margin of pectoral spine with weak (often almost absent) hooks near the tip; membranes between dorsal rays usually black; usually fewer than 21 anal rays

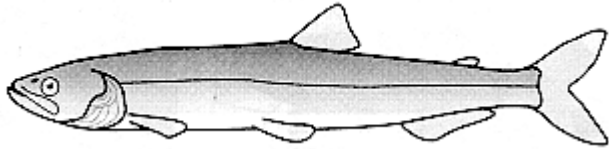
Black catfish
Ameiurus melas

PIKES
FAMILY ESOCIDAE



Northern pike
Esox lucius

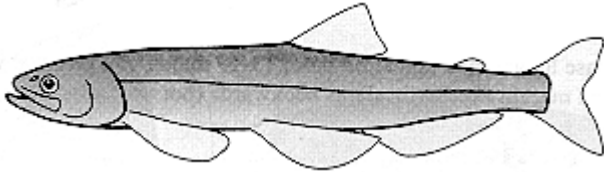
SMELTS
FAMILY OSMERIDAE



1 (2) Concentric marks on operculum; more than 70 scales in lateral line

Eulachon
Thaleichthys pacificus

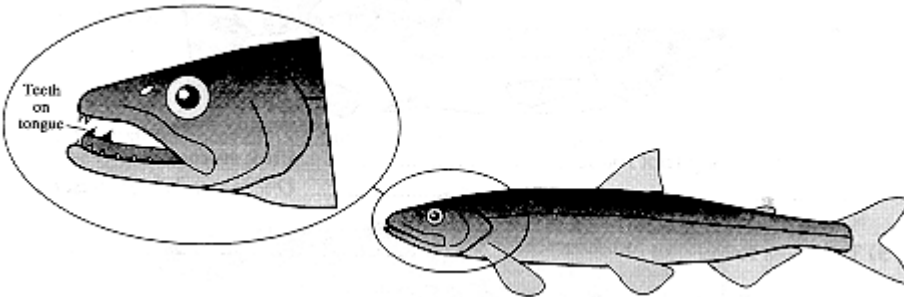
2 (1) No concentric marks on operculum; usually fewer than 70 scales in lateral line



3 (4) Pectoral and anal fins longer than head

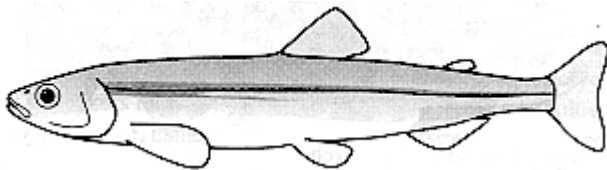
Longfin smelt
Spirinchus thaleichthys

4 (3) Pectoral and anal fins shorter than head



5 (6) One or two prominent curved canine teeth on tongue; lower jaw extends back to hind margin of eye

Rainbow smelt
Osmerus dentex

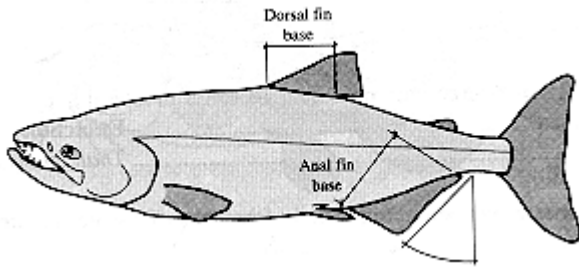


6 (5) No prominent teeth on tongue lower jaw does not extend back to hind margin of eye

Surf smelt
Hypomesus pretiosus

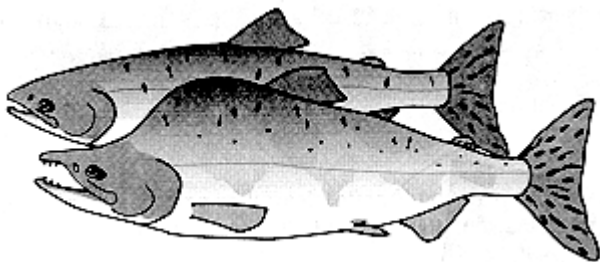
SALMON, TROUT AND CHARS
FAMILY SALMONIDAE
SUBFAMILY SALMONINAE

Key to Adults



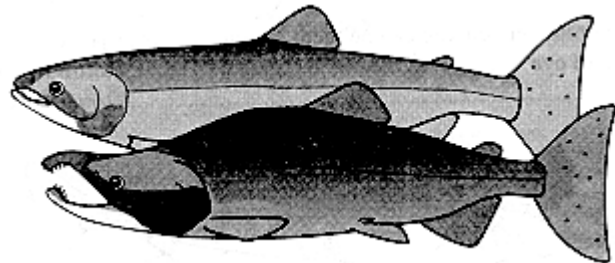
1 (12) Adipose fin base longer than dorsal fin base; 13-19 major anal fin rays; viewed from the side, hind margin of anal fin slants backwards (not vertical)

2 (9) Distinct spots on tail



3 (4) Tail spot oblong (not round)

4 (3) Tail spots round (not oblong)



5 (6) Gill rakers long, 29-44 on first gill arch

Pink salmon

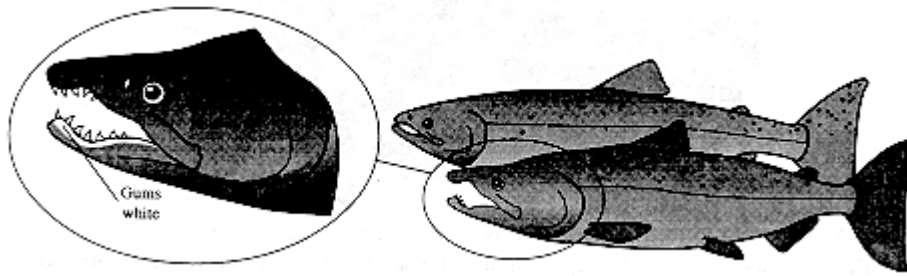
Oncorhynchus gorbuscha

Sockeye salmon

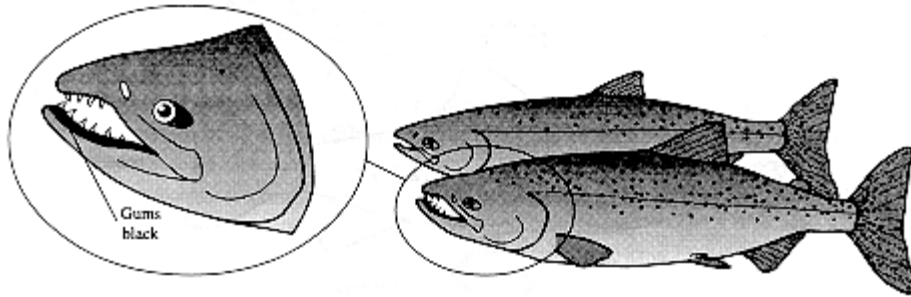
(Kokanee)

Oncorhynchus nerka

6 (5) Gill rakers relatively short, 16-26 on first gill arch

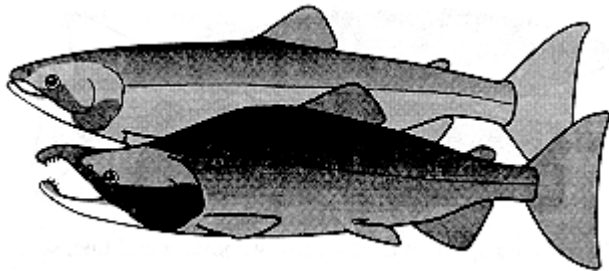


7 (8) Upper half of tail spotted; gums at base of teeth in lower jaw white



8 (7) Tail spotted on both upper and lower lobes; gums at base of lower jaw black

9 (2) No distinct spots on tail, but occasionally fine speckles

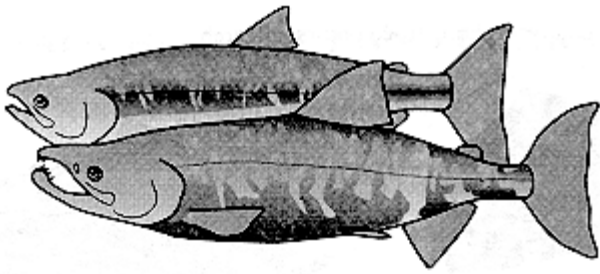


10 (11) Adults occur in fresh waters both as migratory spawners (sockeye) and residents (kokanee); gill rakers numerous (29-44); flanks are uniformly colored (silver in non-breeding kokanee, usually red in breeding sockeye and kokanee)

Coho salmon
Oncorhynchus kisutch

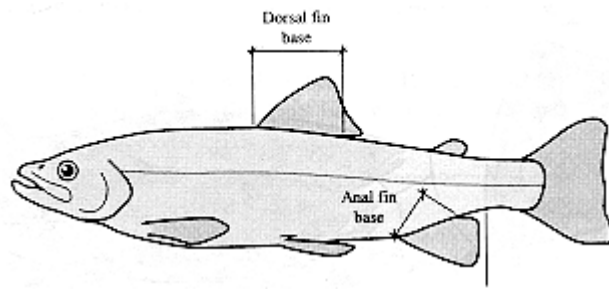
Chinook salmon
Oncorhynchus tshawytscha

Sockeye salmon
(Kokanee)
Oncorhynchus nerka



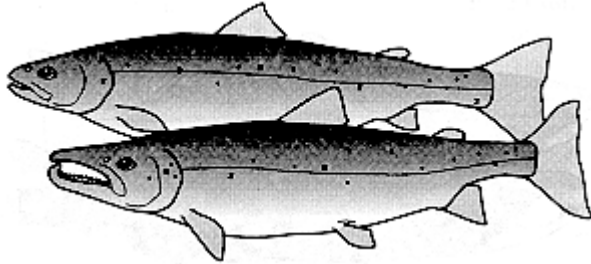
11 (10) Adults occur in fresh waters only as spawners; gill rakers less numerous (19-26); flanks in males pale with irregular red and black blotches, females with a purplish lateral strip

Chum salmon
Oncorhynchus keta



12 (1) Dorsal fin base equal to, or longer than, anal fin base; 8-12 major anal rays; viewed from the side, hind margin of anal fin is vertical (no backward slant)

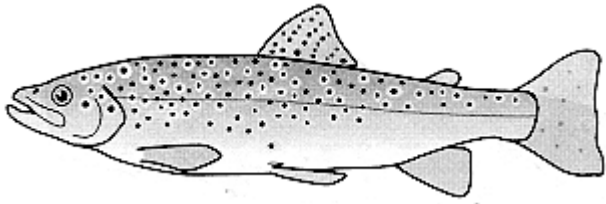
13 (19) Background colour on sides light (silver or golden) with dark spots



14 (15) Relatively few dark spots on flanks, mostly above lateral line, some spots X-shaped; spots on operculum common in returning adults; anal fin whitish; caudal fin usually without spots; spawning males with conspicuously hooked lower jaw

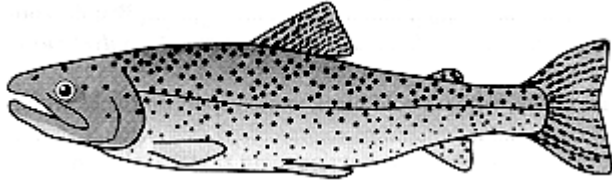
Atlantic salmon
Salmo salar

15 (16) Spots on back and sides more numerous; none X-shaped; caudal fin usually heavily spotted



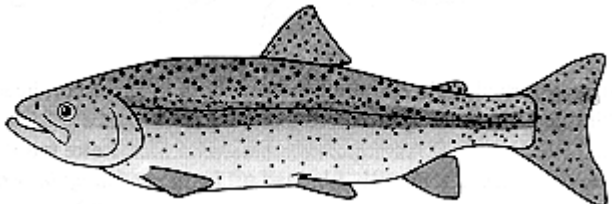
16 (17) Spots on sides mostly black but some red or orange; dark spots on sides usually surrounded by light haloes

Brown trout
Salmo trutta



17 (18) Red or orange slash under lower jaw; mouth large, upper jaw extends back past hind margin of eye;; tail yellowish with black spots; basibranchial teeth usually present

Cutthroat trout*
Oncorhynchus clarki clarki



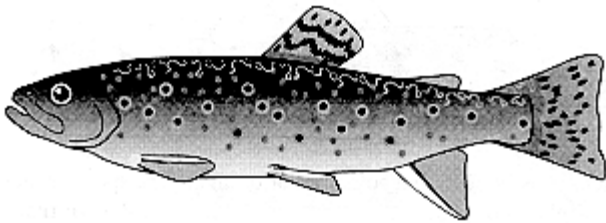
18 (17) No red or orange slash under lower jaw; mouth not large, upper jaw usually does not extend beyond hind margin of eye; tail dusky with dark spots; no basibranchial teeth

Rainbow trout**
Oncorhynchus mykiss

19 (13) Background colour on sides dark with light or coloured spots.

* Two well marked subspecies are native to BC: the coastal cutthroat (*Oncorhynchus clarki clarki*) has the anterior flanks heavily spotted both above and below the lateral line and, usually, a spotted anal fin; and the westslope cutthroat (*Oncorhynchus clarki lewisi*) with the anterior flanks lightly spotted, mainly above the lateral line, and an anal fin that is usually without spots.

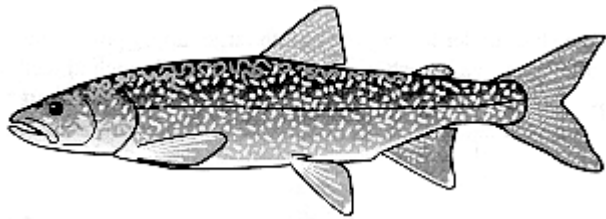
** An exotic subspecies, the golden trout (*Oncorhynchus mykiss aguabonita*) has been introduced into Nicomen Lake, Skagit system.



20 (21) Dorsal fin yellowish, streaked with bold black marbling; back dark, mottled with wormlike vermiculations; red spots on flanks surrounded by blue haloes

Brook trout
Salvelinus fontinalis

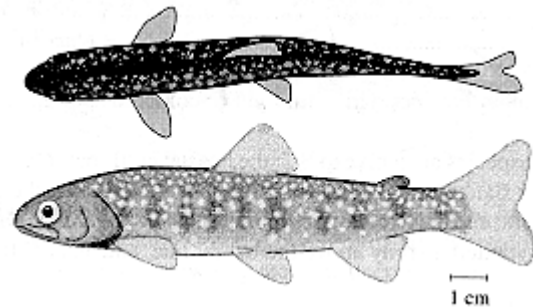
21 (20) Dorsal fin dusky, without bold black marks; spots on flanks without blue haloes



22 (23) Tail deeply forked, light coloured spots on both lobes of tail; head and body covered in light, irregular spots; more than 90 pyloric caeca

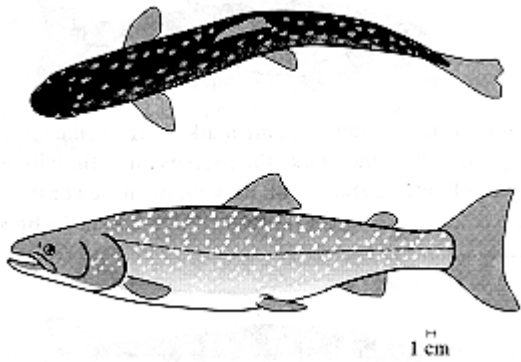
Lake trout
Salvelinus namaycush

23 (22) Tail not deeply forked; spots, if present, only on upper half of tail; fewer than 60 pyloric caeca



24 (25) Viewed from the side, snout is blunt; viewed from above, spots on back are small and crowded together; total branchiostegal count 19-24 (usually 19-22)

Dolly Varden*
Salvelinus malma



28 (27) Viewd from the side, snout is more pointed; viewed from above, spots on back are large and well separated; total branchiostegal count usually 24-29

Bull trout*

Salvelinus confluentus

* Where they coexist, Dolly Varden and bull troat usually show some hybridization.

KEY TO YOUNG SALMON, TROUT AND CHAR (45-100mm)

1 (10) Anal fin base longer than dorsal fin base, 13-19 major anal rays in vertical profile the outer margin of the anal fin has a backward slant; no distinct dark spots on dorsal fin



2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish (usually less than 50 mm in fresh water)

Pink salmon

Oncorhynchus gorbuscha

3 (2) Parr marks present

4 (7)



6 (5) Adipose fin with a clear unpigmented "window"; white leading edge of anal fin not highlighted behind with dark pigment; more than 100 pyloric caeca

Chinook salmon

Oncorhynchus tshawytscha

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye



8 (9) parr marks roughly divided in half by mid line, combined width of parr marks much less than half the combined width of intervening light areas; no greenish iridescence on sides below mid-line; 29-44 gill rakers

Sockeye salmon

(Kokanee)

Oncorhynchus nerka



9 (8) Parr marks faint or absent below mid-line; combined width of parr marks more than half the combined width of the intervening light areas; back mottled green, sides silvery with faint green iridescence below mid-line; 19-26 gill rakers

Chum salmon

Oncorhynchus keta

10 (1) Dorsal fin base equal to, or longer than, anal fin base, 8-12 major anal rays

11 (20) Numerous distinct dark spots on dorsal fin in very small specimens only the first dorsal ray may be black

12 (17) Coloured spots (red to yellow) along mid-line or between parr marks; combined width of parr marks along mid-line about equal to or greater than the combined width of intervening light areas



13 (14) Pectoral fins, as long as depressed dorsal fin; caudal fin deeply forked, centre rays about half the length of longest; usually 1-4 spots on operculum

Atlantic salmon
Salmo salar

14 (13) Pectoral fins shorter than depressed dorsal fin; caudal fin not deeply forked, centre rays definitely more than half the length of the longest rays



15 (16) About 11 (10-12) parr marks, none as wide as eye diameter; small black scattered spots in addition to parr marks; adipose fin orange; row of pale spots along lateral line

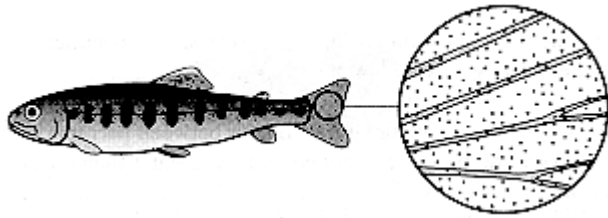
Brown trout
Salmo trutta



16 (15) About 11 (10-12) parr marks, usually 8 or 9, the widest about width of eye; no dark spots other than parr marks; adipose fin plain, not orange; no row of pale spots along lateral line

Brook trout
Salvelinus fontinalis

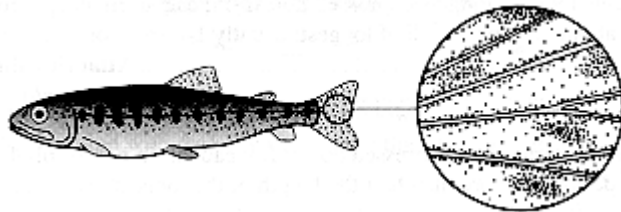
17 (12) No coloured (red or yellow) spots; width of dark areas along mid-line less than width of intervening light areas



18 (19) Few or no spots on tail, on fish less than 50 mm the melanophores are evenly dispersed over the entire tail; hind margin of upper jaw does not reach hind margin of eye; no red or yellow marks under lower jaw

Rainbow trout

Oncorhynchus mykiss



19 (18) Usually black spots on tail, on fish less than 50 mm, melanophores are concentrated between the rays, often forming streaks (precursors of spots); hind margin of upper jaw usually reaches to or past hind margin of eye; often red or yellow marks under lower jaw

Cutthroat trout*

Oncorhynchus clarki

* Two well marked subspecies in BC: the coastal cutthroat (*Oncorhynchus clarki clarki*) along the coast and inland in the Skeena and northern coastal drainages, and the westslope cutthroat (*Oncorhynchus clarki lewisi*) confined in BC to the Columbia system and a few streams tributary to the Fraser system in the Revelstoke area. Introduced into the Peace system.

20 (11) Dorsal fin without dark spots; first dorsal ray is not black



21 (22) Parr marks along mid-line are vertical bars with width of dark areas equal to or less than width of intervening light areas; dorsal fin starts about middle of body (excluding tail); more than 90 pyloric caeca

Lake trout

Salvelinus namaycush



Dolly Varden

Bull trout

22 (21) Parr marks are irregular blotches; width of dark areas on mid-line greater than width of intervening light areas; dorsal fin starts in front of middle of body (excluding tail); fewer than 50 pyloric caeca

Dolly Varden and Bull trout**

Salvelinus malma or *Salvelinus confluentus*

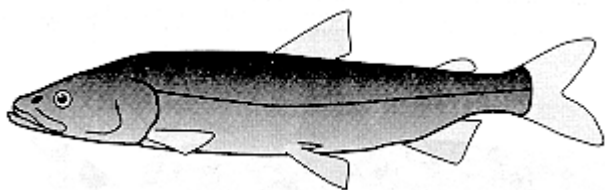
** The young of these species can not be reliably identified except biobiochemically.

WHITEFISH

FAMILY SALMONIDAE

SUBFAMILY COREGONINAE

1 (8) With mouth closed, lower jaw projects beyond upper jaw; profile of snout slopes backwards



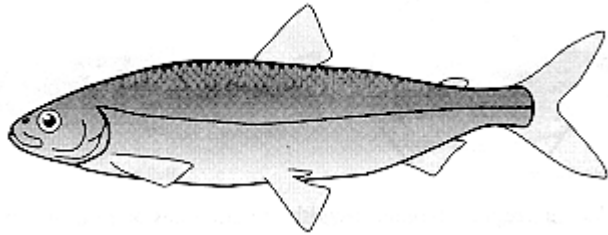
2 (3) Mouth large; viewed from above, snout hardly tapers and is almost as wide at its tip as at the eyes; upper jaw extends back to the posterior margin of the eye

Inconnu

Stenodus leucichthys

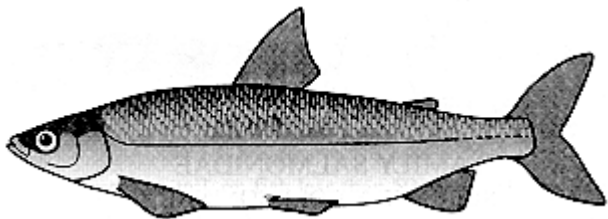
3 (2) Mouth moderate; viewed from above, snout distinctly tapers from tip to eyes; upper jaw does not extend back to the posterior margin of pupil

4 (7) Eye large, its diameter just a little less than interorbital width; pelvic fins often black tipped or dusky



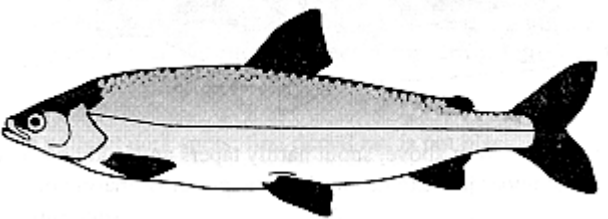
5 (6) Pelvic fins inserted far back, the distance from snout to origin of pelvics equals the distance from origin of the pelvics to a point on the caudal rays posterior to caudal flexure

Lake cisco
Coregonus artedii



6 (5) Pelvic fins inserted forward, the distance from snout to origin of pelvics equals distance from origin of pelvics to a point on the peduncle ahead of caudal flexure

Least cisco
Coregonus sardinella

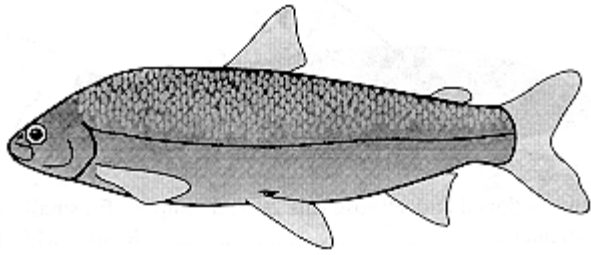


7 (4) Eye small, its diameter almost half the width of the interorbital space; pelvic fins rarely tipped with black

Arctic cisco
Coregonus autumnalis

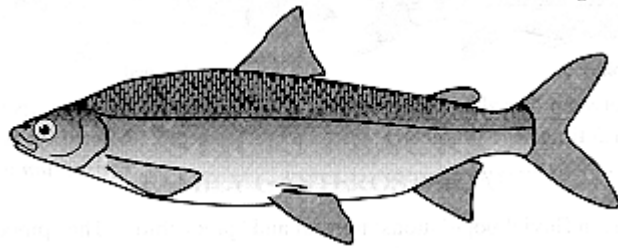
8 (1) with mouth closed, snout clearly overhangs upper jaw

9 (12) Body deep, slab-sided in cross section; juveniles without dark marks along mid-line



10 (11) Snout blunt ("sheep-nosed"), brow rounded when viewed from the side; upper jaw short and broad (its length less than twice its width)

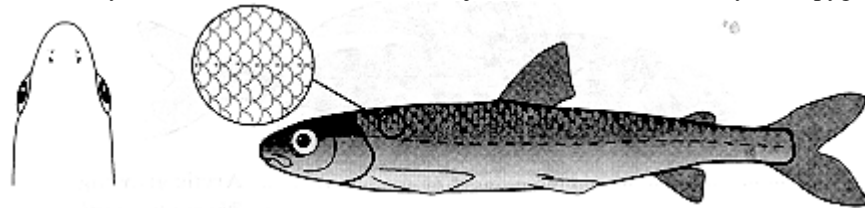
Broad whitefish
Coregonus nasus



11 (10) Snout more pointed when viewed from the side, brow slopes backwards gradually; upper jaw longer (its length more than twice its width)

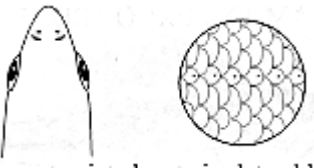
Lake Whitefish
Coregonus clupeaformis

12 (9) Body slender, round in cross section; juveniles (and occasionally adult pygmy whitefish) with dark marks along mid-line



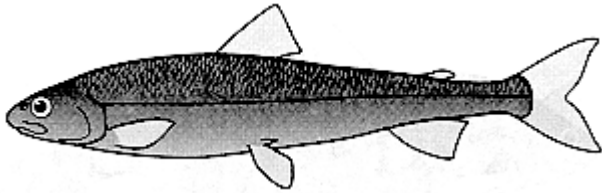
13 (14) Viewed from above, snout blunt, rounded; 52-70 lateral line scales; anterior lateral line scales similar in size to surrounding scales

Pygmy whitefish*
Prosopium coulteri



14 (13) Viewed from above, snout pointed; anterior lateral line scales about half the size of surrounding scales

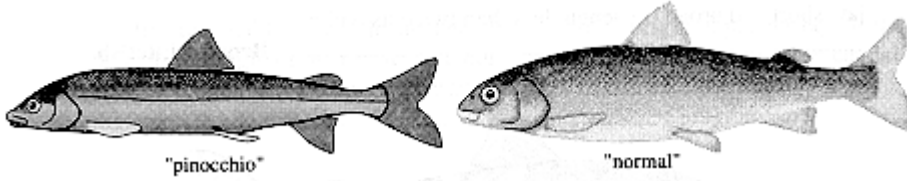
* Hybrids between *P. coulteri* and *P. williamsoni* occur in the Peace River system.



15 (16) Scales between dorsal and adipose fins 29-35; adipose fins small, its base about equal to eye diameter

Round whitefish

Prosopium cylindraceum



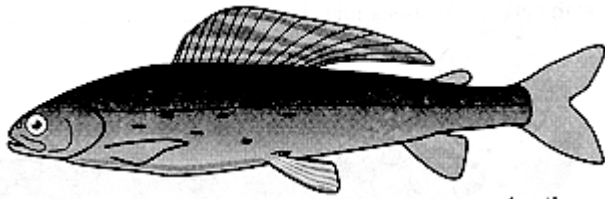
16 (15) Scales between dorsal and adipose fins, 19-26; adipose fin large, its base usually more than 1,5 times eye diameter

Mountain whitefish*

Prosopium williamsoni

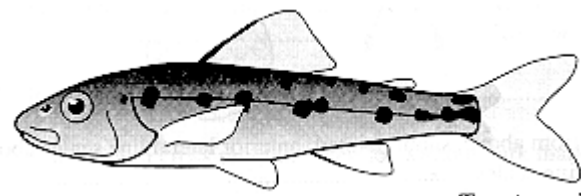
* Two body forms in Fluvial populations; normal and "pinocchio". The "pinocchio" form has a longer snout and thinner body than the normal form.

GRAYLINGS
FAMILY SALMONIDAE
SUBFAMILY THYMALLINAE



Arctic grayling
Thymallus arcticus

TROUT-PERCHES
FAMILY PERCOPSIDAE



Trout-perch
Percopsis omiscomaycus

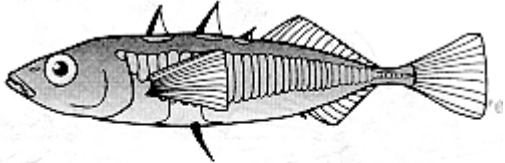
CODS
FAMILY GADIDAE



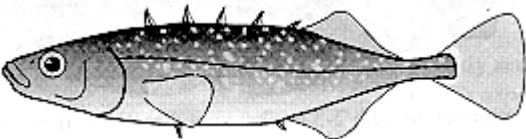
Burbot
Lota lota

STICKLEBACKS
FAMILY GASTEROSTEIDAE

1 (4) Two to six isolated spines before soft dorsal; spines fold straight back when depressed



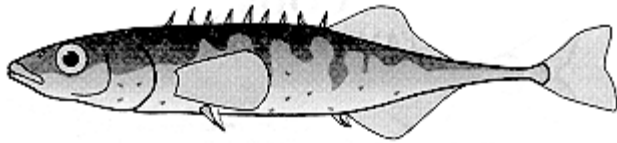
2 (3) Two to four (usually 3) dorsal spines; gill membrane attached to isthmus



3 (2) five to six dorsal spines; gill membrane free from isthmus

Threespine stickleback
Gasterosteus aculeatus

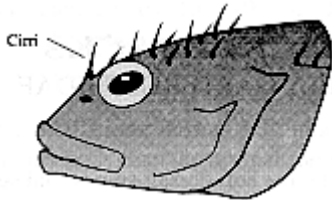
Brook stickleback
Culaea inconstans



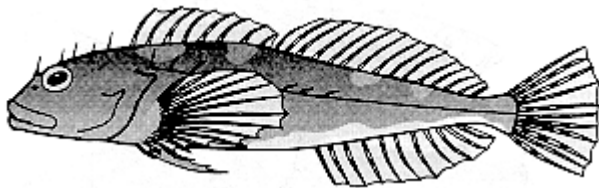
4 (1) Seven to eleven isolated spines before soft dorsal; spines fold alternately to the left and right when depressed

Ninespine stickleback
Pungitius pungitius

SCULPINS FAMILY COTTIDAE

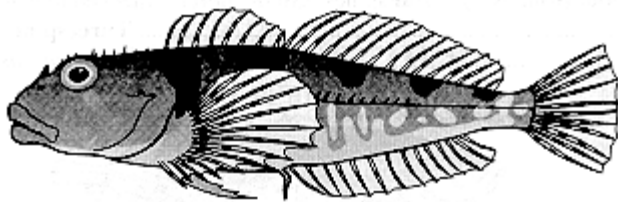


1 (4) Prominent cirri on head and lateral line



2 (3) Spine on preopercle simple; vent advanced from anal fin; a marine species recorded from fresh water above tidal influence in some Queen Charlotte Island

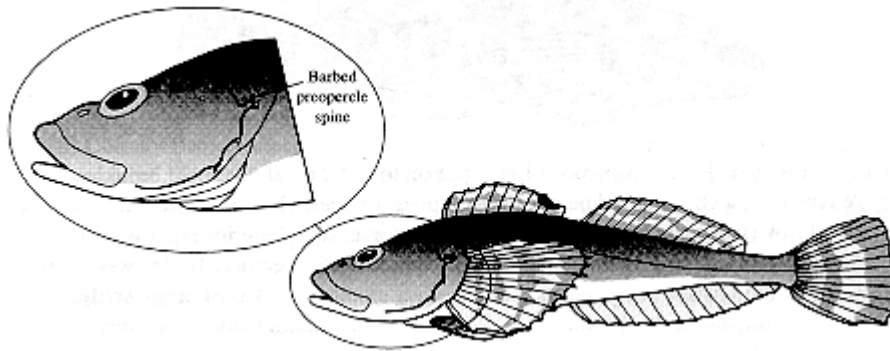
Sharpnose sculpin
Clinocottus acuticeps



3 (2) Spine on preopercle with 2-3 hooks; vent directly in front of anal fin; a marine species that occurs regularly in estuaries, and is recorded from fresh water above tidal influence in some Queen Charlotte Island streams

Tidepool sculpin
Oligocottus maculosus

4 (1) No cirri on head or lateral line



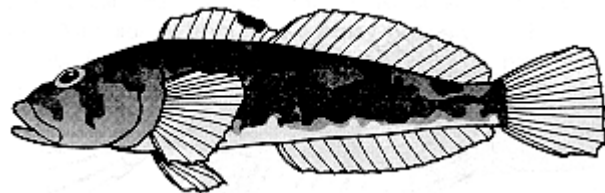
5 (6) Spine on preopercle with 3 or 4 hooks; belly dead white; pectoral fins with alternating yellow and dark bands of approximately equal width; common in estuaries along the entire coast; rare in fresh water above tidal influence

Pacific staghorn sculpin

Leptocottus armatus



6 (5) Preopercular spine simple; belly dusky or light but not dead white, pectoral fins speckled but without broad dark bands



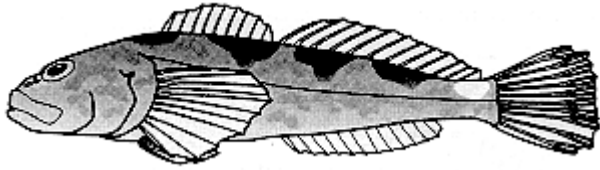
7 (8) anal fin base distinctly longer than head, 15-19 anal rays; first dorsal fin with a conspicuous black spot; single pore on mid-line of chin; back and sides with strong prickling (prickles absent in some coastal lake populations); dorsal VII-X (XI), 19-23; pectorals rays 15-18; lateral line pores 32-43

Prickly sculpin

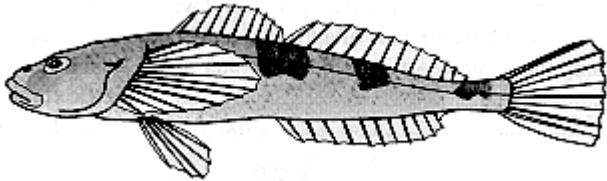
Cottus asper

8 (7) anal fin base about equal to, or less than, head length

9 (12) Single pore on mid-line of chin; lateral line complete



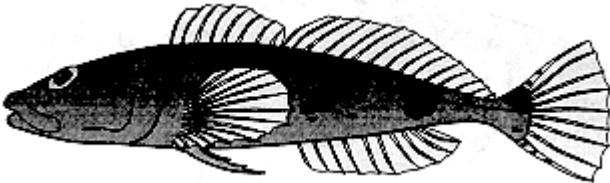
10 (11) In life, usually a conspicuous light spot on top of caudal peduncle; prickles reduced to patches behind pectoral fins; upper preopercular spine straight; head not flat, brow rises from back of eye to origin of dorsal fin; posterior nostrils tubular; dorsal VIII-X, (16) 17-20; anal 12-14 (rarely 15 or 16); pectoral 13-15; west of the Continental Divide.



11 (10) In life, no conspicuous light spot on top of caudal peduncle; upper back and sides with prickles; prominent preopercular spine, strongly hooked; head wide and flattened (about half as deep as long), brow hardly rising from back of eye to origin of dorsal fin; posterior nostrils normal; dorsal VII-X, 16-17; anal 12-13; pectoral fins 14-16; east of the Continental Divide

Spoonhead sculpin
Cottus ricei

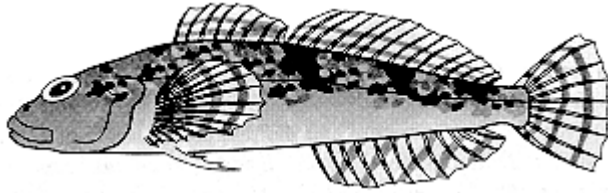
12 (9) Two pores on mid-line of chin; lateral line development variable



13 (14) Head large (less than 3 in standard length); caudal peduncle narrow (less than interorbital width); usually heavily prickled on back and sides (except in populations isolated above barriers); lateral line complete; palatine teeth present (long tooth patch); dorsal VII-IX, 15-17; anal 11-13; pectoral 15-17; lateral line pores 29-35

Torrent sculpin
Cottus rhotheus

14 (13) Head smaller (more than 3 into standard length); caudal peduncle deeper (greater than interorbital width); prickles, if present reduced to a patch behind pectoral fin

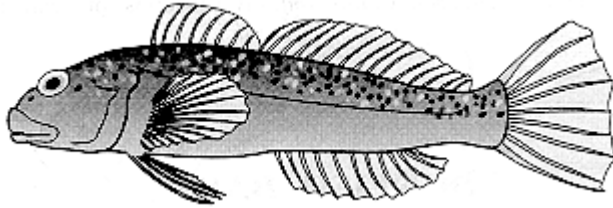


15 (16) Chunky fish, caudal peduncle relatively narrow (more than 3 into body width measured from below and immediately in front of the pectoral fins; lateral line usually complete, extending to base of caudal fin; palatine teeth present; pectoral rays 14-16; common below barriers in the Similkameen system; in the Kettle River below Cascade Falls; in the Columbia River and tributaries below Keenleyside Dam; absent from the Kootenay system above Bonnington Falls and the Okanagan systems above Okanagan Falls.

Mottled sculpin

*Cottus bairdi (hubbsi type)**

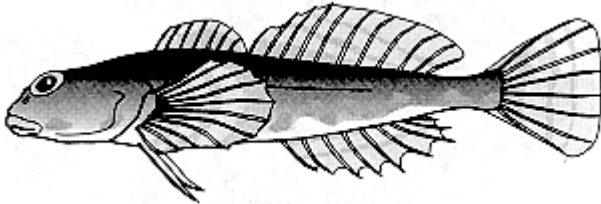
16 (15) Slim fish, caudal peduncle relatively wide (less than 3 into body width measured from below and immediately in front of the pectoral fins; lateral line incomplete, ending well before base of caudal fin



17 (18) Palatine teeth present (sometimes weakly developed); pectoral rays 12-15; anal rays (10) 11-14 (many individuals with more than 12 rays); in BC, in the Kettle River below Cascade Falls; in the Columbia River and tributaries below Keenleyside Dam; absent from the Kootenay system above Bonnington Falls; and absent from the Similkameen and Okanagan systems but present in the lower tributaries to the Flathead River

Shorthead sculpin**

Cottus confusus



18 (17) Palatine teeth absent, pectoral rays 12-15; anal rays 10-13 (most individuals with 12 or less rays); common throughout the upper Columbia, Pend d'Oreille and Kootenay systems, but absent below barriers in the Castlegar-Trail area; absent from the Similkameen system but present in the Okanagan system above Okanagan Falls.

Slimy sculpin

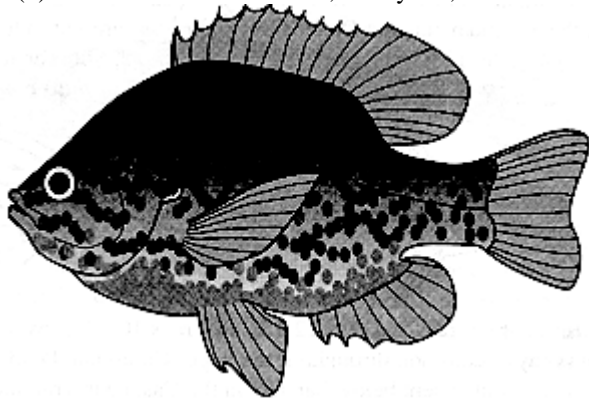
Cottus cognatus

* The Columbia form of *C. bairdi* was originally described as a separate species. *Cottus hubbsi*, but was later synonymized with *C. bairdi* by Bailey and Bond (1963). No reasons were given for the synonymy and the taxonomic status of *C. hubbsi* warrants re-investigation. In BC, although both *C. bairdi* and *C. cognatus* occur in the Castlegar-trail area, apparently they never coexist. This suggests the possibility of a competitive interaction between the species.

** The shorthead sculpin, *Cottus confusus*, occurs in low gradient tributaries of the Columbia and Kootenay rivers in the Castlegar-Trail area. Here, it commonly coexists, and apparently hybridizes, with *C. bairdi*. This makes specific identification in this area difficult. In the Flathead system, *C. confusus* coexists with *C. cognatus*, although the area of overlap is relatively narrow (Peden and Hughes). Recently, Peden (pers. comm.) conducted an allozyme survey of *C. confusus*, and other sculpins, in the Flathead, Columbia, and Kootenay systems. His results suggest that the fish in the Flathead River that were previously identified as *C. confusus* (McAllister and Lindsey 1961; Hughes and Peden 1984) are not the same species as the fish identified as *C. confusus* in the Columbia and Kettle rivers (Peden et al 1989). This matter is still unresolved and, in BC, the only thing certain about *Cottus confusus* is that it is aptly named!

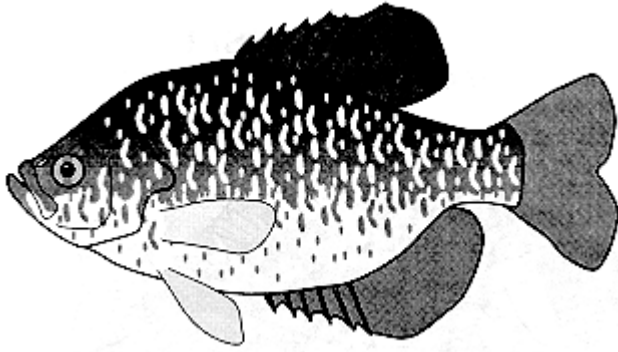
SUNFISH BASS FAMILY CENTRARCHIDAE

1 (4) Pelvic fins extend back to, or beyond, vent



2 (3) anal fin noticeably smaller than dorsal fin; distinct black opercular flap; 3 spines in anal fin

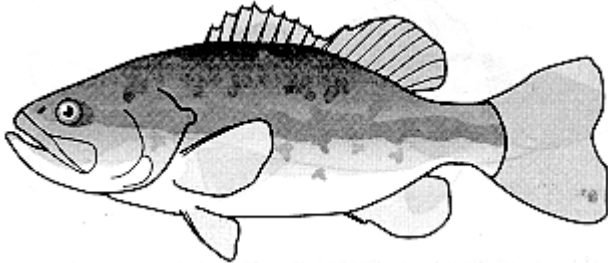
Pumpkinseed
Lepomis gibbosus



3 (2) no distinct black opercular flap; dorsal and anal fin about equal in length; 6-7 spines in anal fin

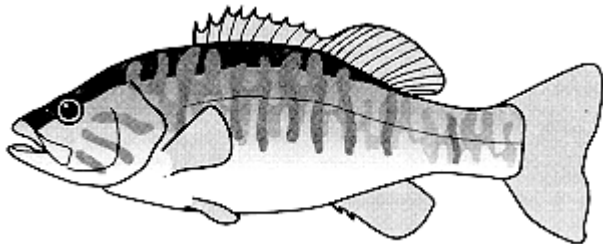
Black crappie
Pomoxis nigromaculatus

4 (1) Pelvic fins do not reach vent, they extend back to about half the distance to vent



5 (6) Upper jaw reaches to beyond hind margin of eye; eye brown; 60-68 scales in lateral line; young with black band continuous across snout and gill cover but broken along sides

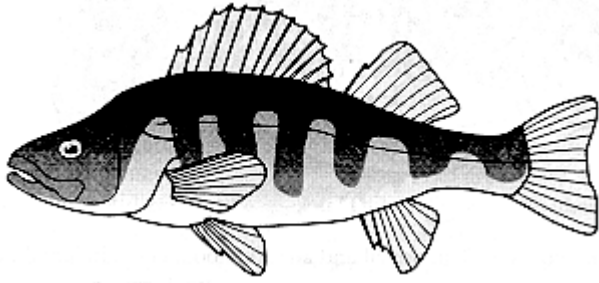
Largemouth bass
Micropterus salmoides



6 (5) Upper jaw reaches back to about mid-eye; eye red to orange; 68-78 scales in lateral line; young with dark, radiating bands on cheeks

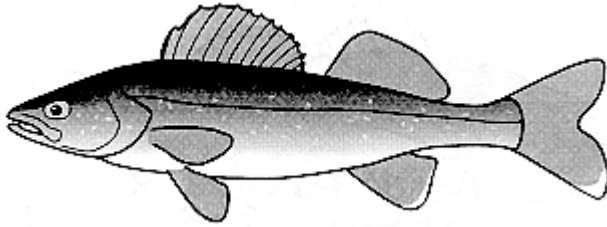
Smallmouth bass
Micropterus dolomieu

PERCHES
FAMILY PERCIDAE



1 (2) Sides in adults with 6 to 9 dark vertical bars; lower lobe of tail fin without a conspicuous white mark; jaws without prominent canine teeth; 6-8 soft anal rays

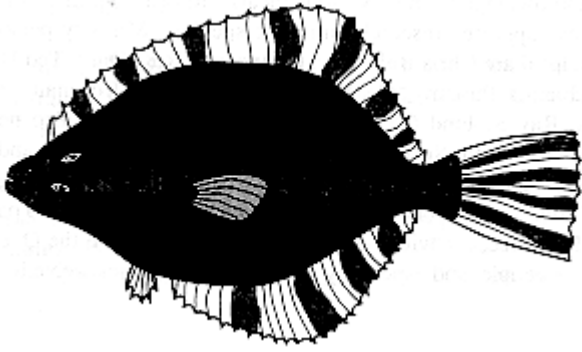
Yellow perch
Perca flavescens



2 (1) Sides in adults without dark vertical bars (irregular bars sometimes present in juveniles); lower lobe of tail fin with a conspicuous white mark; jaws with prominent canine teeth; 12-13 soft anal rays

Walleye
Stizostedion vitreum

FLOUNDERS
FAMILY PLEURONECTIDAE



Starry flounder
Platichthys stellatus

Over the years, our knowledge of BC freshwater fish has grown through the efforts of many people. There is not space to list all the private citizens who have contributed specimens and information; however, their assistance and interest is gratefully acknowledged. In its various incarnations the Ministry of Environment, Lands and Parks has supported research on native species. Ministry personnel who have been especially helpful are Chris Bull, John Cartwright, R.K. Dahl, Ted Down, Jay Hammond, Al Martin, Juanita Ptolemy, George Reid and Marvin Rosenau. Gordon Ennis, Dave Peacock and Ray Sjolund (Dept. of Fisheries and Oceans) also helped in many ways. Cas Lindsey and Tom Northcote started it all; Grant Hughes and Alex Peden of the Royal British Columbia Museum generously shared their knowledge, and Sid Cannings of the BC Conservation Data Centre goaded us into putting it onto paper. Tom Riemchen and Peter Mylechreest provided much of the information on the Queen Charlotte Islands. To all of these people, and especially to those whose names we've forgotten, many thanks.

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