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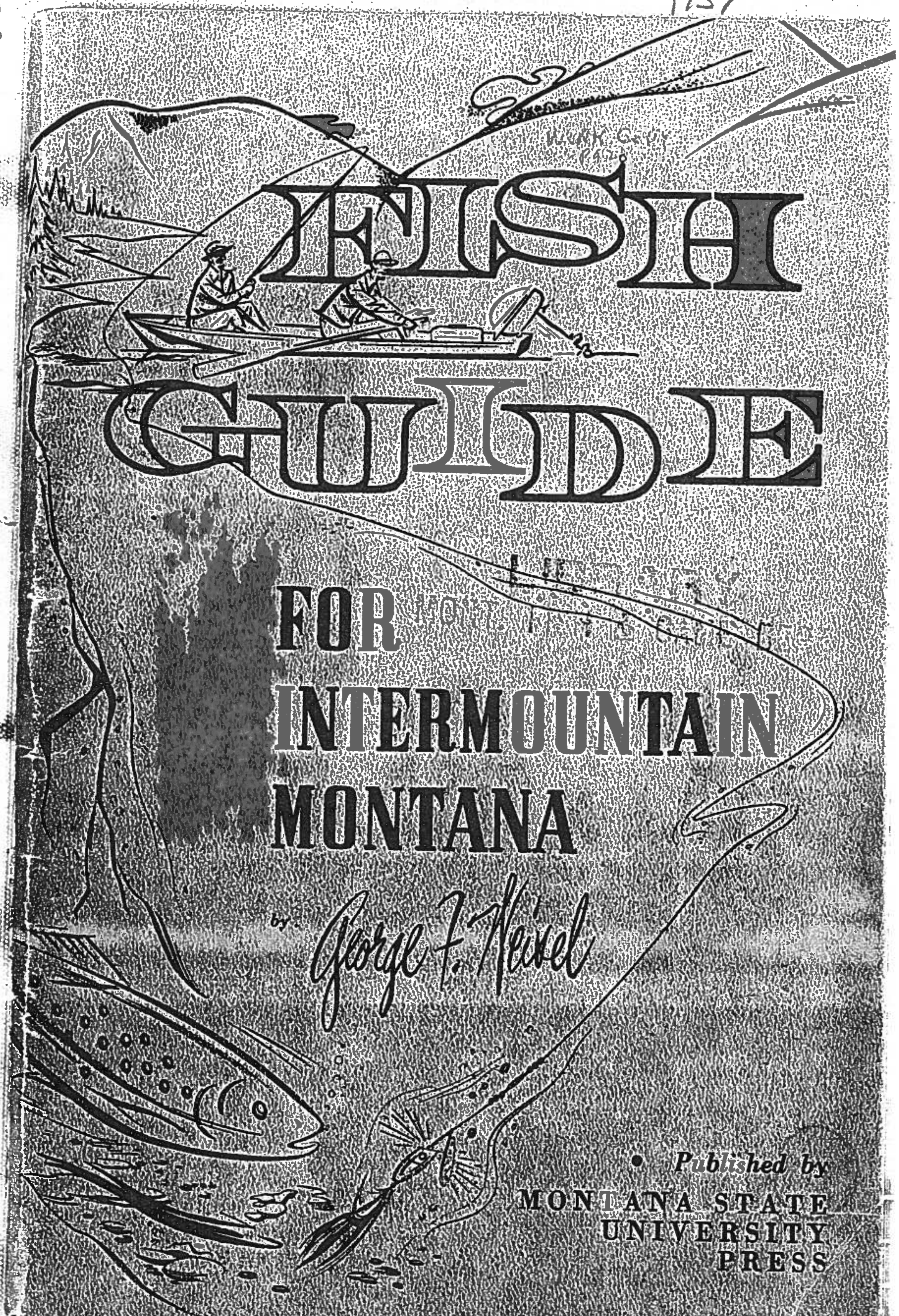

FISH GUIDE

FOR INTERMOUNTAIN MONTANA

by George F. Weisel

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GEORGE F. WEISEL

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INTRODUCTION

Although fishing is the most popular sport in Intermountain Montana, relatively few fishermen know the names of the local fish. This is mostly due to the lack of any particular book or key to fish of the region. It is usually misleading to rely on accounts from other localities as they do not include the same species, and their descriptions of similar types often lead to misidentification. It is hoped that this booklet will fill the void and in so doing add greater enjoyment to the sport.

The booklet is planned for use by both the general fisherman and the more interested student. The keys for identification are simple with scientific terms kept to the minimum. All terms likely to present difficulties are defined, mostly by means of drawings. Following the keys are descriptions of each species, but these details are not necessary for identification. A brief life history of each fish is also included, and, as an aid for finding further information on particular subjects or species, pertinent literature is cited by sections in the back of the booklet. Valid studies concerning life histories and feeding habits are scanty.

The number of species of fish inhabiting the upper Columbia system in Montana is paltry. There are but 30 species and subspecies, and of this number 14 were introduced. Four of the 11 families represented are not native. These are the grayling, catfish, perch, and sunfish families. Of the native species, the cutthroat trout, mountain whitefish, longnose sucker, longnose dace, burbot, and Rocky Mountain mottled sculpin are found (at least as subspecies) in both the Missouri and Columbia basins.

Some of the common and scientific names differ from those in other accounts. The names used here are those that have been most recently approved. I am indebted to Dr. Robert R. Miller of the University of Michigan for checking these. There are many common names used locally for some species. As an example, the cutthroat trout is the proper name for *Salmo clarki,* but this species is also incorrectly referred to as the flat trout, speckled trout, black spotted trout, and redbelly. The use of all but the accepted common names should be avoided.

Inasmuch as so little is known of the fish of Montana, most in-

formation gathered will be a contribution to our knowledge. If some unusual specimens are captured, they should be preserved for identification. The best method is to place them as soon as possible in a solution of one part of formalin to ten of water. The addition of a teaspoonful of regular borax to this preparation will prevent it from becoming too acid. Glassware, such as mason jars, provide the best containers. Specimens more than a couple of inches in length require an incision in the belly to allow the preservative to penetrate into the viscera. This cut should always be made on the right side so as not to interfere with the counts and measurements which are made on the left side. At least, the exact location where the fish was caught and the date should be recorded. Other data such as means of capture, water temperature, time of day, type of stream or lake bottom, and water depth are desirable.

A HISTORY OF FISH SURVEYS IN WESTERN MONTANA

The western portion of Montana includes an area of approximately 38,000 square miles drained by the Kootenai and Clark Fork Rivers, large tributaries of the Columbia. The Continental Divide separates this part of the state from the remainder which belongs to the Missouri watershed, except for a small segment in the northwest corner where the water flows into the Saskatchewan River and thence into Hudson Bay. Inasmuch as the fish on the two sides of the Divide in Montana are quite different, it is practical to treat them separately.

Prehistorically, fishing was an integral part of the culture of the Salishan Indian tribes which inhabited the area, although there were no large migrations of fish as in the lower Columbia. The natives made regular treks to the Salmon and Clearwater Rivers in Idaho during the salmon runs, and took local species by means of weirs, traps, hooks, spears, and brush drags (Weisel, 1952).

Early surveys neglected the fish of the region and collections have been spotty even in recent times. The journals of Lewis and Clark relating their journeys along the Bitterroot and Big Blackfoot Rivers and Lolo Creek contain the first historical records. On the Missouri and lower Columbia they noted the catching of fish for food, and in many instances their descriptions are sufficient to render identification of species possible, but they took no fish in western Montana. On the Bitterroot they wrote, "No fish were to be seen in the river - - - " (Coues, 1893: 587).

The next explorer to leave a record was David Thompson in 1808-12. His party fished frequently in both the Kootenai and Clark Fork, but had little luck. He did note, however, that the Indians had weirs on Swamp and Mission Creeks and that they took trout, mullet (whitefish?), and carp (suckers?) (White, 1950).

It was not until the last half of the nineteenth century that regular biological surveys were conducted in the inland part of the Pacific Northwest. Although a division of the railroad survey

of 1853-5 spent almost a year in the Bitterroot Valley, there is no mention in their voluminous reports of fish from western Montana. A bull trout specimen said to have come from near the present town of Stevensville (Girard, 1859: 308) was later proved to have come from The Dalles in Oregon (Suckley, 1860: 342). Cope (1879) made observations around Fort Benton, but did not cross the Rockies. In his explorations of the upper Columbia in search of a station to obtain salmon eggs, Stone (1885) did not collect or describe the fish in the waters he examined. Evermann (1893) made a reconnaissance of the streams and lakes, but his primary concern was in selecting a hatchery site. His list of fish collected is the first and includes most of the abundant species. Shortly after, Eigenmann (1895) skirted western Montana, and Gilbert and Evermann (1895) collected in the Flathead, Bitterroot and branches of the upper Clark Fork. The only specimens from the region described in the monumental work of Jordan and Evermann (1896) are those taken by the surveys of Evermann and Gilbert and Evermann.

In this same period fairly extensive investigations were made in the upper Missouri basin of Montana. Evermann and Cox (1896) give an inclusive summary of these along with their own annotated list.

At the turn of the century Elrod (1902) remarked briefly on the species of fish found in Echo Lake of the Swan Range. In 1906, "A list of the fishes of Montana" by Henshall was published. This list is incomplete and is drawn largely from records in the federal government's early railroad and fishery surveys cited above. Cockerell's listing (1908), "The fishes of the Rocky Mountain region," is more complete. However, it covers the entire Rocky Mountain states, and, except for the fossil fish, is largely derived from Jordan and Evermann. A rather rambling and popularized report on the fishes of Flathead Lake was later written by Elrod (1929).

More recently a number of good keys and descriptions have been published for fishes of neighboring states and Canada. Each includes most of the species found in western Montana. Among the best are by Schultz (1936) for Washington and Oregon, Simon (1946) for Wyoming, and Carl and Clemens (1948) for British

Columbia. The only account of local fish is by Schultz (1941), and this is confined to the fishes of Glacier National Park.

Extensive collections of fish have been made in western Montana during the past five years and housed in the Zoology Museum of Montana State University. The data and descriptions in this report are from these specimens rather than from the literature. In many instances, counts and measurements do not quite jibe with those given in the literature for the same species from other localities. This may be due in part to racial variations. Also, only those species which have actually been collected are considered. As investigations progress, it is possible that more species may be added, particularly from the Kootenai River district. From 1910-20 there was promiscuous planting of warm-water species, but fortunately few of these have survived.

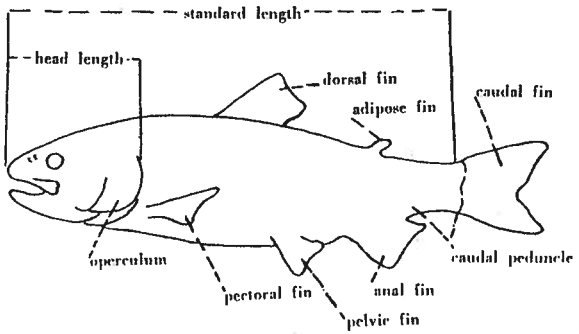


Fig. 1—Diagram of a trout showing the external characters and methods of making measurements.

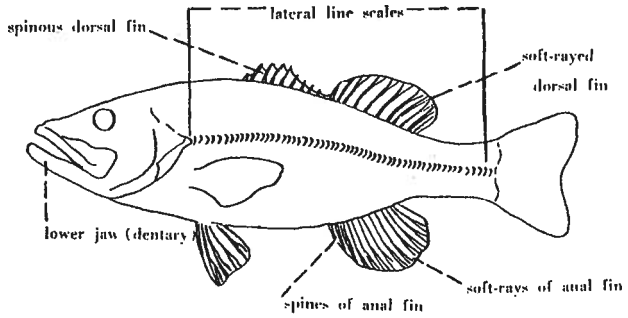


Fig. 2—Diagram of a bass showing external characters.

BASIC TERMS, COUNTS AND MEASUREMENTS USED IN KEYS

In order to identify fish by means of keying it is necessary to know the basic terms applied to fish anatomy and the methods for counts and measurements. The terms listed and those on the diagrams are only the few used in the keys. For more complete information, a good text is "Fishes of the Great Lakes region" authored by C. L. Hubbs and K. F. Lagler and published by Cranbrook Institute of Science.

It is best to take measurements with a pair of dividers and, particularly with small specimens, to make counts with some magnifying aid such as a dissecting microscope. However, the keys are so constructed that identification of the fish of the region is possible without recourse to any laboratory paraphernalia.

Adipose fin — A small fatty fin with no ray supports, located behind the dorsal fin of trout, salmon, whitefish and catfish (Fig. 1).

Anal fin — The median fin just behind the anus (Fig. 1).

Barbels — Fleshy projections near the mouths of fish. These may be elongated as in catfish or quite minute as in the chub (Figs. 29 and 35). The barbels are sensory structures.

Chin — The space between the bones of the lower jaw.

Dentary — The principal and most anterior bone of the lower jaw. (Fig. 2)

Dorsal fin — The unpaired fin on the back of fishes. Some fish have two or more dorsal fins (Fig. 1).

Fin-rays — The rod-like structures which support the membranes of the fins. These are of two types:

Soft-rays — Flexible, usually branched, and striated (Fig. 2).

Spinous rays — Generally stiffer than soft-rays, unbranched, and not striated (Fig. 2).

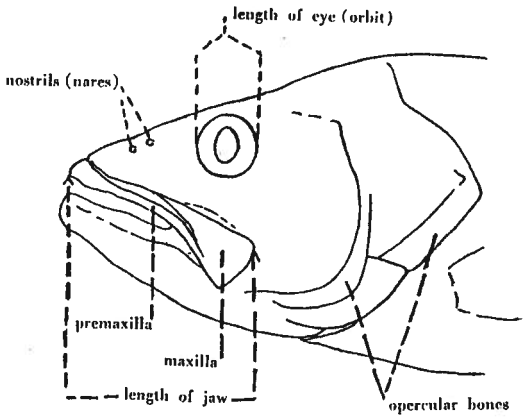


Fig. 3—Diagram of the head of a bass showing the external characters and methods of making measurements.

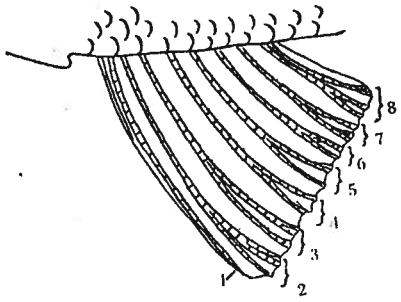


Fig. 4—Fin-ray counts in dorsal and anal fins. The first unbranched ray is short and is not included in the count. The second ray is also unbranched but reaches to the outer margin of the fin. This ray is included in the count. Each of the following branched rays are counted except the last. The last two rays are close together and have the appearance of a single branched ray split to the base. Although it consists of two ray elements, it is counted as one.

Counts of fin-rays — It is general practice to distinguish spinous rays by Roman numerals and soft-rays with Arabic numerals. Not all the fin-rays are counted in the dorsal and anal fins since some are rudimentary and difficult to locate without dissection. The most posterior ray appears to have two bases but is counted as a single ray. The first rays are generally small and unbranched, and are not included in the count. To simplify the ray counts for use in the following keys: ray 1 is the first unbranched ray that reaches the outer margin of the fin, the following branched rays are then counted as one each except for the last two which are joined at the base and counted as one (Fig. 4).

Gillrakers — A series of fine bony projections formed along the inner margin of the gill arches (Fig. 13).

Lateral line scale count — This represents the number of scales which have a small pore and are located in a line along the side of the body. The count commences with the last scale to touch the shoulder girdle and terminates with the scale over the structural base of the caudal fin. The structural base of the caudal is found by flexing the caudal fin. A crease will form at the base. If the lateral line pores are not complete to the caudal, count the scales which would otherwise occupy a typical lateral line (Fig. 2).

Maxillae — The hindermost bones of the upper jaw joined to the premaxillae in front. In fish like the trout both the premaxillae and maxillae border the upper jaw and bear teeth. In such fish as the bass the maxillae are excluded from the gape and are located above the premaxillae (Fig. 3).

Nares — The nostrils. In most fish these are blind pits, each with an anterior and posterior opening (Fig. 3.)

Operculum — A series of four flattened bones which cover the gills (Fig. 3).

Papillose — Covered with small fleshy projections. See lips of suckers (Fig. 24).

Parr marks — Large, darkly pigmented areas on the sides of the body. Parr marks are typical of immature salmon, trout and

native whitefish but tend to disappear when these fish become adults. (Fig. 10).

Pectoral fins — The anterior or uppermost of the paired fins located just behind the operculum (Fig. 1).

Pelvic fins — Paired fins behind or below the pectoral fins. In more primitive fish like trout these fins are located on the belly below the dorsal fin. Their position in more advanced fish like the bass is underneath the pectorals (Fig. 1).

Pharyngeal teeth — These teeth are carried on the modified fifth gill arches of suckers (Fig. 23) and minnows (Fig. 28). They must be dissected out and cleaned for counts. The following keys are so constructed that the fish may be identified without this operation. The rows of teeth and number of teeth in each row is given by a formula. The squawfish has the formula of 2,5-4,2 which indicates that on the left arch there are two teeth in the outer row and five in the inner row, whereas the right arch has two teeth in the outer row and four in the inner row. In other words, the rows of teeth are read from left to right and the counts on the two arches are separated by a dash.

Premaxillae — The bones that form the anterior margin of the upper jaw. See maxillae.

Pyloric caeca — Fingerlike blind sacs opening into the digestive tract just back of the stomach (Fig. 14).

Standard length — The distance in a straight line from the tip of the snout to the structural base of the caudal fin. The structural base is generally taken as the place where a crease forms when the caudal fin is flexed (Fig. 1). This differs from the total length which is taken as a straight line from the tip of the snout to the extreme tip of the caudal fin when it is squeezed together.

Terete — Cylindrical or round in cross-section.

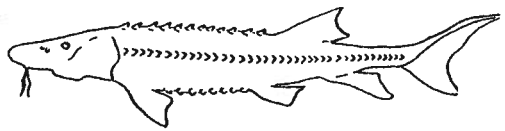
ARTIFICIAL KEY TO FAMILIES OF FISH

This key and those that follow are arranged on an alternative basis. Under each number are two choices. If the first description does not fit, proceed to the second item of that number. Either one or the other of the two contrasted statements must be true. Where the true statement is followed by a number, proceed directly to the statements under that number and omit the intervening descriptions. As long as the descriptions apply to the fish, continue until its family name is reached.

After the family to which the fish belongs is found, turn to the page listed after the family name. On this page will be the key to the genera and species with the common name and description of the particular fish.

1. Body partly covered with bony plates in 5 widely spaced rows; upper lobe of caudal fin larger than lower lobe.

STURGEONS - *Acipenseridae* (p. 22)



No bony plates on body; dorsal and ventral lobes of caudal fin equal or nearly so 2

2. Dorsal fin with only one or no spinous rays; pelvic fin without a spine. (Note: the first dorsal fin and one ray in the pelvic fin of sculpins, Fig. 43, are considered to be spinous although they are weak and flexible.) 3

Dorsal fin with more than one spinous ray; pelvic fin with a spine 9

3. No barbels on chin; some with barbels at angles of jaw only 4

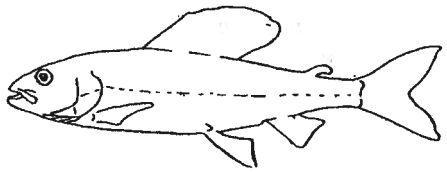
Chin with one or more barbels 8

4. Adipose fin present 5

   No adipose fin present 7

5. Large dorsal fin with 16-24 rays.

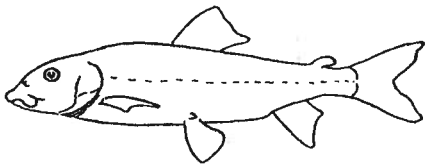
GRAYLINGS - *Thymallidae* (p. 23)



   Dorsal fin with fewer than 15 rays, its base shorter than head 6

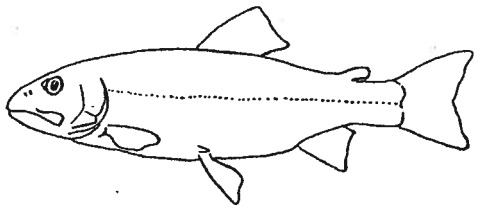
6. Scales large, fewer than 90 in lateral line; mouth small, teeth weak or absent.

WHITEFISH - *Coregonidae* (p. 25)



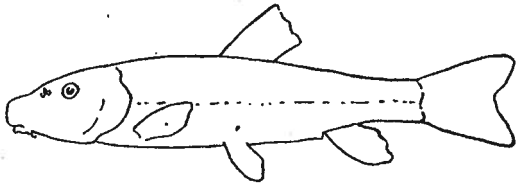
   Scales small, more than 100 in lateral line; jaws with moderately developed teeth.

SALMON, CHARS AND TROUT - *Salmonidae* (p. 29)



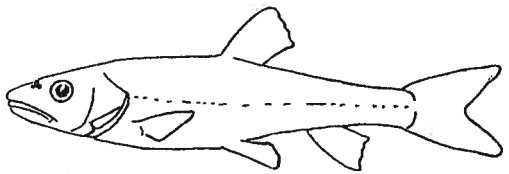
7. Mouth ventral, fitted for sucking; lips fleshy and papillose; pharyngeal teeth in a single comb-like row (Figs. 23 and 24).

SUCKERS - *Catostomidae* (p. 46)



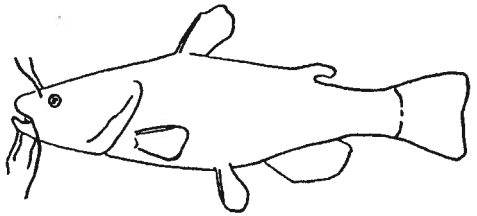
   Mouth not fitted for sucking, subterminal in carp and dace (Figs. 30 and 31) but their lips not fleshy or papillose; pharyngeal teeth in 2-3 rows, not comb-like (Fig. 28).

MINNOWS - *Cyprinidae* (p. 50)

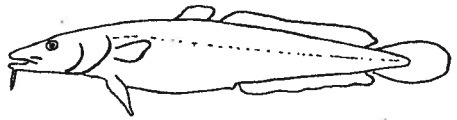


8. Eight prominent barbels about mouth, 2 pairs on chin; an adipose fin present behind the principal dorsal fin.

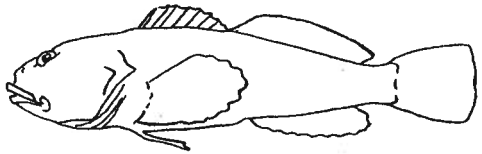
CATFISH - *Ictaluridae* (=*Ameiuridae*) (p. 59)



Single small barbel near tip of chin; two dorsal fins but both provided with soft rays, second much elongated.
CODFISH - *Gadidae* (p. 60)

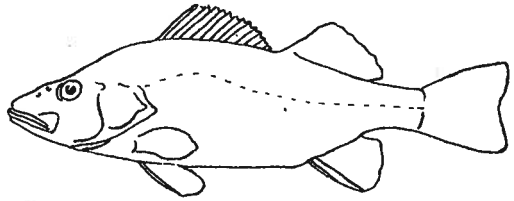


9. Body naked or with small soft prickles; pelvic fin with one hidden spine and 3-4 soft rays; head large and wide.
SCULPINS - *Cottidae* (p. 68)

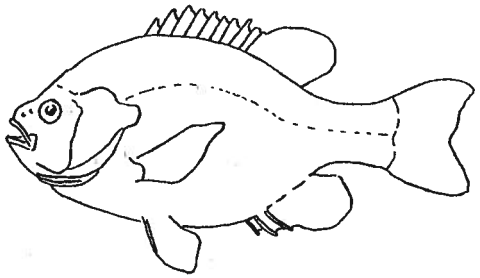


Body and head scaled; pelvic fin with a spine and 5 soft rays; head not broad 10

10. Dorsal fin in two distinct parts, spinous and soft-rayed part not joined by a membrane; anal fin with 1-2 spines.
PERCH - *Percidae* (p. 62)



Dorsal fin single, almost separated in largemouth bass; anal fin with 3 or more spines. (See also Fig. 38.)
SUNFISH - *Centrarchidae* (p. 64)



I. Sturgeons

Family Acipenseridae

The sturgeons are easily distinguished from other fish by their elongated snout, ventral mouth, large plates or scutes in separated rows along the body, two pairs of barbels just anterior to the mouth, and by the upper lobe of the tail fin being larger than the lower lobe. They are a primitive family with a skeleton composed entirely of cartilage. Only one species inhabits western Montana.

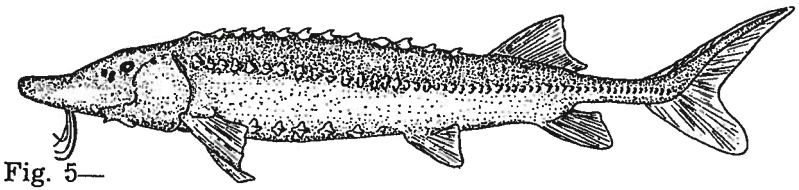


Fig. 5—

WHITE STURGEON — *Acipenser transmontanus* Richardson. White sturgeon are caught in the Kootenai River, mostly below the falls near Troy. There are many tales of sea monsters in Flathead Lake and also in the Clark Fork and Flathead Rivers just below the lake. A large fish, dubiously purported to have been caught in Flathead Lake, was displayed in Polson in the spring of 1955. This was a white sturgeon estimated to weigh 275 pounds. Owing to natural and artificial barriers, there is no possibility that sturgeon can swim up the Columbia to the lake; and it is hardly conceivable that this apparently young specimen could have attained its size landlocked in a lake so poor in food. The Flathead monsters happily remain an enigma like the Abominable Snowman and the Loch Ness Monster.

Characteristics of the white sturgeon which collectively separate it from most other members of its family are: snout blunt and rounded; a small spiracle (opening) between the eye and posterior margin of operculum; upper lobe of caudal not prolonged into a filament; barbels closer to tip of snout than mouth; two rows of 4 to 8 small plates between anus and anal fin; lateral plates 38-48; dorsal plates 11-12; ventral plates 10-12; dorsal fin with about 45 rays and anal fin with about 29 rays; dark grayish in color, belly pale. A few white sturgeon have two extra rows of plates between the dorsal and lateral rows. Three small specimens in our collection, taken from the Snake River of Idaho, have such (Fig. 5).

White sturgeon range from Monterey, California, to Alaska. The only other sturgeon which occurs on the Pacific slope of the United States is the green sturgeon. Although their growth is slow, white sturgeon attain tremendous size. They may reach weights of 300 to 1,000 pounds and grow to 16 feet in length. Their flesh is considered excellent eating and their roe makes expensive caviar. Little is known of their habits. Sturgeon spend most of their lives in the ocean and ascend large rivers in the spring and early summer to spawn. However, it is also likely that some remain in fresh water. In fresh water they are said to feed primarily on fish. They are caught on a variety of bait including night crawlers, beef liver, chicken meat, lampreys, and hunks of fish. Their ventral, suctoral mouth limits them to bottom feeding. The construction of dams and diversion canals threatens the existence of the species.

II. Grayling

Family Thymallidae

Grayling are considered close relatives of the salmon and trout. The external distinguishing feature of the grayling is the sail-like dorsal fin supported by 16 to 24 rays. At the present time there is considered to be only one species of grayling in America.

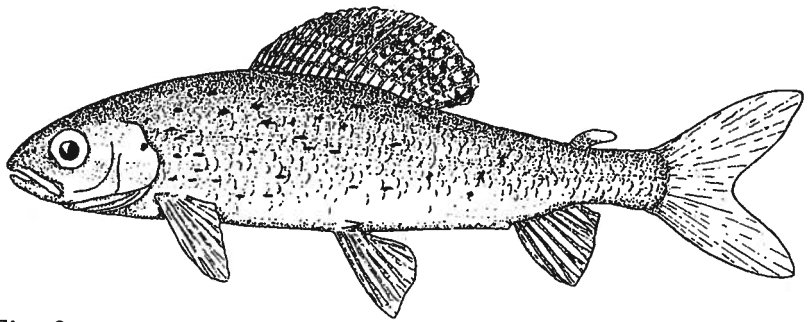


Fig. 6—

AMERICAN GRAYLING — *Thymallus arcticus (Cope) (= Thymallus signifer).*

In the United States the grayling was once abundant in the Missouri drainage of Montana above the great falls. What was probably the same species was also common in many streams in Michigan. The species became extinct in Michigan in the 1930's, and its range in Montana has steadily retreated. It has been successfully planted in several western states and reintroduced in parts of Michigan. In western Montana it has been planted in a few lakes including Georgetown and Rogers.

The grayling is extremely susceptible to pollution or disturbance in its environment. If this beautiful species is to survive, extreme care must be exercised in its conservation and management.

The grayling is like the trout in its general shape and also has the adipose fin. The large, beautifully colored dorsal fin is supported by 16 to 24 rays, the first of which are unbranched. The general color is gray to silver with black spots, many of which are X-shaped. The eye is large; the mouth small; and there are usually from 82 to 95 scales in the lateral line. The length is up to 18 inches and weight up to 2 pounds. A few grow larger (Fig. 6).

Grayling spawn from May to June. They may breed in their second year, but the majority mature in their third of fourth years. Spawning generally occurs over a gravel or rubble bottom of a stream or river. Unlike salmon and trout, no nest is constructed. However, the activities of the fish during the spawning act agitates the gravel so that a shallow depression is made into which the eggs are extruded. Hatching occurs from 11 to 22 days after fertilization, largely depending on the temperature of the water. The oldest Montana grayling examined by Dr. C. J. D. Brown of Bozeman was in its sixth year of life, but records from Great Bear Lake in Canada indicate they may survive to their twelfth summer.

Although successful as a lake fish, grayling prefer clear, cold streams. Their food items cover a wide range—the bulk consisting of insects, both aquatic forms (like stone-flies, may-flies and caddis-flies) and terrestrial forms which land on the surface of the water. The grayling is an excellent sport fish and delicious to eat. They rise readily to an artificial fly, but are tricky to hook because of their small, tender mouth and quick feeding movements.

III. Whitefish

Family Coregonidae

Like the grayling, whitefish are considered to be closely related to salmon and trout and are placed in the family Salmonidae by some authorities. In common with the salmonids and graylings they possess an adipose fin and a process at the angle of each pelvic fin. They are distinguished from these fish by their larger scales and smaller mouth. Also their color is more drab. Three species of whitefish are known from western Montana.

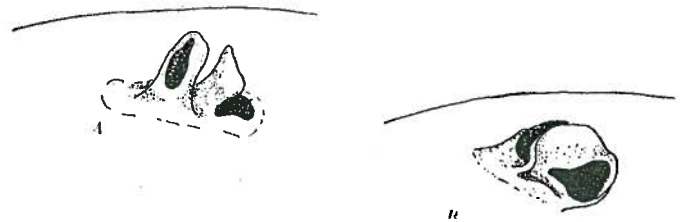


Fig. 7—A. Two flaps between the anterior and posterior nostrils of lake whitefish (*Coregonus clupeaformis*).
B. Single flap between nostrils of mountain whitefish (*C. williamsoni*) and pygmy whitefish (*C. coulteri*).

Key to Species

1. Two flaps between nostrils; body deep and compressed (Figs. 7 and 8). ..... **LAKE WHITEFISH**
— *Coregonus clupeaformis* (Mitchill)

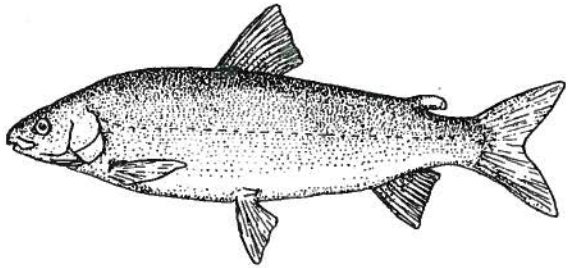
   Single flap between nostrils; body not compressed, terete in cross-section 2

2. Frequently exceeding 12 inches in length; maxillary not reaching to below orbit; eye not large, contained about 4 times in head; margin of lower jaw rounded (Figs. 9 and 10). ..... **MOUNTAIN WHITEFISH**
— *Coregonus williamsoni* Girard

   Size small, seldom exceeding 6½ inches in length, maxillary reaching to below anterior margin of orbit or beyond; eye

large, contained 3.0-3.7 times in head; margin of lower jaw almost square (Frontis and Fig. 9). .. **PYGMY WHITEFISH** *Coregonus coulteri* Eigenmann and Eigenmann

Fig. 8—



LAKE WHITEFISH — Some former common names were "common whitefish" and Great Lakes whitefish.

The general color of this fish is silvery with an olive-brown back. The mouth is small with weak teeth; scales in lateral line 77-88; dorsal and anal rays 10-12; gill rakers on first arch 23-28; premaxillaries wider than long; snout rounded. They attain a length of 24 inches and weigh up to 24 pounds, but none this large have been reported in Montana.

The lake whitefish was introduced into Flathead Lake prior to 1916. Subsequent plantings were evidently needed before they became established. Although an important commercial fish elsewhere, they are of little value in Montana where they have neither become abundant nor reached a large size. They are a poor sport fish, seldom being taken on hook and line.

Only an occasional lake whitefish is found in rivers or streams, and except during the spawning season, they do not frequent the shallow shore line of lakes. They are a bottom feeder consuming mostly small snails, clams, crustaceans, and larvae of midges. According to Bjorklund (1951) the oldest whitefish taken from Flathead Lake had 8 annular rings on their scales, although specimens of the same species from the Great Lakes may reach sixteen years. Lake whitefish become sexually mature in their second or third year and spawn in the winter months along gravelly to rocky shores.

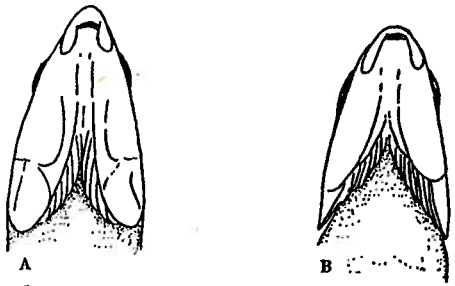
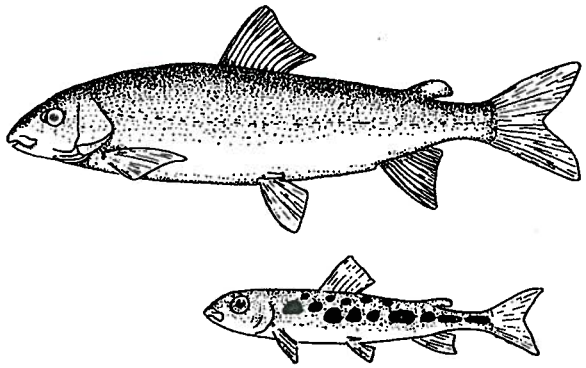


Fig. 9—A. Ventral view of head of mountain whitefish (*Coregonus williamsoni*).
B. Ventral view of head of pygmy whitefish (*C. coulteri*). Notice blunter snout and square lower jaw.

Fig. 10—



Juvenile

MOUNTAIN WHITEFISH — This is the common native whitefish found in most of our lakes and streams. It is also called Rocky Mountain whitefish and peanose. The scientific name was formerly *Prosopium williamsoni.*

Coloration similar to lake whitefish; mouth small with no teeth; scales in lateral line 73-85; dorsal rays 12-13; anal rays 10-13; pectoral rays 17-18; gill rakers on first arch 19-26; length to 18 inches and weight to 3 pounds. The young of this species have parr marks like trout; these are lacking on young lake whitefish. The Yellowstone whitefish, C. w. cismontanus, from east of the Continental Divide has a few body characters that differentiate it from the form in the western part of the state.

The abundant mountain whitefish has become an important sport fish, particularly for late fall and winter fishing after the trout season has closed. They are taken with a long bamboo pole

fitted with line and a small hook baited with hellgrammites or maggots. The flesh of whitefish from cold water is savory eating.

Like most fish, the feeding habits of the mountain whitefish vary with locality and season. They are principally bottom feeders, the bulk of their food consisting of aquatic insects. Hence the species is undoubtedly a food competitor of trout, but not a predator. At times they break water to take surface insects and are occasionally hooked on an artificial dry fly.

The mountain whitefish reaches sexual maturity in three or four years and their spawning occurs in the fall and early winter over gravel and rubble riffle areas of streams. No nest is built. The young hatch by early spring.

PYGMY WHITEFISH — This rare, large-eyed little whitefish is referred to as Coulter's or brown-backed whitefish in older descriptions. Until recently it had the generic name of *Prosopium*.

The color of the back is dark olive-brown, the cheeks silver with a wash of gold, and the lower sides and belly are light silver. Many retain dark parr marks on the sides even as adults. Scales in lateral line 54-63; dorsal and anal rays 9-11; pectoral rays 10-17; gill rakers on first arch 13-16.

In Montana the pygmy whitefish has been reported only from tributaries of Lake McDonald in Glacier National Park and from Bull Lake in Lincoln County. From Bull Lake they migrate short distances up tributary streams in December and January to spawn. Apparently some of them become sexually matured in their second year of life.

Previously it was believed that the pygmy whitefish was restricted to northwestern North America. In 1952 a bottom trawler revealed that they also exist in Lake Superior. This is the greatest disjunct range known for a North American fish. The pygmy whitefish from Lake Superior prefer the depths of sheltered bays. Crustacea are the principal food item, although insect larvae, clams and fish eggs are also taken.

From paper by Worsel & Hanzel IN PREPARATION MAY 1972 - Pygmy Wf Lateral Line scale counts:

Northern Range (Alaska)	50-73	
Flathead L.	52-65	Av. 58.2
Bull L.	54-63	Av. 57.5

IV. Salmon, Chars and Trout

Family Salmonidae

The family to which the salmon, chars and trout belong is typified by the presence of an adipose fin, a fleshy process at the angle of each pelvic fin, and well developed teeth in the jaws. They are fresh-water and "ocean running" fish of the Northern Hemisphere.

The external characters that distinguish many of the trout are based on coloration. Inasmuch as the colors vary with age, locality and season of the year, it is impossible to use simple, sure-fire characters to identify the species. Another complication, which makes assured identification difficult, is that local races vary in scale counts, color and migration patterns; and furthermore, there is hybridization with transplanted stocks.

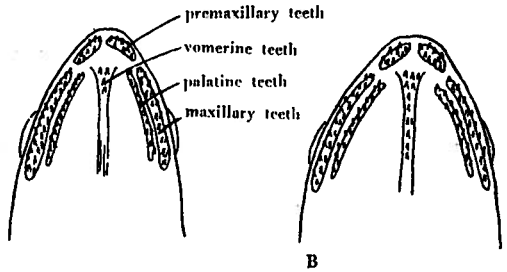


Fig. 12—A. Diagram of dentition in roof of mouth of chars (brook trout, lake trout and Dolly Varden). Vomerine teeth are confined to the front end of vomer.

B. Diagram of dentition in roof of mouth of trout (brown, cutthroat and rainbow trout). Vomerine teeth are on both the head and shaft of vomer.

Key to Species

1. Anal fin higher than the width of its base, with 12 or fewer rays (Figs. 17-22); lining of mouth with no dark coloration, white 3

   Anal fin base longer than height of fin, with 13 or more rays, infrequently with 12 (Fig. 15); black or dusky coloration in mouth. The salmon 2

2. No distinct black spots on back and upper half of caudal fin, fine speckling evident; gill rakers on first arch 30-39, closely set and long and slender. (Mature males develop hump on back, hooked snout, deep red on back and sides.) (Figs. 13 and 15). ..... **KOKANEE** (Sockeye Salmon)
— *Oncorhynchus nerka* (Walbaum)

Small irregular black spots along the sides and upper half of caudal fin; gill rakers on first gill arch 19-25, widely spaced. (Males also develop hump on back and hooked snout but color on sides and back is brighter red.) (Fig. 16). .....
..... **COHO** (Silver Salmon)
— *Oncorhynchus kisutch* (Walbaum)

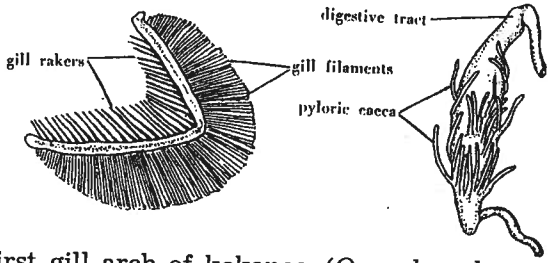


Fig. 13—First gill arch of kokanee (*Oncorhynchus nerka*). Gill rakers slender and closely set.
Fig. 14—Pyloric caeca of kokanee (*Oncorhynchus nerka*).

3. Teeth on head and shaft of vomer (Fig. 12B); black to dark brown spots on body, reddish spots surrounded by a halo in brown trout but black spots also present. The trout 6

Teeth on head of vomer only (Fig. 12A); spots on body gray, yellow, orange or red, never black. The chars 4

4. Back with olive to black mottling (marbling), not spotted; body fairly deep; some red spots on sides bordered with blue; free edges of lower fins white (Fig. 17). .....
..... **EASTERN BROOK TROUT**
— *Salvelinus fontinalis* (Mitchill)

Back without dark mottling; body not deep, almost cylindrical in section; spots on side of body pale 5

5. Gray spots on sides and back; lower fins without conspicuous white edges; usually 11 rays in anal fin; caudal fin strongly forked; vomer with raised crest (Fig. 18). ..... **LAKE TROUT**
— *Salvelinus namaycush* (Walbaum)

Pale yellow spots on back and reddish spots on sides; free edge of lower fins white; usually 9 rays in anal fin; caudal not so deeply forked; vomer without raised crest (Fig. 19).
..... **DOLLY VARDEN (Bull Trout)**
— *Salvelinus alpinus malma*
(Walbaum)

6. Reddish spots frequently surrounded with blue on sides; large black or brown spots on back; caudal fin without black spots or a few on its upper margin only; general color usually brownish (Fig. 20). ..... **BROWN TROUT**
— *Salmo trutta* Linnaeus

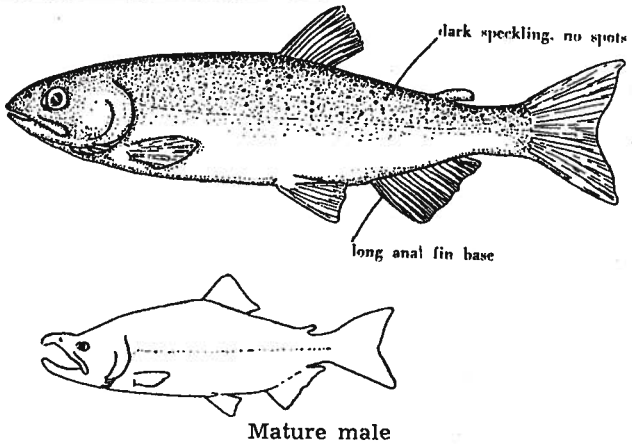
No red spots on sides; dark spots smaller; caudal usually with black spots; general color dark olive to black on upper surfaces 7

7. Conspicuous red dash on sides of jaw (dentary); no marked light margins on fins; belly sometimes red in ripe fish, but no broad red lateral band; black spots not so numerous on head and anterior part of body as in rainbow; head longer and snout more pointed than rainbow; frequently with a few small teeth on back of tongue (Fig. 21). .....
..... **CUTTHROAT TROUT**
— *Salmo clarki* (Richardson)

Usually no conspicuous red dash on lower sides of jaw, sometimes with pale yellow or red in this position; whitish or yellowish border on anal and pelvic fins; usually with a broad red lateral band; in rainbow the black spots are smaller and more diffuse, particularly about the head and anterior part of the body, than in cutthroat; head shorter and blunter; no teeth on back of tongue 8

8. Black spots usually diffuse from head to tail; no bright yellow on sides and belly; red stripe confined to sides; cheeks and operculum with slight rosy wash only; parr marks on juveniles only; scales 116-165 in lateral line (Fig. 22). ..... **RAINBOW TROUT**
— *Salmo gairdneri* (Richardson)

Black spots large and mostly posterior to adipose fin; sides and belly light gold; middle of sides with a deep scarlet lateral stripe; middle of belly with an orange-red band; operculum and cheek rosy; distinct white margin on pelvic fins; dark parr marks retained in adults; scales 170-200 in lateral line. ..... **GOLDEN TROUT**
— *Salmo agua-bonita* Jordan



Mature male

Fig. 15—

KOKANEE — This same salmon also goes by the names of yank, blueback, little red, and silver trout. Some authorities give the kokanee, which is the landlocked form, the subspecific status of *O. nerka kennerlyi.* Salmon of the genus *Oncorhynchus,* which means "hooked snout," are native to the Pacific Coast and migrate up rivers to spawn, sometimes for great distances. Natural barriers prevent them from running into Montana; they were planted in the state about 1912. Flathead Lake, Georgetown Lake,

and the lakes of the Clearwater chain are among those which support a good sport fishing population.

The teeth are small and weak except in breeding males; 30-39 slender, closely set gill rakers on first arch; 11-16 rays in dorsal fin; 13-17 rays in anal fin; 125-143 scales in lateral line; 66-92 pyloric caeca. Color greenish blue on black with fine black specklings, no black spots; mature males bloody to muddy red. Young with oval parr marks situated mostly above the lateral line.

Ocean running sockeye are medium-sized salmon weighing from 8 to 15 pounds. Kokanee are structurally identical but never attain as large a size. Under highly favorable conditions they may reach 5 pounds. Twelve to 14 inches is average length, and under poor conditions they do not exceed 8 inches. Studies in Flathead Lake reveal that the size of mature fish varies from year to year. In recent years they have weighed somewhat under a pound in this lake.

Kokanee have been widely planted in lakes for a number of reasons. They are an open-water lake fish that feed on minute plants and animals. Thus they do not compete seriously with other game fish for food. Also, there are indications that kokanee provide a source of food for large trout. Furthermore, they are a good reproducer if there are tributary streams or sufficient gravelly shores around the lake. And, of course, they are a desirable game fish and excellent to eat.

Most kokanee mature sexually in their fourth year, a few a year earlier or a year later. With the onset of maturity the males develop the striking hook on their snout and hump on their back, and their color changes to deep red. Females undergo little change. The fish congregate over the breeding grounds in November and December, the males appearing earlier than their mates. Loose gravel or coarse sand of lake shore or streams are chosen for making the nests. (A more proper term for a salmonid nest is redd.) These are constructed by the females in from 6 inches to 4 feet of water. The excavation is performed by flexing the body from side to side, sometimes turning at an angle of about 45°. This disturbs the loose material and creates a depression several inches deep. A male is generally in attendance to chase away intruders. Salmon spawn in pairs, lying close together at the time

the sex products are extruded. During the actual spawning act both fish quiver noticeably. This lasts but for a few seconds. Further digging movements of the female washes gravel over the redd so most of the eggs are buried several inches. After spawning the kokanee are gaunt and have large sores - they die a few days to a couple of weeks later. The young remain under the gravel until they have hatched and absorbed the yolk.

In the summer preceding their maturity the kokanee readily strike lures and will also take bait. Only infrequently are they taken on a fly. When they are massed over the spawning beds, fishermen take large numbers by jigging or snagging. If this is done late in the season, the flesh may not be fresh and firm enough for cooking but when smoked is delicious.

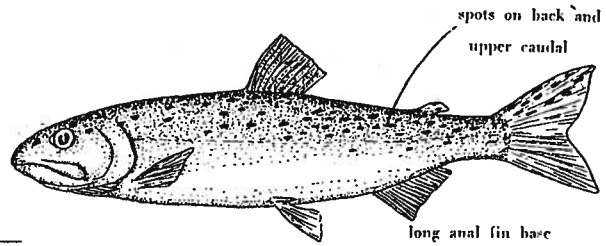


Fig. 16—

COHO — The coho is more frequently called silver salmon in this area. A landlocked strain is being developed for planting in the state, and it is an important sport fish in a few small lakes.

There are 19-25 gill rakers on the first arch; 121-136 scales in lateral line; 12-17 rays in anal fin; 9-13 rays in dorsal fin; and 45-80 pyloric caeca. The color is metallic blue above and silver below; black spotting is confined to the back and upper lobe of the caudal fin; and the mouth is black with a white gum line. The males develop the same secondary sex characters as the kokanee but the red coloration is brighter. The young may be identified by the elongated parr marks, orange tinge on the lower fins, and by the first rays of the anal fin being elongated and bordered with white.

Ocean running coho average about 8 pounds in weight. The record sport fish was 31 pounds. Those confined to fresh water are much smaller, seldom attaining a pound.

Not much is known concerning the landlocked coho. Apparently the majority mature in their third year of life. Their general habits are similar to those of the kokanee.

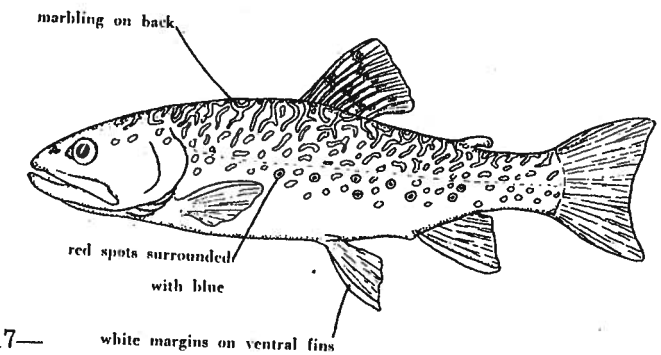


Fig. 17—

EASTERN BROOK TROUT — In Canada the eastern brook trout is commonly called the speckled char. This beautiful fish had an original distribution in the streams and lakes of northeastern North America. It has been widely introduced.

Like all the chars, the brook trout has teeth only on the anterior part of the vomerine bone. Its body is deeper than that of the Dolly Varden and the lake trout. There are about 10 rays in the dorsal fin; 9 rays in anal fin; 110-130 scales in lateral line; and 20-50 pyloric caeca. The color of the back is dark olive to almost black. There are no spots on the back but there are wavy lines of lighter color that make it look vermiculated or marbled. Red spots with blue borders are on the sides, and the ventral fins have broad, white anterior margins. Juvenile brook trout have distinctive, large pear-shaped parr marks and conspicuous pigmentation on the adipose fin.

Brook trout are cold-water fish, thriving best in clear, cold, springwater streams. They have become established in a great many feeder streams of the Bitterroot, Clark Fork, Clearwater and Blackfoot Rivers, but have never furnished extensive sport fishing. A record brook trout from eastern waters weighed 14½ pounds. None from western Montana have approached this size. Most of the local populations are dwarfed and the majority caught do not exceed 10 inches in length.

Like all trout, the diet of the brook trout varies with the season and the size of the fish. The majority of studies report that they feed principally on worms and on aquatic and terrestrial insects. Large brook trout prey to some extent on other fish.

The best spawning areas for brook trout are in headwater streams where there are welling springs and a gravel bottom. The height of breeding activity is in late October through November. Like all salmonids, except the lake trout, the females construct a redd, and a male and female pair to spawn. The eggs hatch in early spring.

It is more probable that the introduction of the species into western Montana is harmful rather than beneficial to overall sport fishing.

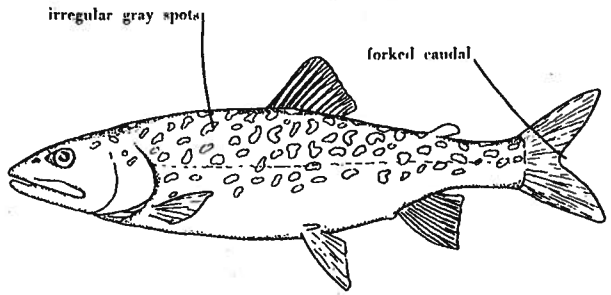


Fig. 18—

LAKE TROUT — The lake trout has a host of common names including mackinaw, forktail, togue, and Great Lakes char. Recently the generic name was changed from *Cristivomer* to *Salvelinus*. It is distributed through northern North America but is not native to Montana. A few are caught in Flathead Lake. In Whitefish Lake, as well as in a few smaller lakes such as Spar Lake in Lincoln County, it provides some fine fishing.

The vomerine teeth are on the head of the vomer which is often somewhat raised. There are 11 rays in dorsal and anal fins; 120-130 scales in lateral line; and 95-170 pyloric caeca. The caudal fin is more strongly forked than that of other chars. The general color is light for a salmonid, it may be greenish to grayish with many light spots on the sides. Some of the light spots on the back may be large and irregular, but they do not form vermiculations like on the back of brook trout.

Lake trout frequent deep, cold lakes. In the East the species may grow to a weight of 100 pounds; locally they seldom weigh over 18 pounds. During the spring lake trout may strike an artificial fly, but by far the greatest number are secured by deep trolling.

In the spring months lake trout will feed extensively on insects. If no other food is available in sufficient quantity, they will also consume small surface organisms. However, after the trout have attained a length of about a foot, their principal diet is fish such as minnows, sculpins, whitefish, and salmonids.

Lake trout do not mature until about their sixth year. Unlike most salmonids, they do not move into streams or rivers to spawn. They gather over gravel or broken, rocky areas of lake shores in water from 1 to 14 feet deep. The date of spawning varies from late September to early December depending on the race of trout, the amount of sunlight, the autumnal drop in temperature, and the depth of the lake. There is some courtship behavior, but no redd is constructed. The eggs simply fall between crevices of rocks where they are protected, the few exposed are undoubtedly eaten by predators. The young hatch in early spring.

Because the type of lake required by lake trout must be cold and deep, and because they are predaceous feeders, it would be senseless to plant them promiscuously.

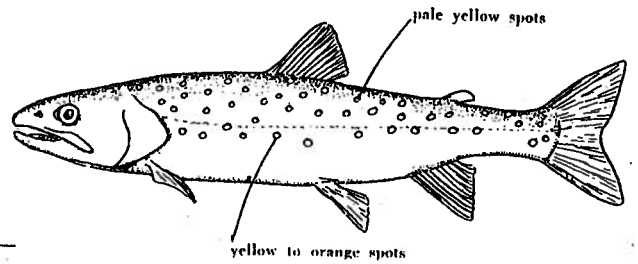


Fig. 19—

DOLLY VARDEN — Most people in Montana call this native char the bull trout. This is a more western appellation, but it so happened that at the time of the first descriptions of this fish, Charles Dickens was much read and admired in this country. In his novel "Barnaby Rudge" was a character called Dolly Varden who selected a gaily polkadotted style of dress. The newly discovered char was named in her honor, and scientists insist the

name should be preserved. The scientific name of the local Dolly Varden has in the recent past been *S. malma spectabilis.*

The Dolly Varden is less deep and compressed than most trout and the head is larger and more elongate. The mouth is large, reaching to a point behind the posterior margin of the eye. The vomerine teeth are on the head of the vomer only; 10-11 rays in dorsal fin; usually 9 rays in anal fin; scales small, 120-135 in lateral line; and 20-40 pyloric caeca. The caudal fin is more truncate than that of the lake trout, particularly so in larger specimens. The color of the back and sides is a rather plain olive with round orange or yellow spots nearly as large as the pupil of the eye. The mature fish are the most highly colored. Their fins have an orange tinge and show a white border on the anal, pelvics and pectorals. The juveniles are characterized by their relatively small parr marks which are oval and often blend with the colors of the back.

The distribution of the Dolly Varden is from northern California to northwestern Alaska. In coastal streams they run to the ocean. At one time they were apparently abundant in most of the waters of western Montana. Some of the older Flathead Indians remember taking them in numbers from Rattlesnake Creek in Missoula and from Jocko Creek. They are rarely taken there now. Although no longer numerous, the species is still found in all the major waters.

There are reports of Dolly Varden weighing over 30 pounds, and fish weighing up to 20 pounds are still taken occasionally. It is not often that this char is hooked on a fly. They are usually caught on a spinner or with bait fish.

Dolly Varden have acquired the unsavory reputation of being devastating predators of salmon and trout. This is probably not entirely deserved, at least little more so than for any large char or trout. It must also be remembered that their diet includes many rough fish which are competitors and predators of cold-water sport fish. Besides fish, Dolly Varden also consume snails, clams, larval and adult insects, and fish eggs.

The spawning migration of the Dolly Varden may be quite extensive. For instance, Dan Block (1955) has evidence that they migrate from Flathead Lake up the North Fork of the Flathead River to tributaries well over 100 miles distant. Travelling in schools, the fish begin their migration in the spring and continue through the summer. Although there is undoubtedly some variation in the age at which Dolly Varden from different areas mature, it is likely that the majority do not attain full development until their fifth year and a length of about 20 inches. At this time the belly of the males develops an orange hue and the lower fins become red except for their anterior margin. The lower jaw, as in most male salmonids, develops a pronounced hook. Spawning occurs from the middle of August to as late as the first of November. The choice of nesting sites is in cold, head-water streams with gravel substrate. The construction of the redd and spawning act is very similar to that of most salmonids (see kokanee). After spawning the adults drop back into the lakes or large rivers. In the North Fork of the Flathead drainage the newly hatched Dolly Varden evidently remain in the head-water streams until they are 2 or 3 years old before moving down to Flathead Lake.

The Dolly Varden should be considered a species threatened with extinction in Montana. There is no doubt that they have already become seriously depleted. Any obstruction, such as a dam, across the route to their spawning grounds will greatly reduce their numbers.

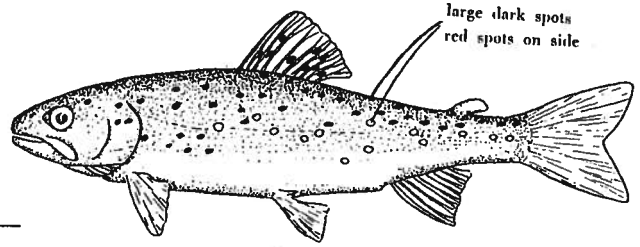


Fig. 20—

BROWN TROUT — The brown trout is a native of Europe and since 1883 has been widely introduced in North America. The strains of the original German brown and Loch Leven trout have been so mixed that it is no longer possible to distinguish the two subspecies in this country. It is now common in the Clark Fork, Bitterroot and Blackfoot drainages.

The general color of the brown trout has a more brownish or yellowish tinge than other trout of the area. The relatively large spots are brown

to black and only slightly developed on the caudal fin. There are a few red spots on the sides, often surrounded with blue. There are 10-11 rays in dorsal and anal fins, and usually about 125 scales in the lateral line. The old males develop a hooked snout. The young may be distinguished by their orange adipose fin and by dark specklings on the abdomen.

Brown trout are hardier than either cutthroat or rainbow. They are able to tolerate higher water temperature, lower oxygen concentration, and greater silting and contamination of the water. Also they are more difficult to catch. They are thus of value in streams that would otherwise be barren of trout. Inasmuch as most of western Montana's waters are still pure, it is doubtful that the introduction of brown trout has been beneficial, especially if it is desirable to maintain the natural fish fauna. Brown trout are considered detrimental to other trout since they compete for food, prey on other trout, and are accused of eating fish eggs.

Under favorable conditions brown trout may grow to over 25 pounds in weight. Ten pounds is about the maximum for the upper Columbia. They rise to a fly, but the larger ones are usually caught with bait or spinner. Their ability to put up a fight is less than that of rainbow or most cutthroat. Rivers, spring fed sloughs and larger streams provide the best brown trout fishing. They are not much of a lake fish.

Brown trout up to 9 inches appear to be harmless insect feeders, but as they grow larger they become predaceous feeders—as much as 70% of their diet depending on fish. A few stomachs of medium sized fish from the upper Clarkfork contained dragon-fly nymphs, snails, scuds and redside shiners. Birds, mice and frogs also have been reported as dietary items.

The spawning season of brown trout is in the fall and early winter. The choice of spawning ground and breeding behavior is similar to that of other salmonids (see cutthroat trout).

CUTTHROAT TROUT — Some of the common names this fish is called are native trout, black-spotted trout, flat trout, red-throated trout, red-belly, and mountain trout. The cutthroat and Dolly Varden are the only salmonids native to western Montana.

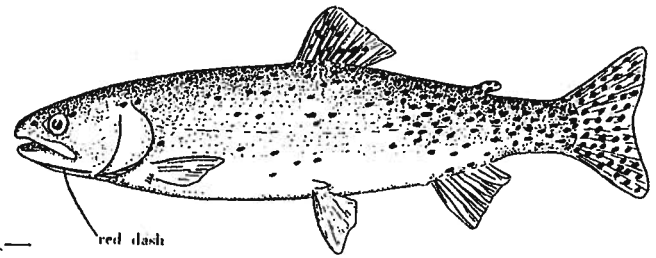


Fig. 21—

There are considered to be two principal subspecies of cutthroats: the Yellowstone cutthroat *(S. clarki lewisi)* and the coastal cutthroat *(S. c. clarki)*. The specific and subspecific names were given to aptly honor Captains William Clark and Meriwether Lewis, the great explorers. The Yellowstone cutthroat is indigenous to headwaters of both sides of the Continental Divide; the coastal cutthroat is native only to the west side. Typically, the coastal form has fewer scales and more numerous and smaller black spots. Yellowstone cutthroat have few spots on the head, most of the spots being confined to the back and sides posterior to the dorsal fin. Only a few waters, such as the upper reaches of the South Fork of the Flathead, have pure strains of the original cutthroat left. Different races of coastal and Yellowstone cutthroat have been planted and have evidently bred with the native populations. Introduced rainbow trout have also crossed with the cutthroat. The result is a hodge-podge.

The following description of the typical cutthroat is taken largely from Miller (1950). The most conspicuous character is the presence of a red or orange dash on each side of the jaw along the dentary. This color is weaker in young fish and fades rapidly after death. Black spots are usually larger and less diffuse than on rainbow. Local cutthroat have noticeably fewer black spots on the anterior part of the body. Fins are usually of a uniform color, there is little evidence of colored borders. A rosy wash or narrow red band sometimes present on sides, but not so broad and well developed as on rainbow. Hyoid (tongue) teeth usually present, but small and difficult to detect; lower jaw of adults longer than rainbow, 1.6-2.1 times in head; 143-230 scales along the side; 27-45 pyloric caeca; and 10-11 rays in anal fin.

Cutthroat trout are present in all the suitable waters of western Montana. In most streams and lakes, however, they have be-

come scarce because of intense fishing, construction of barriers across their migratory routes, and introduction of exotic species. Some small streams, like Dirty Ike Creek near Clinton and Pearson Creek near Ovando, support populations of small cutthroat although their flow of water in the summer is hardly more than a trickle. Scales from these fish show they are not all young, they are stunted. On rare occasions cutthroat weighing over 10 pounds have been caught from lakes. The majority taken weigh from less than ½ a pound to 5 pounds. Dry fly, wet fly, spinner, and bait are all used to catch them - the most effective depending upon the season, the time of day, the weather, and the type of water. Although cutthroat are splendid fighters and will make good runs, they do not often break water in the rainbow trout fashion.

Insects are undoubtedly the chief food of cutthroat. Among the more important insect groups utilized are the adults and larval or nymphal stages of caddis-flies, may-flies, stone-flies, and true flies. The second most important food is fish. Reports suggest that lake cutthroat consume more fish than stream cutthroat, and that this food is taken most frequently by the larger individuals. Freshwater shrimp or scuds, beetles, bees, and ants are eaten if available. Dietary items depend to a large extent on availability. Ten small cutthroat seined from Nevada Creek near Helmville contained nothing but snow berries, yet a thorough study of their feeding habits would undoubtedly show these berries to be of minor importance.

Cutthroat apparently do not become sexually mature until they are at least three years old. The spawning season is in the spring and early summer. It varies with different populations, but as a general rule commences 3 to 5 weeks after the ice has broken up. Fish at higher elevations spawn later than those at lower elevations. The cutthroat seeks gravel riffles of a stream, and when in lakes they run up the inlets rather than using the outlets. The distance traveled to the spawning grounds also varies with populations. At least some races of cutthroat swim over 2 miles, whereas other runs may be less than a hundred yards. The distance traveled and the tributaries chosen by cutthroat to find a suitable spawning area are perhaps a particular instinct of the population. Hence the planting of "outside" fish is less likely to establish a

self propagating population than is commonly believed. A better management practice is to conserve the local reproducing fish.

It is usual for the redds to be constructed just above a riffle. The female turns on her side, presses her tail down flat against the gravel, and flaps it vigorously up and down. It may take her over 4 hours to construct a single redd. The male hangs about, chasing away intruders and occasionally giving the female a courtship nudge. The size of the nest depends on the size of the fish. It is often about a foot in diameter and 4 or 5 inches deep. When the nest is completed, the female lies in it with the male beside her. Milt and eggs are deposited simultaneously. The female next moves a short distance upstream and commences digging another depression. This covers the eggs in the redd below. Many times a number of redds are constructed in successive days and nights, and the female continues spawning until depleted of most of her eggs. After spawning is completed, there is no true guarding of the redd. The fish are gaunt and in poor flesh following their reproductive act, but they do not die; a few even return to spawn the following year.

Cutthroat trout are on the way out. Rainbow trout, brown trout and brook trout are taking over more and more of their haunts. Only in a few isolated lakes, in streams above obstructing log jams, and in streams of primitive areas are they to be found in numbers and untouched by hybridization. Every effort should be made to preserve this native. Besides their ability to fight, their meat is considered by many to be the most delectable of all trout.

RAINBOW TROUT — There are a number of "strains" of rainbow trout that may or may not be valid subspecies. At any rate, the steelhead, Kamloops and rainbow are now considered to be one species. The steelhead is the anadromous (ocean running) form. Originally the rainbow were confined to coastwise streams of the Pacific. They soon became a favorite for hatchery culture inasmuch as they are easy to handle, grow rapidly, and are believed to be more disease resistant than other trout. This, with their fighting qualities, has led to widespread transplantation. The mixing in hatcheries of rainbow from different areas as well as plantings have largely obliterated the original races. In west-

ern Montana rainbow are not taken as frequently from small headwater streams as cutthroat are, but are widespread in most of the lakes and larger streams. In some localities they have become inextricably mixed with the cutthroat. Planted rainbow have been substituting for the cutthroat which are probably less capable of existing under the conditions of advancing civilization.

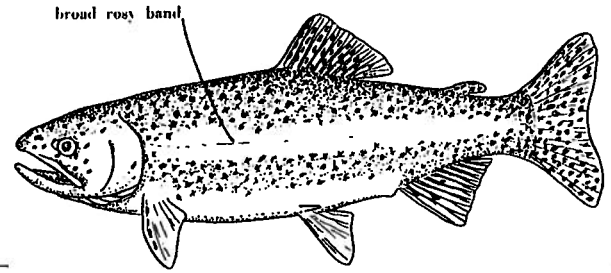


Fig. 22—

Although rainbow may possess a faint red or yellow dash on each side of the lower jaw, it is frequently absent and never as intense as on cutthroat. The spots are smaller, more irregular in size, and more diffuse than on cutthroat; the head particularly is more spotted. The anal, pelvic and dorsal fins frequently have a light anterior border. There is usually a well-developed, broad red to rosy band on the sides. The cheeks and opercles are rosy. The head is blunter than that of cutthroat; the lower jaw is shorter, 1.9-2.2 times in length of head. Dorsal and anal fins usually with 11 rays; pyloric caeca number 39-80; scales larger than those of cutthroat, 120-150 in lateral line. Young rainbow can usually be separated from young cutthroat in that their caudal fin is spotless whereas the caudal of cutthroat is spotted.

Observations indicate that rainbow move further than either brown trout or brook trout, and that they distribute themselves in deeper, lower stretches of streams than either cutthroat or brook trout. They do well in lakes as well as in streams. The maximum size locally is from 10 to 15 pounds, chiefly in lakes. For fly fishermen, the rainbow is the king of trout. They will often dash clear of the water to seize the fly and make repeated runs and leaps after hooked.

The food of rainbow resembles that of other trout. Insects form the bulk of the diet for young fish. As they become larger, there

is a shift to feeding on fish, which may compose over 70% of the bulk taken, but they are able to shift back to invertebrates when small fish become scarce. Green algae is also consumed to some extent.

The spawning season varies from October to July. Typically, rainbow spawn in the spring, April to May usually; but fall-spawning races have been developed, and at high elevations or in particularly cold spring seasons spawning may be delayed until mid-July. The spawning act resembles that of the cutthroat.

Of all the exotic species of fish introduced into western Montana, the rainbow is undoubtedly the most desirable. As the native Dolly Varden and cutthroat continue to be depleted, the rainbow takes their place as a sport fish. Whether they will be successful in propagating themselves remains to be seen.

GOLDEN TROUT — This trout comes from the Kern River of California and has been successfully introduced in a few high lakes in Montana. Sky Lake of Lincoln County has provided nice catches of the species. Golden trout are regarded as having rainbow ancestry - the reduction in the size of the scales and usual retention of parr marks is perhaps associated with the alpine conditions of their typical habitat.

Golden trout are the most gorgeously colored trout in the world. Introduction into new localities is often attended by loss of color and there is much individual variation, but the general color persists. The top of the head, back and upper sides are yellowish olive; a bright carmine stripe extends along the sides from the head to the caudal fin; sides below lateral line are golden yellow; a red to orange-yellow band extends on the belly from the throat to the anal fin; dark, oblong parr marks generally retained on the sides; cheeks and operculum bright rosy; pelvics and anal fins tipped with white; black spots sparse, extending onto dorsal, adipose and caudal fins. The scales are very small, about 180 along the side.

Golden trout do well in alpine lakes if sufficient food is available, but they do not attain the size of other trout. In California the most important food items were found to be the larvae of midges and caddis-flies. Scuds, may-flies, beetles, ants and wasps were also found in their stomachs.

V. Suckers

Family Catostomidae

The two species of suckers which inhabit western Montana are easily identified as belonging to the family Catostomidae. Members of the family are typified by their small, ventral mouth and fleshy, papillose lips (Fig. 24). There are no teeth in the jaws, but the last pharyngeal arch, which must be dissected out to be observed, is provided with a single row of comb-like teeth (Fig. 23). Their closest relations are the minnows.

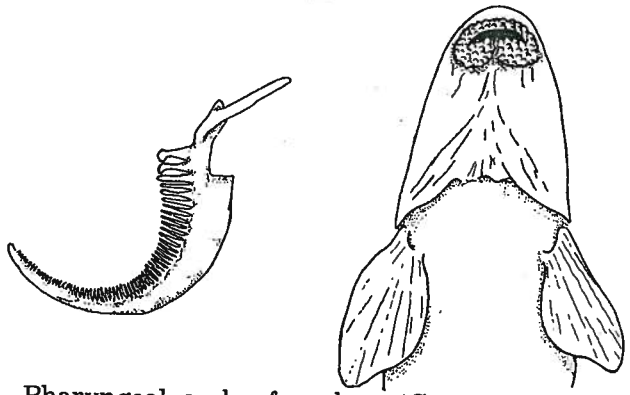


Fig. 23—Pharyngeal arch of sucker (*Catostomus sp.*) showing comb-like teeth.

Fig. 24—Ventral view of sucker (*Catostomus sp.*) showing ventral mouth fitted for sucking and surrounded by fleshy, papillose lips.

Key to Species

1. Dorsal fin with 13-15 rays, its base 1½ times its vertical height; scales in lateral line 62-80 (Fig. 25). ..... **LARGESCALE SUCKER** — *Catostomus macrocheilus* Girard

   Dorsal fin with 9-11 rays, most often with 10, its base not as long as its height; scales in lateral line 91-115 2

2. Eye small, contained 6.0-7.5 times in head of medium-sized specimens and 8.0-8.6 in large specimens; size large, up to 20 inches in total length; common (Fig. 26). ..... **LONGNOSE SUCKER** — *Catostomus catostomus subsp.* (Forster)

   Eye larger in typical specimens, contained 5.0-6.0 times in head; size small, adults 7-8 inches in total length; rare. Other characters are practically identical to longnose sucker (Fig. 27). ..... **PYGMY LONGNOSE SUCKER** — *Catostomus catostomus pocatello* Gilbert and Evermann

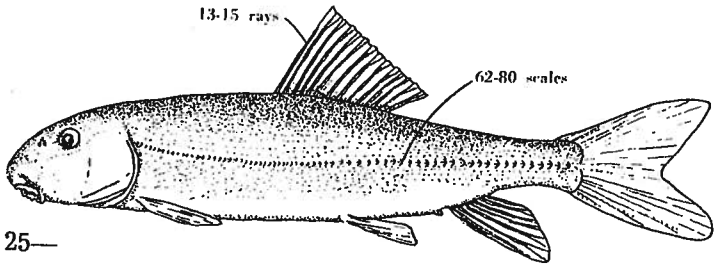


Fig. 25—

LARGESCALE SUCKER — Formerly termed the course-scaled sucker. It is found only west of the Divide.

The back and sides are dark olive, the belly white to yellow. Breeding males develop tubercles on the head and anal fin. Body elongate, almost cylindrical in section; dorsal rays 13-15; anal rays 7; pectoral rays 18-22; most often 20-22; scales in lateral line 62-80; lower lips broad and fleshy, deeply incised with 1-2 rows of papillae across isthmus; upper lip with 3-5 main rows of papillae; head rounded in profile, its depth through orbits greater than snout length; caudal peduncle slender, its least depth in medium-sized specimens about 13 times in standard length; length to 24 inches.

Largescale suckers are common in the rivers and particularly in the lakes. The longnose suckers frequent the same habitat but are also taken in small headwater streams. Although bony, their flesh is edible.

Suckers are bottom feeders, consuming insect larvae, snails, water fleas, etc. mixed with some plant material and bottom ooze. There are a number of accounts which report their feeding on fish eggs. They may be considered as food competitors of sport fish, and of course they also may be undesirable if they feed extensively on trout eggs, but this has not been proven. However, the sucker should not be condemned as an objectionable fish. Their numerous young make a valuable contribution to the diet of trout and act as a buffer to small salmon and trout against such predators as kingfishers. The increase of suckers in a body of water does not indicate that they are responsible for the decrease in numbers of sport fish. Rather it is symptomatic of the reduction of sport fish that normally prey on suckers.

Spawning occurs in the spring, usually in April and May. This takes place along lake margins or in ox bows of rivers and up smaller streams. The yellow eggs are small and adhesive. We counted over 20,000 eggs in the ovaries of a 12 inch fish. The young hatch in about two weeks. At this time their mouth is terminal rather than ventral. For six months or more they remain in large schools in the quiet, shallow back waters. The tremendous reproductive potential of these fish makes it difficult to control their numbers by such means as trapping.

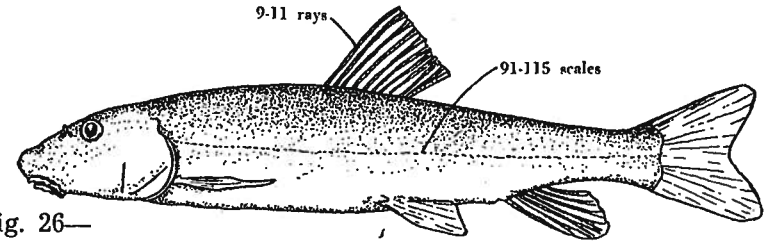


Fig. 26—

LONGNOSE SUCKER — Two other names applied to this fish are fine-scaled sucker and sturgeon sucker. Our collections indicate that it is more numerous in western Montana than the largescale sucker.

The shape of the body and general color are similar to the largescale sucker. Breeding males have a wide rosy band on the sides and develop tubercles on the head and anal fin. The females also may have tubercles, but they are generally not as pronounced as those of the male. Anal rays 7; dorsal rays 9-11; pectoral rays 16-22, most often 20; scales in lateral line 91-115; upper lip narrow with only 2-3 main rows of papillae; lower lip deeply incised with 1-2 rows of papillae across the isthmus; head barely rounded on top, its depth through orbits about the same as snout length; least depth of caudal peduncle of medium-sized specimens about 11 times in standard length. They rarely grow to more than 20 inches in length.

This same sucker apparently lives on the east side of the Continental Divide where it grades into *C. c. griseus* of the plains. The latter has a broader upper lip, wider head and back, and deeper caudal peduncle. Perhaps there should be no subspecies in the *C. catostomus* group. They are in need of further investigation and revision.

The habits of the longnose sucker are similar to those of the largescale sucker. The adults frequent deep water during the heat of summer days, but in the evening and night they approach the shores to feed. A large amount of algae, a plant, is said to be included in their diet. Short spawning migrations up streams generally occur in May and June.

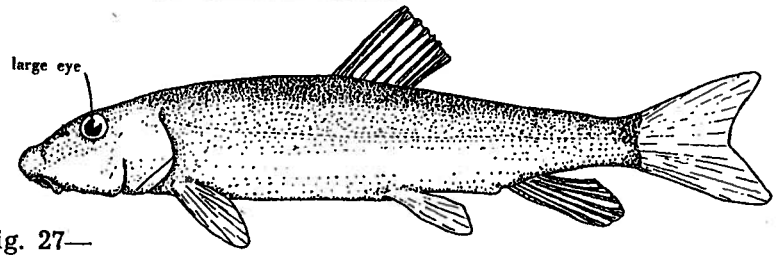


Fig. 27—

PYGMY LONGNOSE SUCKER — This sucker is a dwarf form of the longnose sucker. Except for its smaller size and larger eye, it is a replica of the larger form. The only place we have collected it is from Fish Trap Lake in Sanders County. Hubbs and Schultz (1932) claim to have taken it from Brown's Gulch Creek and Flint Creek in the upper Clark Fork. Little is known of its life history. Specimens taken from Fish Trap Lake were spawning in the outlet in the first of June. The males had a bright lateral stripe and were highly tuberculate. They measured 5½ to 6½ inches long.

VI. Minnows

Family Cyprinidae

By common conception, any small fish is called a "minnow." Technically the minnows are a definite family of fish, and some species, such as the squawfish, may grow to over 16 inches in length. The family is characterized by lacking teeth in the jaws, but having pharyngeal teeth in the throat (Fig. 28), and except for the carp and goldfish by possessing only soft rays in the fins. In these respects they are similar to the suckers, but the pharyngeal teeth are not set in a fine, comb-like row and the mouth is not fleshy or fitted for sucking.

Comprised in the minnows is a larger number of species than in any other family of North American fresh-water fish. Western Montana is unique in having only four species native to its waters.

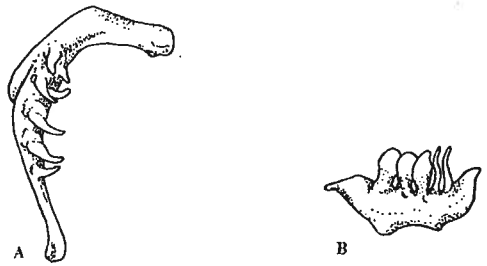


Fig. 28—Pharyngeal arches and teeth of minnows.
A. Left arch of northern squawfish (*Ptychocheilus oregonense*) having a count of 2, 5.

B. Left arch of peamouth chub (*Mylocheilus caurinum*) showing molar type of teeth.

Key to Species

1. Dorsal and anal fins each with a strong spine; dorsal long with about 20 soft rays; two pairs of well-developed barbels on each side of the upper jaw (Fig. 30). ..... **CARP**
— *Cyprinus carpio* Linnaeus

No spines in fins; dorsal with 11 or fewer soft rays; barbels if present minute and only one at each angle of the jaw 2

2. No barbels present; mouth large, reaching to at least below a point between the nostrils and orbit 4

Small barbel present at each angle of jaw, difficult to see in small specimens (Fig. 29); mouth small, reaching only to below the nostrils 3

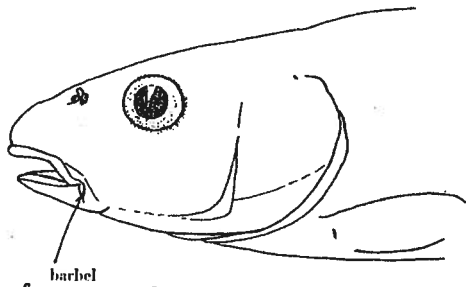


Fig. 29—Head of peamouth chub (*Mylocheilus caurinum*) illustrating the small barbel near the angle of the jaw.

3. Mouth ventral, almost sucker-like; head long with pointed snout overhanging mouth; premaxillaries not protractile; size small, seldom over 4 inches in length (Fig. 31). ..... **LONGNOSE DACE**
— *Rhinichthys cataractae* (Valenciennes)

Mouth horizontal, only slightly overhung by snout; premaxillaries protractile; size large, attaining 12 inches in length (Figs. 29 and 32). ..... **PEAMOUTH CHUB**
— *Mylocheilus caurinum* (Richardson)

4. Base of anal fin long, with 13-18 rays; 52-61 scales in lateral line; body deep and somewhat compressed; size small, largest seldom over 5 inches in length; brightly colored with red be-

hind the gill cover and at base of pectorals (Fig. 33). ..... **REDSIDE SHINER**
— *Richardsonius balteatus balteatus* (Richardson)

Base of anal fin short, with 8-9 rays; 68-76 scales in lateral line; size large, up to 18 inches; body slender and somewhat terete; color dull (Fig. 34). ..... **NORTHERN SQUAWFISH**
— *Ptychocheilus oregonense* (Richardson)

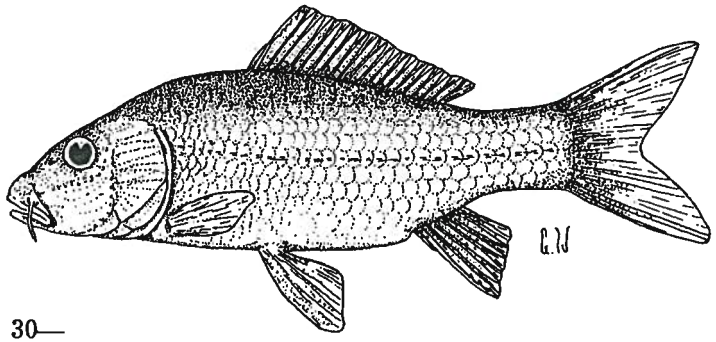


Fig. 30—

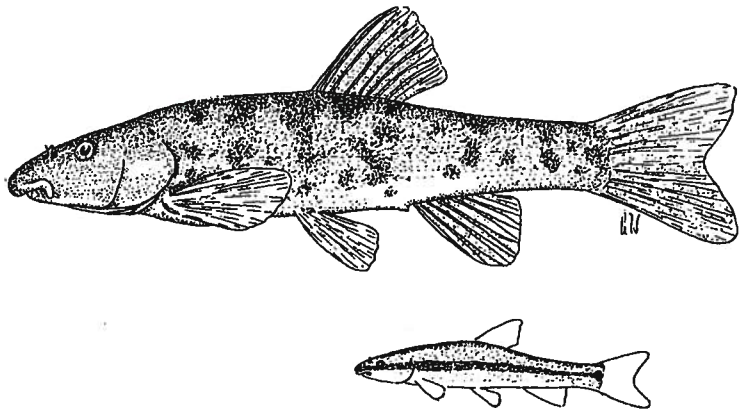
CARP — The carp has been widely introduced throughout the world. It originated in the basin of the Black and Caspian Seas. In the Middle Ages it was brought to the Island of Cyprus, hence the name *Cyprinus,* and then to Europe and eastern Asia. Apparently the species was brought to North America in 1872 and has since spread over the temperate part of the continent. It is an extremely hardy fish, easy to rear and harvest for commercial purposes. The Germans especially have developed techniques for their culture. The meat is considered excellent by Asians and many Europeans. German families would always have a large baked carp included in the Christmas meal. Unfortunately the carp is hardly utilized in the United States.

The color is dark green to bluish above shading to muddy yellow below. Occasionally they may be a bright yellow. The body is deep and compressed; small mouth with two pairs of long barbels on each side of the jaw; the dorsal fin long with the first ray a serrated spine followed by

17-21 soft rays; anal fin also preceded by a spine; pharyngeal teeth 1,1,3-3,1,1. In scaled races the scales are large. The mirror carp is only partly scaled with exceptionally large scales. The leather carp is scaleless.

A few ponds around the Kootenai River district of Montana have been planted with carp. Subsequently an effort has been made to eradicate them. If we desire to keep our natural fauna intact, carp certainly should not be introduced in any of the waters.

Under favorable conditions, carp may attain a length of 30 inches and a weight of 50 pounds. Although typically a fish of warm, sluggish water, they are capable of inhabiting swift, cool trout streams. They are omnivorous in their diet, taking plankton, aquatic insects, worms and molluscs, and also feeding extensively on plant material. The spawning season is in the spring or early summer when the water temperature is around 60° F. The number of eggs produced is large; a 5-6 pound fish produces an average of 500,000. These are laid in the shallow water usually over vegetation to which the adhesive eggs stick. The fish splash about considerably during the act of breeding.



Juvenile

Fig. 31—

LONGNOSE DACE — The species occurs from coast to coast in North America.

The color of this little cyprinid is light-olive to black on the back, dark

blotches on the sides, and silver to yellow on the belly and throat. The juveniles have a marked wide, black band which runs along the sides and over the snout. The head is long with a pointed snout overhanging the mouth; mouth ventral, almost sucker-like; a small barbel at the tip of the maxillary; premaxillaries not protractile; 60-68 scales in lateral line; dorsal rays 8; anal rays 7; pharyngeal teeth generally 2,4-4,2. The length is seldom over 4 inches in this country.

Longnose dace exhibit a decided preference for the swift, cold water of rivers and streams rather than for lakes. Although widespread, they are infrequently seen and are difficult to collect without an electric shocker. The adults do not swim in schools like so many of the cyprinids, but remain mostly on the bottom in the shelter of a rock or branch. They may be present in some abundance even though their presence is difficult to detect.

Practically nothing is known of the habits of the dace in the Northwest. However, we may assume that they are similar to the same or related species in other areas. The most important item of food is insects: aquatic mayflies, caddis-flies, dragon-flies, larvae of midges, and some terrestrial insects. Occasionally they take fish eggs. In turn, dace are devoured by game fish. Their remains are frequently found in stomachs of trout caught in the Blackfoot River.

Breeding occurs in the late spring or early summer. No nest is constructed but the males guard a territory over which they entice the females to spawn. This territory is generally in water only a few inches deep over a gravel bottom. An occasional hybrid of the dace and redside shiner is found in western Montana.

PEAMOUTH CHUB — Until a few years ago the specific name of this fish was *caurinus*. It was altered to *caurinum* to agree with the gender of the genus.

The peamouth chub is one of the most abundant species in the Columbia River and its tributaries, the coastal streams of Oregon and Washington, and the Fraser and Skeena Rivers of British Columbia. It is limited in its distribution up the Snake River by the Shoshone Falls. The peamouth appears to be one of the few members of its family to enter the sea, which may explain its presence on Vancouver and Nelson Islands.

This chub is dark on the back and silvery below. There are two dusky lateral stripes on the sides and red at the angles of the jaw. Like the other cyprinids of the area, they develop small tubercles over the head and back when they are approaching their breeding condition. Mouth horizontal, slightly overhung by snout, and reaches only to the middle of the nostril; a small barbel present at each angle of the jaw; premaxillaries are protractile; scales in lateral line 68-79; dorsal and anal fins with 8 rays; pharyngeal teeth 1,5-5,1 but variable; largest teeth of the molar type (Fig. 28 B); body shape slender, little compressed. Specimens up to 13 inches in length have been taken from Seeley Lake.

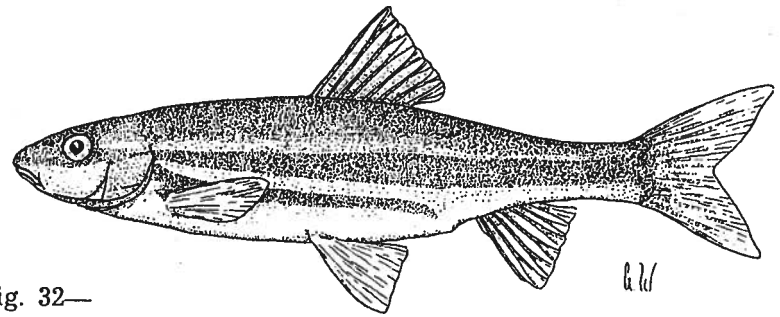


Fig. 32—

The meat of this fish is said to be bony and insipid. Still, at the turn of the century they were served in the hotels of Polson under the appellation of "whitefish," and have been described as a food fish of some importance in Washington and Oregon. As our hunting and fishing resources dwindle and the human population increases, this fish may become more important as a source for both food and sport. They will take both bait and artificial fly.

Peamouth are typically a fish of lakes and rivers. As may be expected from the small mouth, lack of jaw teeth, and weak jaws, they are not a voracious fish. The young feed chiefly on waterfleas, scuds, midge larvae, and other small insects. The principal food of the adults consists of aquatic and terrestrial insects and molluscs. Only rarely are fish eggs or fish remains found in their stomachs. The species may be considered as valuable forage for large trout and salmon.

Spawning occurs in the very late spring or early summer. At this time the fish congregate in the shallows over gravel and rubble where they spawn in groups. The eggs simply settle to the bottom where they become attached to stones and detritus. The newly hatched young remain in schools along the shoreline until the last of the summer, at which time they apparently move to deeper water. Even as adults they tend to remain schooled.

Hybridization is known to occur between the peamouth chub and northern squawfish and between the peamouth chub and redside shiner in Montana.

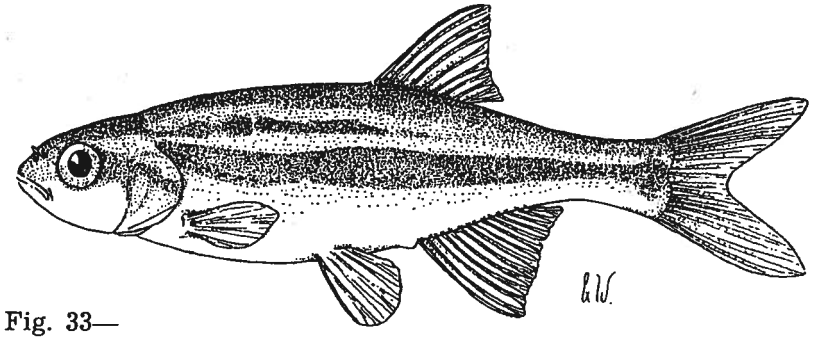


Fig. 33—

REDSIDE SHINER — Six and one-half inches is as large as this beautiful minnow grows. The top of the head, nape and back are dark olive; a dark stripe follows the lateral line. A red wash of varying intensity is located just behind the gill cover, at the base of the pectorals and as a band narrowing towards the anal fin. A metallic gold half-moon encircles the lower part of the orbit and the same color is evident on the fins and sides. The males are more colorful than the females and breeding tubercles are developed.

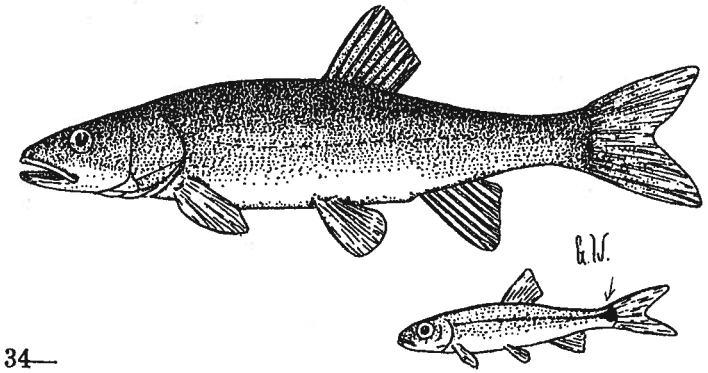
Anal rays 13-18; dorsal rays 8-11; scales in lateral line 52-61; pharyngeal teeth typically 2,5-4,2; body deep, somewhat compressed, depth about 3.5 in standard length; mouth small, oblique, not overhung by snout; eye large, about 3.4 in head length.

These shiners inhabit the Skeena and Fraser systems of British

Columbia, coastal streams of Washington and Oregon, and the Columbia system except above the Snake River Falls in Idaho. They are found in lakes, ponds and rivers but seldom in rapid, small streams. The fry subsist on diatoms, scuds, water-fleas and other small planktonic organisms. Larger shiners feed extensively on aquatic insects, small snails, etc. Like most fish, they will feed on eggs and fry of their own and other species, but not extensively. Inasmuch as they are small and hardly predacious, and serve as bait and forage, they are perhaps one of the most beneficial species in our waters.

Redside shiners almost invariably school together. In the protracted spawning season, April to early July, they gather over gravel riffles or among aquatic plants to lay and fertilize the eggs. There is no definite "pairing off' and no nest is built. The larval fish hatch in about 15 days.

This species hybridizes with the peamouth chub, the northern squawfish, and the longnose dace.



Juvenile

Fig. 34—

NORTHERN SQUAWFISH — This fish was formerly named simply "squawfish" and the specific name spelled *oregonensis* rather than *oregonense.*

The color is rather drab. It is dark-olive, almost black, over the back, sides, and top of head. The belly and throat are silver to muddy-yellow. The fins are tinged with orange at spawning time. Juveniles of the species

have a distinctive black spot at the base of the caudal fin. Dorsal fin with 9 rays, a few with 8 or 10; anal fin with 8-9 rays; 68-76 scales in lateral line; pharyngeal teeth typically 2,5-4,2; body little compressed; head somewhat pointed with a large mouth which usually reaches to below the pupil or beyond. Small tubercles are developed over the top of the head and back prior to and during the spawning season. The size is large, up to 18 inches.

Northern squawfish are distributed in the Columbia, Skeena, and Fraser systems and the coastal drainages of Washington and Oregon. They are one of the most numerous fishes in the Columbia system. Although common, relatively little is known concerning their habits and life history. The young are found in large schools along the shores of lakes and quiet backwaters of rivers and streams. They probably serve as forage for larger fish. The young soon commence feeding on insects and other aquatic organisms. During a hatch of winged insects both large and small squawfish may frequently be seen breaking water in large numbers to feed. Artificial flies will attract them, but after a few short runs they are easily landed. With proper cooking and seasoning, the flesh of squawfish is fair eating, albeit bony.

Not only are squawfish competitors of sport fish, they are also predacious on other fish, and for this reason have been widely condemned. In British Columbia it is thought that they are a principal factor in depletion of young salmon and trout.

Squawfish ascend streams to spawn, or lay their eggs over gravelly margins of lakes. This occurs from May to the first part of July. A prodigious number of small adhesive eggs are produced. One female only 9½ inches long contained 7,580 eggs. The growth is rapid—they attain a length of about 5 inches in their second year. One large fish 21½ inches long was aged as 19 years by the rings on its opercular bones.

Hybrids of northern squawfish and peamouth chub occur frequently in Flathead Lake, and the cross between squawfish and redside shiner is common in a warm spring slough near Bearmouth.

VII. North American Catfish

Family Ictaluridae (=Ameiuridae)

The long whisker-like barbels about the mouth is the most striking trade mark of the North American catfish. They are all scaleless fishes with an adipose fin and with the first ray in the dorsal fin and each pectoral fin developed into a spine.

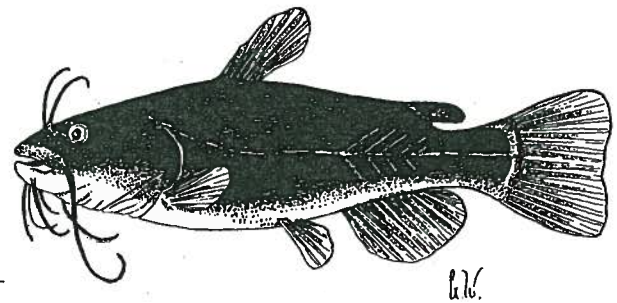


Fig. 35—

NORTHERN BLACK BULLHEAD — *Ictalurus melas melas* (Rafinesque) *(=Ameiurus m. melas)*. The black bullhead ranges from New York west to North Dakota and south into Kansas and Tennessee. They have been introduced into a few farm ponds in the Flathead Valley and Frenchtown Valley and are also to be found in irrigation ditches of those areas and in Polson Bay of Flathead Lake. They have a marked preference for quiet, muddy waters. As practically no one fishes for them and as they may be harmful to other fish, they probably should never have been planted in western Montana.

Catfish are hardy, prolific, and their habits and structure render them comparatively safe from enemies. They will bite on practically any kind of bait. Their flesh is white and flaky and of good flavor, but for proper cooking they must be skinned, which is quite a chore since their hide is like tough rubber.

The black bullhead seldom exceeds 10 inches in length or a weight of over 2 pounds; color on top and sides is black or a yellowish-tan (they change color readily); throat and belly are white or yellow; membrane of anal fin is darkly pigmented and there is frequently a light color band at the base of caudal. There are 8 barbels about the mouth; posterior part of adipose fin is free; caudal fin is square or slightly emarginate; dorsal

fin and pectoral fins each with an anterior spine which is smooth or only slightly roughened; dorsal fin with 7 soft rays; and anal fin with 17-21 rays (Fig. 35).

In diet the bullheads are omnivorous. Their principal food consists of aquatic insects, crustaceans and molluscs. However they also feed on other fish and on vegetable matter.

The success of catfish can be attributed in part to the care they take of their eggs and young. Breeding takes places from the last of April to the first of June. The eggs may be attached to plants or roots, but more frequently they are laid in depressions dug by both parents along the shore. The male carefully guards the nest, chasing away intruders and fanning the eggs. After the eggs have hatched and the yolk is absorbed so the young can swim about, the male will often continue tending them. It is a fascinating sight to watch a closely bunched school of black, little round bullheads with their wary parent in attendance.

VIII. Cods

Family Gadidae

The burbot is the only fresh-water representative of the cod family. It is easily told from other local fish by the presence of a single barbel near the tip of the chin, by the small, imbedded scales, and by the long dorsal and anal fins.

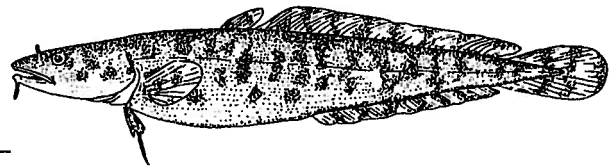


Fig. 36—

BURBOT —*Lota lota* (Linnaeus). The burbot has a great many common names, being variously called ling, lawyer, eelpout, methy, dogfish, fresh-water cod, lake cusk, loche, lush, and maria.

The range of the burbot is in the rivers and lakes of northern

North America. It is present in the Missouri and Kootenai systems of Montana but apparently is absent from the Clark Fork.

Body slender, eel-like, except in large specimens which become deeper anteriorly; head small and wide, somewhat flat on top; pelvic fins placed below and in front of pectoral fins; caudal fin rounded; dorsal fin with soft rays only, in two parts, the first with 11-13 rays and the second with 72-76 rays; anal fin long with 63-68 rays; scales extremely small; a single barbel present near the tip of the lower jaw and a small barbel at each anterior nostril. The color is dark olive to yellowish-slate with darker blotches or marbling on the back, sides and fins (Fig. 36).

Burbot as heavy as 24 pounds have been reported and it is still not uncommon to catch fish weighing 10 pounds. During the summer they are taken most frequently in deep water by means of set lines or nets, whereas during the winter they are caught in shallow water by spearing through holes in the ice or with bait minnows. They are most active at night so fishing is more fruitful after dark. In some sections of the country these fish are favored as food, but in many other areas they are used only for the manufacture of pet food or fertilizer. As January to March is the best time of year to fish for burbot, they provide a sport when the season for other species is closed.

Until their third year of life burbot feed extensively on such invertebrates as scuds, snails, clams, and insects - only a few small fish are eaten. However, after their third year more and more fish are eaten, the kind depending largely on availability. One large burbot was reported to have consumed 179 fish in a single meal. Because of their fish-eating habits, the burbot, especially if abundant, are generally condemned as being injurious to game fish. They feed mostly at night and seem to eat more during the winter than during the summer.

Spawning occurs in December, January and February. The females produce a tremendous number of eggs, over a million for an 8 pound fish. The breeding behavior of burbot is most unusual. This takes place only at night in water from 1 to 4 feet in depth when a number of males and females come together and form a ball of squirming bodies. Cahn (1936) described this phenomenon as " . . . a tangled, nearly globular mass of moving, writhing lawyers. The fish were all intertwined, slithering over one another

constantly, slowly, weaving in and out of the living ball. About ten or a dozen fish were involved . . . ". During this behavior the eggs and milt are broadcast and settle to the bottom where the eggs undergo development and hatch in from one to two months, depending on water temperature.

IX. Perch

Family Percidae

The perch family includes the pikeperches, saugers, and darters as well as the better known yellow perch. None of them are native to Montana west of the Continental Divide. The distinctive characters of the family are the presence of two separate dorsal fins, the first supported by spiny rays and the second by soft rays, and having only one or two spines in the anal fin. The only other family it might be confused with locally is the sunfish family which includes the largemouth bass. The largemouth has three spines in the anal fin, and although the dorsal fin is deeply cleft, the spinous portion is connected by a membrane to the soft-rayed portion.

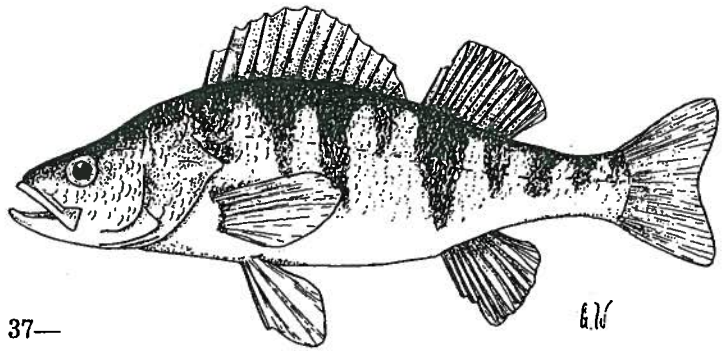


Fig. 37—

YELLOW PERCH — *Perca flavescens* (Mitchill). The yellow perch originally ranged from central and eastern Canada to South

Carolina and Kansas. It has been planted in many places in the West.

As its name implies, the general color is yellowish. The back is greenish and the underparts are dirty white; there are 6-8 broad, vertical black bands which extend ventrally onto the belly; the lower fins are orange in breeding males. The body is somewhat compressed, back arched, and head with a concave profile; pelvic fins are close together and just behind the pectoral fins. Many small teeth in mouth; single spine on operculum; dorsal fins separate, the first with 13-15 spines, the second with 13-15 soft rays; anal fin with 2 spines and 7 soft rays; body and cheek with ctenoid scales, 55-70 scales along lateral line (Fig. 37).

Yellow perch are one of the commonest and most widely distributed fishes in the Midwest. They form an important part of the commercial catch besides providing sport and food for the angler. It is seldom that a yellow perch attains more than 10 inches in length, and locally it is rare to catch one weighing more than ¾ of a pound. The record size was a 4¼ pounder taken in the Delaware River, New Jersey, back in 1865.

Inasmuch as yellow perch are hardy and prolific, they spread rapidly. Their favorite haunts are weedy lakes and quiet holes of sluggish streams, but they are adaptable and can inhabit good trout waters. From plantings in the Clearwater chain of lakes they have extended down the Clearwater River and far up and down the Blackfoot River—the latter is a swift body of water. They are also not uncommon in the Pleasant, Flathead and Swan Valleys. In former years the margins of Seeley Lake used to have schools of young redside shiners, squawfish and suckers—these natives have been largely replaced by small perch.

It is most unfortunate that yellow perch were brought into western Montana. They have undoubtedly upset nature's balance and have contributed to the depletion of the native fish. Although they are a good pan fish, they are troublesome to scale and clean. They never attain much size in this area and many of the populations are overcrowded and stunted. They bite readily on worms, grasshoppers and minnows, but with more worthy trout fishing handy, it is rarely that even small boys attempt to catch them.

The feeding habits of perch also make them objectionable for our waters. The young feed on small aquatic organisms, graduate

to feeding on scuds and aquatic insects, and finally the adults commence feeding on fish. If not a direct predator on trout, they at least reduce the food supply of trout. On the credit side, however, it should be mentioned that perch are found in the stomachs of large Dolly Varden and trout, and that perhaps in the future they will be utilized more by the sport fisherman.

Within a week or so after the ice has broken up and melted, yellow perch commence to spawn. Ripe females come close to the shores, each followed by a retinue of from 2 to 12 males. The eggs are laid in zigzag, flattened strings of gelatinous material, somewhat resembling masses of frog's eggs. These adhere in streamers to submerged plants, brush and fallen tree limbs. Buckets of these eggs have been collected from Elbow Lake, Clearwater drainage, in the last of April to the last of May.

X. Sunfish

Family Centrarchidae

The centrarchids are a diverse group of North American freshwater fishes. They comprise many of the more important warmwater sport fish such as largemouth bass, smallmouth bass, warmouth, rock bass, Sacramento perch, crappies, and the many species of sunfish. None of them are native to western Montana. Members of the family have the spinous and soft-rayed portions connected into a single dorsal fin, rather than having two distinct fins as in the perch family. (The dorsal fin is almost divided in the largemouth bass.) The anal fin has 3-8 spines, the pelvic fins are each provided with a spine and are located close to the pectoral fins, and the scales are usually of the rough ctenoid type.

Key to Species

1. Body somewhat elongate, depth contained more than 3 times in total length; the spinous part of the dorsal fin separated from the soft-rayed part by a deep notch; scales 60-70 in lateral line; no red spot on operculum (Fig. 38). ..... **LARGEMOUTH BASS** — *Micropterus salmoides* (Lacepede)

Body short and deep; depth about 2½ times in total length; no deep notch between spinous and soft-rayed portions of dorsal fin; scales 40-50 in lateral line; scarlet spot at tip of operculum (Fig. 39). ..... **PUMPKINSEED** — *Lepomis gibbosus* (Linnaeus)

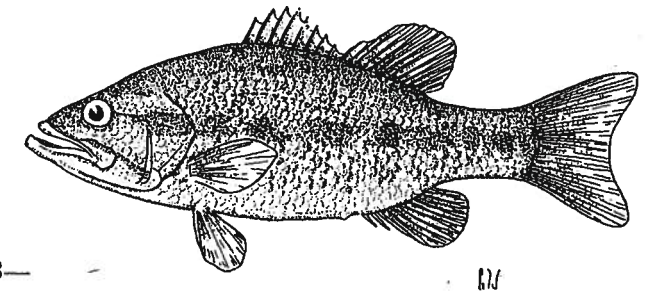


Fig. 38—

LARGEMOUTH BASS — Although the largemouth bass has many vernacular names, as may be expected in its wide range, people of the northwest usually call it by its proper name, or sometimes bigmouth bass or largemouth black bass. *Huro* used to be the generic name. The original distribution of the species was from southwest Canada throughout the Great Lakes and Mississippi Valley south to Florida and Mexico. It has been extensively introduced elsewhere.

The color is dark green over the back, metallic greenish-yellow on sides, and whiteish on underparts. There is a dark green to almost black, broken band radiating from the eye to the caudal fin. Many also have dark mottlings on the sides. The young have a distinct, black, broad band along the side from opercle to middle of caudal fin. The body is moderately deep, somewhat compressed; the mouth is large, extending well behind the eye in adults; the head is large with cheeks and gill covers scaled. The dorsal fin is almost divided into two parts, the last spine in the cleft less than ½ as long as the longest spines; there are 10 spines and 12-13 soft rays in the dorsal; anal fin with 3 spines and 10-11 soft rays; scales ctenoid, 58-69 in lateral line, and 9-12 in an oblique row across the cheek. The maximum weight of largemouth bass is around 15 pounds, but they seldom exceed 4 pounds in Montana waters.

A matter of frequent controversy among fishermen is the difference between the largemouth and smallmouth basses. The re-

lative length of the jaw is not always a good means of identifying them since the size of the mouth is variable and changes with age. Some characters of the smallmouth that differentiate it from the largemouth are greater number of scales in the lateral line, 68-81; more scales on the cheeks, 14-18 in a diagonal row; the dorsal fin is hardly emarginate; the upper jaw extends only to the middle of the eye; and the eye in life is redish. As smallmouth bass are associated with clear, cold lakes and streams, their introduction would upset the trout population more than largemouth which prefer weedy lakes and ponds and sluggish streams.

The young of largemouth bass feed first on small planktonic organisms, shift to surface and submerged insects as they become older, and by the time they are about three inches in length, their food consists primarily of fish if present in sufficient numbers. The adults will eat a wide variety of food including—besides small fish—insects, crayfish and frogs.

Largemouth bass are one of the most popular fishes in the central states. They are not considered to be the fighter the smallmouth is, but they are more widely distributed. Nine Pipes and Kicking Horse Reservoirs, the lower lakes of the Clearwater, and a number of ponds along the Flathead and Clark Forks Rivers offer some fair bass fishing in western Montana. They are hooked to some extent on wet and dry flies, but mostly with live bait, plugs, floating-diving and surface lures, and also spinners and bucktails cast into or near weedy patches.

Bass spawn between May and July when the water reaches a temperature of close to 60° F. The male cleans off an area over a bottom of gravel, sand or roots in water from 1 to 4 feet deep. He then urges a female into the nest. The adhesive, developing eggs are closely guarded by the male. There are about 700 to 12,000 fry which hatch out of nests of medium-sized bass. It requires about 10 days for the eggs to hatch, the length of time depending on water temperature.

PUMPKINSEED — Common sunfish, pond perch, and kiver are a few of the improper names the pumpkinseed goes by. Its home waters were from southern Canada and the Dakotas southward along the Atlantic seaboard to South Carolina and through the

northern part of the Mississippi Valley. It has become established in many small ponds in the western part of Montana and is now common in some of the warmer lakes, such as those in the lower part of the Clearwater chain.

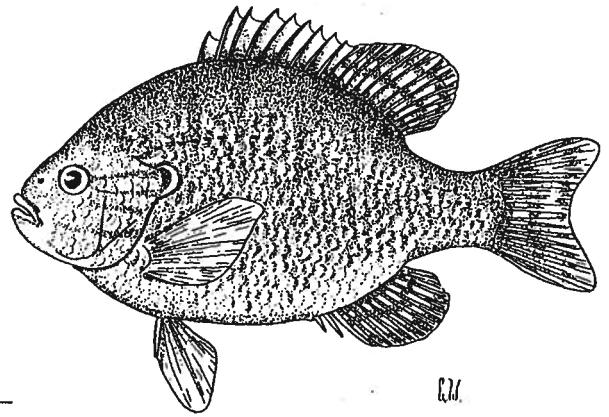


Fig. 39—

The pumpkinseed is readily distinguished from other local species. The body is very deep and compressed laterally. The color is dark greenish-olive above; there is a bluish sheen to sides and back; sides are blotched with dark marks mingled with orange; belly is yellow to orange; lower fins are orange; cheeks scaled and colored orange with wavy blue streaks; and very noticeable is a bright scarlet spot on posterior tip of gill cover — this fades after death. The small mouth is set at an angle and scarcely reaches the front of orbit; pelvic fins each with a spine and set close to pectoral fins; dorsal fin is not cleft, with 10 spines and 10-12 soft rays; anal fin with 3 spines, rarely 4, and 10 soft rays; there are 35-40 scales in lateral line; scales strongly ctenoid. Eight inches in length is close to their maximum size.

Most of the food taken by pumpkinseeds consists of scuds and a variety of insects. The larvae of midges are an important item, and snails, worms, and plant material are also frequently found in their stomachs. They may be caught with spinners and bait, and sometimes on a fly, but because of their small size and logy habits, they provide little sport. It is seldom that anyone in this part of the country fishes for them, and the value of their introduction is dubious. The long cold seasons in the state are not conducive to their growth, and since they are not harvested, they

have become overpopulated and stunted in many ponds. However, they are good bass forage, and there are some fat rascals in Placid Lake if anyone wishes to try for them.

Pumpkinseed nest from June to August. The nests are shallow depressions made in water 1½ to 4 feet deep over almost any kind of bottom. They are often built in colonies. From 1,000 to 15,000 eggs are deposited in a nest. As with most centrarchids, the males stay on or near the nest until the eggs have hatched.

XI. Sculpins

Family Cottidae

The family cottidae includes many species, most of them marine. The local fresh-water members are easily recognized by their small size, large broad heads with the eyes placed high, tapering bodies, long dorsal fin with spiny-rayed portion usually separate from the soft-rayed portion, no spines in the anal fin, expansive pectoral fins, and the body being scaleless.

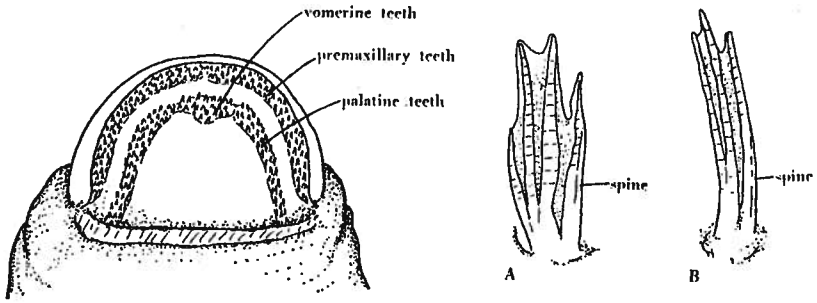


Fig. 40—Diagram of dentition in roof of mouth of Rocky Mountain mottled sculpin (*Cottus bairdi*).

Fig. 41—Pelvic fins of sculpins. The spine is slender and bound in flesh to the first soft-ray. Without dissection it appears as though the spine were a part of the ray.

A. Pelvic fin of Rocky Mountain mottled sculpin (*Cottus bairdi*) and torrent sculpin (*C. rhotheus*) with 1 spine and 4 rays.

B. Pelvic fin of slimy sculpin (*C. cognatus*) with 1 spine and 3 rays.

Key to Species

1. Palatine teeth absent (Fig. 40); pelvic fin usually with 1 spine and 3 rays (Figs. 41B and 42). ..... **SLIMY SCULPIN**
— *Cottus cognatus* Richardson

   Palatine teeth normally present; pelvic fin usually with 1 spine and 4 rays (Figs. 40 and 41A) 2

2. Lateral line incomplete, sensory pores not extending beyond the second dorsal fin; caudal peduncle deep, its least depth equal to or greater than length of orbit (Fig. 43). .....
..... **ROCKY MOUNTAIN MOTTLED SCULPIN**
— *Cottus bairdi punctulatus* (Gill)

   Lateral line sensory pores usually extending to base of caudal fin; caudal peduncle slender, its least depth less than length of orbit (Fig. 44). ..... **TORRENT SCULPIN**
—*Cottus rhotheus* (Rosa Smith)

The accepted common name for this group of fish is sculpin. Members of the family are also locally known as miller's thumb, blob, muddler, and especially bullhead. The latter name is unfortunate as it is used for species of the catfish family as well.

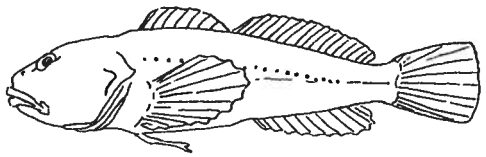


Fig. 42—

SLIMY SCULPIN—Other common names for this particular sculpin are slimy muddler and mottled sculpin. The species is distributed throughout the northern part of North America. It is the only sculpin so far taken from the Blackfoot, Bitterroot, and Clark Fork Rivers and their tributary streams.

The color is dark brown or grey with variable dark mottlings; dorsal, caudal and pectoral fins also mottled or with dark cross-bars; belly somewhat lighter. Palatine teeth are absent; pelvic fin usually with 1 spine and

3 rays; first dorsal fin with 7-9 spines; second dorsal with 15-18 rays; anal fin with 10-13 rays; sensory pores of lateral line not extending beyond second dorsal fin; least depth of caudal peduncle 10.7-12.0 times in standard length; prickles on body usually sparse. The largest specimens are only about 4 inches long.

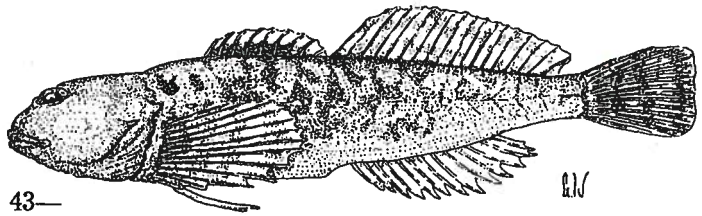


Fig. 43—

ROCKY MOUNTAIN MOTTLED SCULPIN — This sculpin used to be called Rocky Mountain sculpin with the scientific name of *C. punctulatus*. It is native to both sides of the Continental Divide: in the upper Missouri and upper Colorado. In 1954 Mr. Dan Block provided a number of fine specimens collected with an electric shocker from streams flowing into the upper part of the North Fork of the Flathead River. In counts and measurements they are identical to specimens collected from the Gallatin River in the Missouri basin. The species has not been taken in other waters of western Montana, including Flathead Lake.

Color similar to the slimy sculpin but mottlings generally darker; lower membrane of first dorsal fin usually black. Lateral line incomplete, sensory pores not extending beyond the second dorsal fin; palatine teeth normally present; the least depth of the caudal peduncle equal to or greater than the length of the orbit; first dorsal fin with 7-9 spines; second part of dorsal with 16-19 rays; anal fin with 10-13 rays; pectoral fin with 13-15 rays; pelvic fin usually with 1 spine and 4 rays; prickles sparse to absent. Specimens as large as 6 inches are not uncommon.

TORRENT SCULPIN — The torrent sculpin is distributed in the Kootenai and Columbia Rivers, in the Pudget Sound drainage and south into coastal streams of Oregon. The Kootenai River is the only locality it has been taken from in western Montana.

The color is dark grey or slate with dusky spots and mottlings. Palatine teeth normally present; pelvic fin usually with 1 spine and 4 rays; lateral line usually complete to base of caudal fin; caudal peduncle slender, its

least depth less than length of orbit; first part of dorsal fin with 7-9 spines, second part with 16-18 soft rays; anal fin with 11-13 rays; pectoral fin with 16-17 rays; prickles sparse to well developed over most of body.

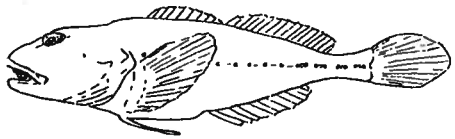


Fig. 44—

There is not a great deal of difference in the habits of the three species of sculpins. They require cool and well oxygenated water, and although they frequent cold lakes, they are more typical of rocky streams and rivers. A few netting reports indicate that sculpins live in the depths of lakes as well as along the shore line. If a body of water supports sculpins, it is indicative that it is fit for trout.

There are more sculpins present than is generally realized. They remain close to the bottom, singly or in pairs under the edge of a stone, where they blend well with the background. It is only by close observation that they can be seen. When disturbed they dart short distances to another protective boulder. Bait fishermen catch them by setting a net and then kicking over the rocks upstream to frighten them into it. Others spear them with table forks tied to a stick.

The food taken by sculpins consists primarily of the larvae of aquatic insects and some molluscs. They are canabalistic, but under most conditions consume few other fish or eggs. The sculpins are undoubtedly maligned as being serious predators of game fish. They may be considered competitors of trout for some foods. However, they are useful in that they serve as forage for large trout and provide excellent bait for angling.

The spawning season depends on the temperature of the water. In the West Gallatin River, the Rocky Mountain mottled sculpins spawn from May through June, but other species have been known to spawn as early as February. Each female may lay from 300-600 adhesive eggs in clusters under rocks and debris or on

foliage, either in swift water or in quiet areas. The male usually remains close to the nest until after the eggs hatch. At water temperatures of 48-50° F. the eggs hatch in 30-40 days; colder temperatures prolong the hatching. Sexual maturity may be reached in the second year of life.

SELECTED LITERATURE

References concerning the fish of western Montana are here listed. Frequently the title of a paper will not reveal that the contents treat with a particular fish. To facilitate finding information on particular subjects or species, the references are placed under headings in the order they appear in the text, although this necessitates some slight repetition. The citations include most of the literature consulted for the writing of this booklet.

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