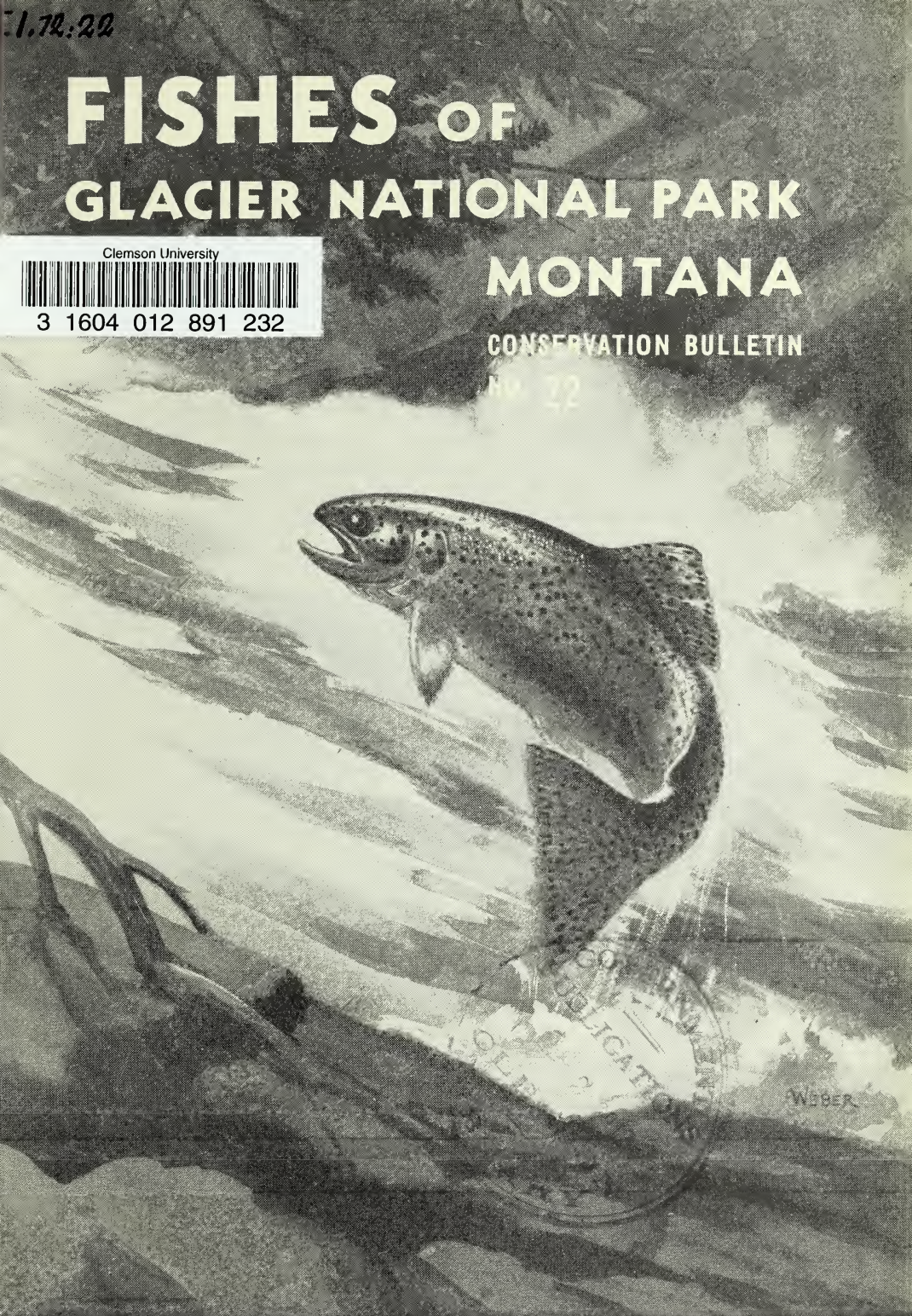
FISHES OF GLACIER NATIONAL PARK MONTANA

CONSERVATION BULLETIN



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

FISHING NOTES

The native trout are caught during the entire open season extending from May 30 to October 15; however, the best catches are made during June, the first part of July, and during the cooler part of September. Fishing remains good during the entire season in some of the interior lakes and streams. Early and late season fishing yields superior catches of the other species. The comparatively warm weather occurring during the latter part of July and August tends to drive the fish to the bottoms of the deeper pools where additional skill is necessary to make successful catches.

Fly Fishing.—Royal coachman, brown and gray hackles, queen of waters, ginger quills, bees, and gnats are used with success in many waters of the park.

Trolling and Bait Casting.—Red and white dare-devils, plugs, and spinners are used with success. Bait casting from either shore or boat often yields desired results. Josephine, Swiftcurrent, Waterton, St. Mary, Kintla, and Bowman Lakes are outstanding for either trolling or bait casting.

Stocking.—The Glacier National Park Fish Hatchery near Creston, Mont., is operated by the Fish and Wildlife Service which supplies fish to the park. Owing to the availability of this superb planting stock the maintenance of Glacier National Park's excellent fishing is assured

Regulations.—All fishing must be done in conformity with park regulations. Current fishing regulations may be procured from rangers or park headquarters.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
NATIONAL PARK SERVICE
Newton B. Drury, Director

Conservation Bulletin No. 22

FISHES OF GLACIER NATIONAL PARK MONTANA

BY

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FOREWORD

This bulletin, written mostly to aid sportsmen and tourists in identifying the fishes of Glacier National Park, is based on specimens and data collected by survey parties under the direction of the United States Bureau of Fisheries (now the Fish and Wildlife Service). It is the first scientific report on the fishes of Glacier National Park and therefore is a most useful contribution to our knowledge of the fishes in the headwaters of the Missouri, Saskatchewan, and Flathead River systems.

NEWTON B. DRURY,
Director, National Park Service.

CONTENTS

Tables

Illustrations

FISHES OF GLACIER NATIONAL PARK, MONTANA

This report was prepared from data obtained by the United States Bureau of Fisheries (now part of the Fish and Wildlife Service) biological survey of Glacier National Park during the summers of 1932 and 1934. The fishes reported upon here were collected by three survey parties. One, under the direction of Dr. A. S. Hazzard, during 1932 covered the region from Summit Creek northward to Sherburne Lake, and also Lake McDonald. Mr. J. E. Hancey and party in 1934 surveyed the region from Kennedy Creek drainage to Waterton Lake and from Kintla Lake drainage to Quartz Lake drainage. The author's party in 1934 surveyed the region from Bear Creek northward to Logging Lake and made special studies on the fish fauna of Bowman Lake, Waterton Lake, Sherburne Lake, and Moran's Bath Tub. Dr. Lauren R. Donaldson, of The School of Fisheries, University of Washington, contributed valuable fish specimens from various localities in Glacier National Park and in adjoining regions of Montana, and Richard T. Smith of the Washington State Department of Fisheries, assisted in the routine work of sorting specimens and tabulating some of the data used in this report.

Since in any intelligent stocking plan the species and abundance of the fishes already present must be considered, a careful study of the distribution of the fish fauna of the park has been undertaken. Moreover, since one purpose of our national parks is to preserve the original fauna and flora of these unique areas, it is of the utmost importance to determine as accurately as possible what species are present and whether any of the native species are threatened by the introduction of non-native game fishes. Comparisons of the presence and abundance of the various species with the records of stocking also furnishes valuable clues to the suitability of certain waters for particular species and strengthens the validity of the planting recommendations. For example, if the records show consistent plantings of rainbow trout in a certain stream but fish collections yield a preponderance of eastern brook trout, it is evident that conditions are better suited to the latter and that it will be more effective to stock with this species.

The specimens forming the basis of this study were collected by various methods, any one of which depended on circumstances as well as the habits and habitat of the species. In general, in the lakes, an experimental gill net was used which was made of linen thread, and supplied with cedar floats and leaded to sink. It had a depth of 5

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feet, a length of 125 feet, and was composed of five 25-foot sections of ¾-, 1-, 1¼-, 1½-, and 2-inch square mesh, respectively. The efficiency of this net, when used in the clear waters of the park, was greatly improved by dyeing it dark green. Usually, one, two, or even more overnight sets were made in each lake visited by the survey. Fly-fishing for trout was another routine method of obtaining specimens, especially in the swift streams where no net of any type could be used successfully. In some of the lakes, a beach seine 70 feet long, with a small bag, was used. This net, with ½-inch square mesh in the middle third, tapered from a depth of 4 feet at the ends to a depth of 8 feet at the middle. The best results were obtained at night by setting from the rubber boat and pulling it on shore by means of ropes which had been previously attached at each end. Smaller seines were used in the streams in the ordinary manner. One of these, 6 feet long and with a depth of 4 feet, ¼-inch square mesh, was most useful in collecting young fish in the swiftly flowing water. Sculpins (*Cottus*) occur among the stones of the bottom, and by stirring the rubble vigorously with our boots and placing the net downstream, they, as well as many *Ascaphus* tadpoles were swept into it.

The specimens, including whole fish as well as viscera from other fish, as soon as collected were placed in a solution of 10 percent formalin, where they remained for 2 or 3 days or until thoroughly preserved. Small specimens were placed in fruit jars completely filled with liquid. A label [1] was inserted into the jar containing the following information: Serial number, station number, date, locality, and collectors. Ecological and other data were recorded on separate blanks in a field notebook. Provisional identification was made in the field. Numbered copper tags were fastened with copper wire on the lower jaw of specimens too large for the fruit jars. These were then placed in a 2-gallon can which was carried on one of the pack horses. A small slit was made in the abdomen of all specimens over 3 inches in length in order to allow the preservative to enter and penetrate the viscera. As soon as the specimens in the fruit jars were preserved, they were removed and wrapped with cloth to form a package, thus reducing the wear on the specimens which were frequently carried from 5 to 14 days on a packhorse. The packages were then placed in the 2-gallon can or if this became full, they were wrapped in an oilcloth and moistened twice daily. At the end of each pack-horse trip, at the base camp, the specimens were sorted and prepared for shipment to the laboratory, where later on they were to be studied. Final preservation was made in 70 percent alcohol.

In Glacier National Park three major rivers rise and flow into separate and far removed seas: (1) Milk River, Cut Bank Creek, and

[1] This label was made of L. L. Brown's Resistall Linen Ledger, substance 36.

Two Medicine River on the southeast corner of the park drain into the Missouri River system and eventually into the Gulf of Mexico; (2) St. Mary River, Swiftcurrent Creek, Belly River, Waterton Lake, and Waterton Creek in the northeast corner of the park flow into the Saskatchewan River, thence into Hudson Bay; (3) the entire west side, from the Canadian boundary to Bear Creek on the south, an area consisting of more than one half of Glacier National Park, is drained by the Flathead River, a tributary of the Columbia River which flows into the Pacific Ocean.

The fish fauna in the headwaters of these three river systems has much in common, as may be seen by examination of tables 1, 2, and 3, prepared from the distributional data collected by the survey and from the literature. Among the 23 species listed, three endemic species—*Prosopium williamsoni* (Rocky Mountain whitefish), *Salmo clarkii lewisi* (cutthroat trout), and *Catostomus catostomus griseus* (long-nosed sucker)—occur in all three stream systems, while *Cristivomer namaycush*[2] (lake trout), *Thymallus montanus* (grayling), *Catostomus commersonii* (sucker), *Couesius dissimilis* (lake chub), and *Lota lota maculosa*[2] (ling), are found in the headwaters of the Missouri and Saskatchewan systems. *Cottus punctulatus* is found in both the Flathead and Missouri systems but not in the Saskatchewan in the park where it is replaced by *Cottus ricei.*

The similarity of the fish fauna in the headwaters of these streams may have been brought about in at least three ways. The geological history of the region indicates that the fauna might have intermingled before or during the time when the mountains were formed by overthrusts. During the glacier period, the damming up of water along the southern edge of the great ice sheet may have aided in the general distribution of the fishes. Stream capture probably formed the best and most continuous opportunity for dispersal of the fishes. In the region of Duck Lake, just east of the park boundary in the Blackfeet Indian Reservation, according to topographic maps, certain streams appear to be tributary to both the Milk River and the Sasketchewan River systems. Again, in Marias Pass, Summit Lake was tributary to Bear Creek (Flathead system) and Summit Creek (Missouri system) until the Great Northern Railroad dammed the outlet, the excess now flowing only into Summit Creek. This lake might have provided, in recent times, a direct connection between the Flathead and Missouri systems, similar to the celebrated "Two Ocean Pass" of Evermann and Jordan, near the southern boundary of Yellowstone National Park.

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[2] *Lota lota maculosa* and *Cristivomer namaycush* are found in the Columbia River system, but no record can be found of their occurrence in the headwaters of the Flathead River.

The first information on the fishes of the Glacier National Park region was obtained by the Lewis and Clark Expedition which visited Cut Bank Creek, just east of the park, in 1805 and reported that trout were taken (Elliott Coues 1893: 1095). Henshall (1906) mentions that Lewis and Clark saw grayling too. Naturalists connected with the Pacific Railroad Survey parties visited the Milk River region just east of Glacier National Park and collected material that was reported upon by Girard (1857 and 1857a), and by Suckley in 1860. The Hayden Geological Survey of Montana and adjacent territory in 1870 made few additions to the already known fauna of the region east of the park. Cope (1879) reporting on these collections records *Prosopium williamsoni* from the upper Missouri system for the first time. Cope (1889) records "*Amia* sp. numerous vertebrae" from the Swiftcurrent River.

In 1874, Dr. Elliott Coues, a naturalist, visited the eastern border of the park and collected fish in the Milk River and its northern tributaries, in the St. Mary River, in "Chief Mountain Lake" (Waterton Lake) near Chief Mountain, and in other headwaters of the Saskatchewan. Coues' collections made known the following species as reported upon by Jordan (1878a: 779–799): the lake chub, *Couesius dissimilis*[3]; the long-nosed dace, *Rhinichthys cataractae;* the Rocky mountain whitefish, *Prosopium williamsoni;* the lake trout, *Cristivomer namaycush* Montana blackspotted trout, *Salmo clarkii lewisi;* the pike, *Esox lucius;* the long-nosed sucker, *Catostomus catostomus griseus;* the mountain sucker, *Pantosteus jordani.*[4] The shovelnose sturgeon, *Scaphirhynchus platorynchus*[4] was reported farther east in Montana under the name "*Polyodon folium Lac*" by Jordan (1878a).

During the summer of 1892 Carl H. Eigenmann made a trip across northwestern United States and in western Canada for the purpose of collecting fish. He visited the region just northeast of Glacier National Park, and from these explorations Eigenmann (1894: 101–132)[3] recorded from Swiftcurrent River (headwaters of Saskatchewan) two suckers, *Catostomus catostomus grieseus* and *Catostomus commersonii;* three minnows, *Rhinichthys cataractae*, *Couesius dissimilis*, and *Pimephales promeles*[4]; the pike, *Esox lucius;* the trout perch, *Percopsis omiscomaycus*[4]; the grayling, *Thymallus montanus;* the darter, *Poecilichthys exilis*[4]; the stickleback, *Eucalia inconstans*[4]; and *Cottus ricei.* At Calgary, Alberta, he reported the ling, *Lota lota maculosa.* Eigenmann (1895: (10–25) records *Richardsonius balteatus* from Brown's Gulch and Flathead Lake, both of which are located

[3] The scientific names used here are the present names accepted for those species and may not have been used by this author.

[4] These forms as yet have not been found in Glacier National Park. In addition, the large-mouth black bass, *Huro floridiana;* the small-mouth black bass, *Micropterus dolomieu;* the Crappie, *Pomoxis annularis;* the Blue Gill sun fish, *Lepomis pallidus,* occur in Flathead Lake, but they have not been found in the park.

south of Glacier National Park. Evermann (1893), Evermann and Cox (1896), Evermann and Scovell (1895), Evermann and Smith (1896), and others have published information on numerous collections made in the vicinity of Brown's Gulch, the Flathead Lake region, and the country southward and eastward of the park.

A review of the literature dealing with the fish fauna of Montana and adjoining regions indicates a great scarcity of information about the fishes of Glacier National Park. Numerous papers have been written about the fish fauna of Yellowstone National Park, but even the general papers on the fish fauna of Montana such as that by Henshall (1906), and Cockerell (1908), give no actual records for the area west of the Divide later included in Glacier National Park. Dr. Coues probably was the only naturalist, interested in fishes, who actually visited the northeastern border of the park in the vicinity of "Chief Mountain Lake," (Waterton Lake), while other investigators have visited the region east of the park in the vicinity of Milk River, and Swiftcurrent Creek. No record has been found of any fish collections from north of the Flathead Lake region and east of the Whitefish and Flathead Mountain ranges to the Divide. The fish fauna of Flathead Lake has been studied by numerous authors, but most recently by Dr. M. J. Elrod (1929).

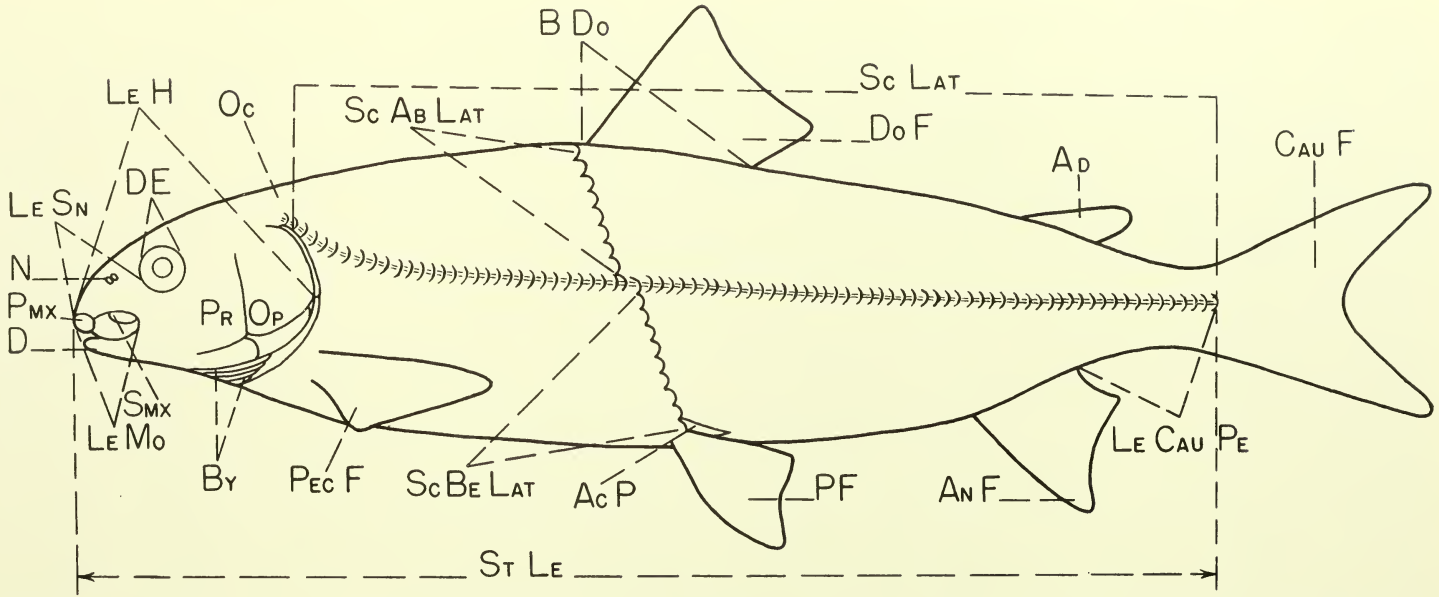

Figure 1.—Outline drawing of *Prosopium williamsoni*, Rocky Mountain whitefish, to show anatomical characters and methods of measuring certain distances on fishes. Ac P—accessory pelvic scale; Ad—adipose fin; An F—anal fin; B DO—base of dorsal fin; By—branchiostegal rays; Cau F—caudal fin; D—dentary or lower jaw; D E—diameter of eye; Do F-dorsal fin; Le Cau Pe—length of caudal peduncle; Le H—length of head; Le Mo—length of mouth; Le Sn—length of snout; Oc—Occiput; Op—opercular bone which forms part of the operculum; Pec F—pectoral fin; P F—pelvic fin; P mx—premaxillary; Pr—preopercular bone; Sc Ab Lat—showing how and where to count the number of scales above the lateral line; Sc Be Lat—showing how and where to count the number of scales below the lateral line; Sc Lat—showing where and how to count the number of scales in or scale rows crossing the lateral line; S mx—supplemental maxillary bone; St Le—standard length.

KEY TO THE FISHES OF GLACIER NATIONAL PARK

The following descriptive key and the figures of the fishes of Glacier National Park will enable the layman, sportsman, and naturalist to identify the various fishes which they may take. Since the description of any group of animals as complex as the fishes is difficult to put into terms familiar to the layman, the footnotes and figure 1 should be consulted frequently. This key, like most zoological keys, has the statements arranged so that the user must consider alternative characters. One group of characters is given under a designation as "1a" and the contrasting character under "1b." In using the key to trace a fish down to its correct name, for example, the Rocky Mountain whitefish, proceed as follows: If 1a is correct, do not proceed to the alternative 1b, but go to the next number directly below 1a, on the same page, which is 2a. Since 2a is correct proceed to 3a and since 3a fits the whitefish, then go to the next number below, on the same page, which is 4a. But since the characters given under 4a do not fit the rocky mountain whitefish then proceed to the alternative 4b, which corresponds. Again 5a does not fit so turn to 5b which does. Since 6a is the next number below 5b, and the characteristics under 6a correspond with the specimen at hand, the fish is identified because the name, *Prosopium williamsoni*, occurs at the end of the paragraph.

1a. Two dorsal fins present, the second may be very small as in the case of an adipose fin, which lacks typical fin rays, or large when composed of normal fin rays.

2a. The second or posterior dorsal is an adipose fin, without rays, located behind the dorsal fin, over the caudal peduncle; no spines in any of the fins; scales cycloid and smooth; more than 55 oblique rows of scales crossing the lateral line.

3a. Fewer than 105 oblique scale rows on the side of the body from head to base of caudal fin rays; teeth weak in mouth on jaws.

4a. Dorsal fin with 20 to 24[5] rays; dorsal fin long and high, its base longer than the head; scales in about 90 to 100 oblique rows on side of body; pyloric caeca about 15 to 20. (Family Thymallidae).

Grayling. (fig. 13) *Thymallus montanus* Milner, p. 26, No. 11.

[5] Throughout this report the number of soft rays in the dorsal and anal fins are counted as follows: The first one or two rudimentary rays, closely joined to the first complete ray, are omitted. The last two rays, sometimes branching from a common base, are counted as one ray.

4b. Dorsal fin not long and high, of 10 to 15 rays, its base shorter than the length of the head; pyloric caeca more than 25. (Family Coregonidae).

5a. Scales on side of body in about 58 to 65 oblique rows, and about 8 scales above and 6 scales below the lateral line; back brownish; snout broad and very blunt; two flaps of skin between the nostrils.

Brown-backed whitefish. (fig. 11) *Prosopium coulteri* (Eigenmann and Eigenmann), p. 24, No. 9.

5b. Scales on side of body in 74 to 95 oblique rows; back more grayish brown; snout not definitely blunt.

6a. One flap of skin between the pair of nasal openings on each side of head; mouth small, the maxillary not reaching below eye; the supplemental maxillary bone[5] narrow and sharply elliptical, more than 3 times as long as deep; gill rakers[7] about 20 or fewer on the first arch; greatest depth of body 4 to 5 times in the length.

Rocky Mountain whitefish. (figs. 9 and 10) *Prosopium williamsoni* Girard, p. 23, No. 8.

6b. Two flaps of skin between the nostrils; mouth larger, the maxillary reaching past front of eye, the supplemental maxillary[6] bone ovate, nearly twice as long as deep; gill rakers[7] about 27 to 29 on the first arch; greatest depth of body 3 to 4 times in its length.

Great Lakes whitefish. (fig. 12) *Coregonus clupeaformis* (Mitchill), p. 25, No. 10.

3b. More than 115 oblique rows of scales on the side of the body from head to base of caudal fin rays; teeth strong and sharp.

7a. Anal fin elongate of 13 to 17[5] rays (rarely 12); gill rakers rather long 11 to 24+20 to 26[8], usually totaling 31 to 50[7] on the first gill arch; anal and dorsal fins seldom with black spots; oblique scale rows 125 to 145 (usually about 130), and 19 to 24 scales above and 19 to 23 scales below the lateral line; young with rather large round black spots above the lateral line; sides red at spawning.

Little redfish. Silver trout. Landlocked red salmon. (fig. 8) *Oncorhynchus nerka* (Walbaum), p. 22, No. 7.

7b. Anal fin short, of 9 to 12 (rarely 13) rays; gill rakers rather short 20 or fewer on first gill arch; dorsal fin usually with numerous black spots.

8a. Species with dark spots on a lighter background of color; less than 190 oblique scale rows crossing the lateral line; vomer flat, its toothed surface plane, teeth on shaft of the vomer in alternating rows or in one zigzag row, those on the shaft placed directly on the surface of the bone, not on a free crest.

9a. Red dash on dentary (between lower jaw bone and isthmus) evident in life; maxillary on adults extending behind eye; length of mouth contained 1.6 to 2.25 times in the head

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[5] See footnote, p. 7.

[6] The supplemental maxillary bone is situated at the dorsal and posterior corner of the maxillary bone.

[7] All rudiments are counted.

[8] The gill-raker formula indicates the number of rakers on the upper half of the arch plus the number on the lower half.

length; hyoid teeth (those located behind the patch of teeth on the tip of the tongue) usually present but few and scattered; vertebrae[9] 58 to 62 (usually about 60); dorsal rays 9 to 11 (usually 10 or 11); anal rays 9 to 11.

10a. Black spots large and scattered, most numerous posteriorly, those on anterior part of the body widely separated, the spots are usually absent on belly and sometimes to the lateral line; scales above and below the lateral line 32 to 42 (usually 35 to 38); scales in the lateral line 156 to 190 (usually about 170); gill rakers 6 to 9+9 to 13 or totaling 15 to 22.

Montana black-spotted trout. Cutthroat trout. Native trout. (fig. 2) *Salmo clarkii lewisi* (Girard), p. 15, No. 1.

10b. Black spots very numerous and covering the body, a few occurring even on the belly; the spots are about as close together posteriorly as anteriorly; scales above the lateral line 35 or fewer; scales below the lateral line 35 or fewer; scales in the lateral line 120 to 180 (usually fewer than 160).

Coastal cutthroat trout. (fig. 3) *Salmo clarkii clarkii* Richardson, p. 18, No. 2.

9b. No red dash of color on dentary evident in life; dorsal rays 10 to 13 (usually 11 or 12); hyoid teeth always absent; vertebrae 59 to 65 (rarely 59 or 60, usually 63);[9] color on sides reddish, the lateral band usually but slightly interrupted by faint parr marks on adults; gill rakers 7 to 9+9 to 13;[8] length of mouth contained 2.0 to 2.5 times in the head length of adults and seldom extending behind eye; scales in 130 to 160 (usually about 135) oblique rows on side of body; 23 to 32 scales above and 20 to 30 scales below the lateral line; body profusely covered with black spots.

Rainbow trout. (fig. 4) *Salmo gairdneri* Richardson p. 19, No. 3.

8b. Species with light spots (white or light gray, sometimes yellowish) on a darker background of color; often with red spots on the sides; over 190 scale rows crossing the lateral line; vomer with the shaft depressed and without teeth, but the head of the bone bears teeth.

11a. Vomer with a raised crest, projecting backward a little from the head of the bone, this crest armed with strong teeth; species gray-spotted, but without red spots; fins slightly bright (white) edged; 185 to 205 oblique scale rows on side of body; head about 4½ times in length of body; the greatest depth of body about 4 in its length; diameter of eye about 4½ times in the length of the head.

Lake trout. (fig. 7) *Cristivomer namaycush* (Walbaum), p. 21, No. 6.

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[8] See footnote, p. 8.

[9] The total number of vertebrae are counted from the upturned tip of the hypural plate to the head.

11b. Vomer without a raised crest which extends backward, head of bone toothed; species red-spotted in life, the lower fins with bright silvery edgings.

12a. Back unspotted, instead it is strongly mottled with olive and black, the blotches connect with each other causing the mottled appearance; dorsal and caudal finely mottled; body robust or stout, the head heavy, scales in about 230 oblique rows along the side of the body.

Eastern brook trout. (fig. 6) *Salvelinus fontinalis* (Mitchill), p. 21, No. 5.

12b. Back not mottled, but with the light spots like those on the sides of the body, only smaller and paler; body less robust or stout, the head larger, about 3⅔ in the standard length; scales in about 240 rows along the side of the body.

Dolly varden trout. Bull trout. Western Charr. (fig. 5) *Salvelinus malma spectabilis* (Girard), p. 19, No. 4.

2b. The second or posterior dorsal is not an adipose fin, but it is a normal fin composed of normal soft rays.

13a. No spines in any of the fins, all of the rays soft; anterior dorsal short, of 12 or 13 rays; second dorsal long, about three-fifths the length of the body with 70 to 75 rays; the anal long, about two-fifths the length of the body, with about 65 rays; pelvic fins located under the bases of the pectoral fins; body and head covered with very small embedded scales; tip of chin with barbel. (Family Gadidae).

Ling. Burbot. (fig. 24) *Lota lota maculosa* (Le Sueur), p. 35, No. 21.

13b. Spines are present in the first or anterior dorsal fin; pelvic fins with I spine, and 3 or 4 soft rays; body and head naked, no scales present, although the head may be profusely covered with prickles; first dorsal fin with VI to VIII [10] spines; second dorsal with 16 to 19 soft rays; anal without spines, of 10 to 14 soft rays; lateral line incomplete or complete (if extending to base of caudal fin). (Family Cottidae).

14a. Teeth on vomer and palatines; preopercle with a stout spine, its length not over half the diameter of eye, two or three small, short spines below, directed downward; lateral line incomplete ending under soft dorsal; sides without stiff prickles, usually but slightly roughened.

Blob. Bullhead. Sculpin. (fig. 25) *Cottus punctulatus* (Gill), p. 35, No. 22.

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[10] Roman numerals indicate spines and arabic numerals soft rays.

14b. Teeth on vomer, none on palatines; preopercle with an upturned curved spine, very large, about as long as eye, hooked backward and upward, giving a buffalolike appearance, below which are 2 or 3 smaller spines hooked downward; lateral line complete; sides with stiff prickles, head sometimes with prickles on the dorsal side.

Prickly sculpin (fig. 26). *Cottus ricei* Nelson, p. 37, No. 23.

1b. A single dorsal fin of soft rays only; the pelvic fins without spines, located ventrally, behind the pectoral fins on the abdomen, usually near the middle of body.

15a. Jaws, tongue, palatines, vomer, with teeth; origin of the dorsal fin in the posterior third of the body, tail fin not included; dorsal fin of 15 or 16 rays;[5] anal of 14 or 15 rays; 122 to 125 rows of scales on side of body from head to base of caudal fin; jaws with large canine teeth; head about 2.9 to 3.6 in standard length; greatest depth of body is contained about 5 to 7 times in the standard length; color of body darker with light spots. (Family Esocidae.)

Common pike. Pickerel (fig. 23). *Esox lucius* Linnaeus, p. 34, No. 20.

15b. Jaws, tongue, palatines, and vomer without teeth; origin of dorsal fin in middle third of the body (tail fin excluded) but it may continue into the posterior third; branchiostegals 3; gill membranes united to the isthmus.

16a. Mouth usually directed downward, excessively protractile and suckerlike with papillous lips; pharyngeal teeth in[11] one row, comblike and numbering more than 10 on one side (bone). (Family Catostomidae.)

17a. Oblique scale rows fewer than 85 on the side of the body.

18a. Dorsal rays 12 to 15 (rarely 12)[5]; 12 to 17 scales above the lateral line; 65 to 80 (rarely more than 80) oblique rows of scales on side of body, and 8 to 10 scales below the lateral line; peritoneum white to dusky, the color not showing through the body wall in the young; caudal peduncle very slender in the young.

Columbia River coarse scaled sucker (figs. 14 and 15). *Catostomus macrocheilus* Girard, p. 27, No. 12.

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[5] See footnote, p. 7.

[11] The pharyngeal bones which bear the pharyngeal teeth are located behind the last gill arch and at the beginning of the oesophagus. These are best removed through the last gill cleft.

18b. Dorsal rays 11 or 12; 63 to 70 oblique scale rows on side of body; 9 to 11 scales above the lateral line; and 8 or 9 scales below lateral line; peritoneum dusky, seldom whitish or silvery, the color sometimes showing through the body wall in the young; caudal peduncle robust.

Common sucker. White sucker (fig. 17). *Catostomus commersonii* (Lacepéde), p. 30, No. 14.

17b. Oblique scale rows 98 to 115 on the side of the body; 18 to 21 scales above and 15 to 18 below the lateral line; dorsal rays 9 to 11 (rarely 11); peritoneum dusky, seldom whitish; caudal peduncle moderately slender.

Long-nosed sucker (fig. 16). *Catostomus catostomus griscus* Girard, p. 29, No. 13.

16b. Mouth not especially directed downward, nor excessively protractile; if inferior in position non-protractile; the lips are never papillous and not suckerlike; pharyngeal teeth in one or two rows and fewer than 8 on one bone, and never arranged like the teeth in a comb. (Family Cyprinidae.)

19a. Premaxillary not protractile, a broad frenum present, which binds it to the projecting snout; mouth inferior; barbel present on posterior edge of the maxillary; teeth usually 1:4—4:1;[12] dorsal rays 8 (rarely 9); scales in about 62 to 75 oblique rows.

Long-nosed dace, Black nosed dace (fig. 20). *Rhinichthys cataractae dulcis* (Girard), p. 32, No. 17.

19b. Premaxillary protractile, no frenum present; scales in 55 to 65 oblique rows on side of body; mouth terminal, not inferior in position.

20a. Anal rays 13 to 18; no barbel present; mouth terminal, oblique; body compressed; lateral band of blackish color between two silvery streaks; lower sides of adults red; dorsal rays 10 or 11; greatest depth 3¼ to 4¼ times in standard length; diameter of eye 3 or

[12] In Cyprinidae, the main row of teeth on each pharyngeal bone contains 4 or 5 teeth (seldom more or less); inside of this main row is a so-called "lesser row," which may contain 1 or 2 teeth or none, in the latter case being designated 0 in the formula, as, for example, "teeth 2:4—4:0," which means 4 teeth in each main (outer) row, and 2 teeth in one lesser row of one side and 0 teeth in the other lesser (inner) row of other side.

4 times in the head; length of head 4 to 4½ times in the standard length.

Red sided minnow or bream. (fig. 19) *Richardsonius balteatus balteatus* (Richardson), p. 32, No. 16.

20b. Anal rays 7 to 10[5]; scales in 64 to 83 oblique rows on side of body; pharyngeal teeth usually 2:5—4:2 or 2:4—4:2[12]; 5 to 8 short blunt gill rakers on first gill arch.[7]

21a. Mouth terminal, horizontal, deeply cleft, the maxillary reaching to under the eye; 46 to 56 scale rows before the dorsal fin on the back; barbel always present on posterior edge of maxillary except on the young less than 2 inches in length; peritoneum silvery; anal of about 8 rays; dorsal of 9 or 10 rays; 16 to 20 scales above and 7 to 9 scales below the lateral line; diameter of eye 4.1 (in young) to 7.5 times in the head length; greatest depth 4.4 to 5.2 times in standard length.

Squawfish. (fig. 18) *Ptychocheilus oregonensis* (Richardson), p. 31, No. 15.

21b. Mouth terminal, slightly oblique, not deeply cleft, the maxillary seldom extending to the anterior margin of the eye; scale rows in front of the dorsal 32 to 44 on the back; barbel present or absent; peritoneum silvery to dusky (usually somewhat pigmented); anal rays 8 or 9 (usually 9); dorsal rays 8 to 10 (usually 9); 12 to 14 scales above and 8 to 11 scales below the lateral line.

22a. Barbel present, seldom absent on one side, located just anterior to posterior tip of the maxillary; no black caudal fin spot (near base of caudal fin rays) present in specimens over 1½ inches long; interorbital space flattish; upper jaw nearly straight, the premaxillary and maxillary in a straight line and nearly reaching to under the orbit; no light streak above the wide blackish color

[5] See footnote, p. 7.
[7] See footnote, p. 8.
[12] See footnote, p. 12.

band on sides; origin of dorsal fin just behind insertion of pelvic fin (nearer base than middle of fin).

Lake chub. (fig. 21) *Couesius dissimilis.* (Girard), p. 33, No. 18.

22b. Barbel absent (rarely present on one side); a black caudal fin spot near base of middle caudal rays, always present; interorbital space evenly arched; upper jaws curved, the maxillary more inclined from the horizontal axis than the premaxillary, and not nearly reaching the orbit; a light streak above the wide dark color band on sides; origin of dorsal fin nearer a vertical line passing through middle of pelvic fin than one passing through its insertion.

Pearl minnow. (fig. 22) *Margariscus margarieta nachtriebi* (Cox), p. 34, No. 19.

ANNOTATED LIST OF FISHES OF GLACIER NATIONAL PARK

Family 1. Salmonidae.[13] Salmon. Trout. Charrs

The Salmonidae are represented by three species of trout, three charrs, and one species of salmon. They constitute the chief game fishes of the region. They are fished extensively during the tourist season and the supply is maintained by natural reproduction and artificial propagation so that excellent fly fishing occurs throughout the summer.

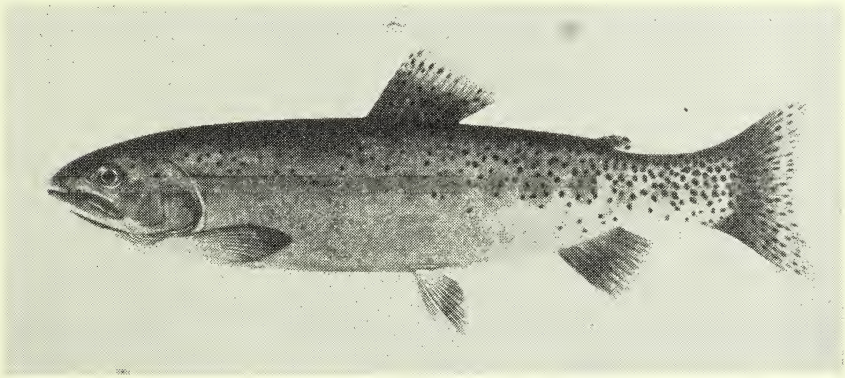

FIGURE 2.—*Salmo clarkii lewisi*, Montana black-spotted cutthroat trout. Reproduced by permission of Department of Fisheries, Ottawa, and the Biological Board of Canada from the *Trout and Other Game Fishes of British Columbia*, by J. R. Dymond.

1. *Salmo clarkii lewisi* (Girard). Native trout. Cutthroat trout. Montana black-spotted trout. Flat trout. Red-throated trout.

Range: Upper and middle Columbia River system, upper Missouri, Fraser, and upper Saskatchewan systems. Abundant.

The cutthroat is the most important game fish in Glacier National Park. It was taken extensively by the survey in most of the streams and lakes, not isolated from the main rivers by waterfalls or other barriers. In the Flathead system, it is the most abundant game fish, and rises to a fly throughout the summer. East of the Divide, it is

[13] In addition to the Salmonidae listed here, *Oncorhynchus tschawytscha*, the king salmon, and *Oncorhynchus kisutch*, the silver salmon, have been reported as occurring near the park in Flathead Lake.

less abundant, its place being taken by the rainbow trout and other species.

The black-spotted trout spawn in the early spring shortly after the ice disappears from the lakes and streams sometimes as early as March and often as late as July or even August in the highest mountain streams and lakes. Recently hatched fry, with the yolk sac not yet fully absorbed, make their way to the surface where they usually may be seen in July. The larger fry and fingerlings occur in shallow pools of creeks. Half-grown trout are common in the beaver ponds of the larger creeks. The largest trout were taken (during the summer) in the lakes and deeper holes of the large rivers. Cutthroat trout were abundant in the following lakes: Isabel, Katherine, Grace, Howe, Trout, Arrow, and Quartz, west of the Divide, and in Lower Two Medicine, Old Man, and Red Eagle Lakes, east of the Divide.

The speciation and racial differences among the trout of Glacier National Park and adjacent regions do not form clear-cut problems of easy solution. In the Flathead system native trout occur which resemble in coloration, at least, the coastal trout of Washington and Oregon, *Salmo clarkii clarkii* (fig. 3). The typical coastal form has fewer scales and more numerous and smaller black spots. The latter are almost evenly dispersed over the body, while *Salmo clarkii lewisi*,[14] the Montana black-spotted trout, the commonest variety in the park, is characterized by having fewer and larger black spots, which are most numerous posteriorly, very scarce anteriorly on the body and usually absent on the belly, and a greater number of scales. *Salmo bouvieri* Bendire, another form at the opposite extreme from *S. c. clarkii* in regard to coloration, is characterized by large black spots, similar to those of *lewisi*, but the spots are wholly absent anteriorly on the body and on the belly.

A characteristic type of coloration, especially in regard to the distribution, size, and frequency of occurrence of spots on the cutthroat trout in certain of the lakes on the west side of the park, is sufficiently different from the *S. c. lewisi* type of coloration (fig. 2), to suggest another subspecies. This type of spotting is almost exactly like that shown for *S. c. stomias*, fig. 213 in Jordan and Everman, Bulletin 47, U. S. National Museum Pt. 4. It is unlike the coloration for *S. c. henshawi*, fig. 208 in Jordan and Everman (*l. c.*) the spotting in that case extending down on the belly. We do not know the source of the stock of the "*stomias*" type of cutthroat trout which was planted in Glacier National Park and hence we cannot assign with certainty a name, although this type of coloration has been referred to the species, *S. c. henshawi* by numerous ichthyologists. This "*stomias*" type intergrades with the *lewisi* type in most of the lakes and streams visited by

[14] Since *Salmo lewisi* was the first name applied to this type of coloration we select it as the valid subspecific name.

us, least so in Grace Lake (this lake is separated from Logging Lake by a waterfall) where it remains partially distinct.

Among the hundreds of cutthroat trout observed in the park by the survey, specimens were selected from numerous localities and arranged, according to the color pattern, into a series with those profusely and evenly spotted all over the body, at one end of the series, and grading down to the opposite end where the spots were few in number and located only on the caudal peduncle. This series of 30 representative specimens was then divided into the following groups: (1) profusely and evenly spotted all over body (1 specimen); (2) small to large spots most numerous posteriorly and extending on belly (5 specimens); (3) small to large spots most numerous posteriorly but not on belly (5 specimens); (4) spots large and scattered, few anteriorly but many posteriorly and none on belly (10 specimens); (5) spots large, few anteriorly on upper sides and on back, more numerous posteriorly, none on belly (8 specimens); (6) large spots occurring only on caudal peduncle region (1 specimen). These 30 specimens, grouped according to color, were found not to correlate with the following characters which were studied: (1) number of scales in the lateral line; (2) number of scales above and below the lateral line; (3) number of gill rakers; (4) number of rays in the anal, dorsal, pelvic, and pectoral fins; (5) number of vertebrae. Perhaps when man first visited the western United States numerous forms of cutthroat trout possessed definite and constant color patterns in restricted localities. That condition does not prevail at present because we have a beautiful graded series from the park, with some of the specimens at or near the opposite end of the series, taken from the same lake. The *S. c. clarkii* type is at one end, *S. c. lewisi* is intermediate and the most abundant form in Montana, while the *S. c. bouvieri* type of coloration is at the other end of the series. The *clarkii* and *bouvieri* types of coloration are not common in the park waters. By taking the picture as a whole, we cannot draw a definite line of demarkation between the various forms recognized above, each of which may dominate in certain restricted areas but intergrade in others.

The nomenclature which has been applied to these fish was based on an inadequate study by early authors. The problem of speciation was not comprehended when early authors described numerous forms in the West. This is attested clearly in the case of the two trout from Lake Crescent, Washington, described as *Salmo gairdneri crescentis* Jordan and Beardslee, in Jordan (1896) and *Salmo gairdneri beardsleei* Jordan and Seale in Jordan (1896). If the former species is valid, the name *Salmo clarkii crescentis* would be nearer correct since it is a cutthroat trout, yet both were described as a subspecies of "*gairdneri*" the rainbow or steelhead trout. Our examination of many hundreds of cutthroat trout from widely scattered localities in western North

America convinces us that many types of color variation occur; in one locality it is of one type, in another some other type, each of which may represent local races. The difficulties of recognizing the structural difference of these "races" have been multiplied by cross-breeding of original stocks in artificial propagation.

The morphological characters so often used in the description of species or subspecies of trout, such as color pattern, rate of growth, variation in number of scales, vertebrae, fin rays, etc., need careful experimental study to prove their variability under different environmental conditions. At present enough experimental data to settle this problem of speciation are not available, although Mottley (1934) made a preliminary study. We believe that the cutthroat trout of northwestern United States is represented by one species, which may be divided into two or more races or subspecies, best represented by a

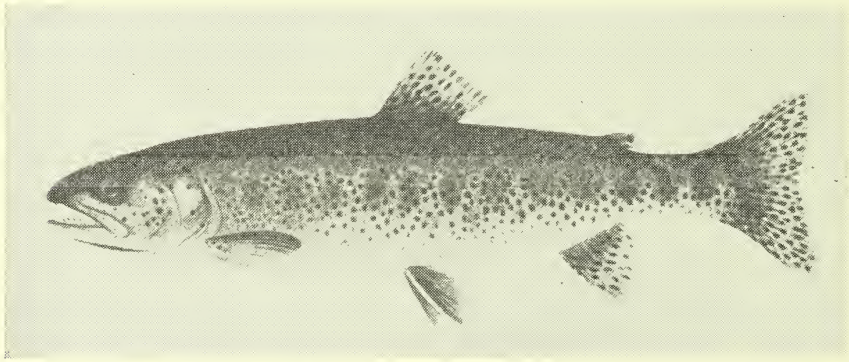

FIGURE 3.—*Salmo clarkii clarkii*, Coastal form of cutthroat trout. Reproduced through the courtesy of Dr. J. R. Dymond.

more or less constant type of color pattern and by the number of scales, above, below, and in the lateral line, as well as by other characters.

2. *Salmo clarkii clarkii* Richardson. Coastal cutthroat trout. Speckled trout. Native trout.

Range: Coastal streams and lakes from British Columbia to California, occasionally taken in the upper waters of the Columbia River system. Not common in the park.

This form of the cutthroat trout is characterized by larger scales (see keys) and smaller and more numerous black spots almost evenly distributed over the body. A single large specimen referred to this species was taken on a dry fly by the survey, near the mouth of Nyack Creek (Flathead system). Other specimens intermediate in coloration between *Salmo clarkii clarkii* and *Salmo clarkii lewisi* were taken in various localities in the Flathead system. Probably cross-breeding through artificial propagation and the great adaptability of the trout

are important factors in causing much structural variation among the cutthroat trout of western North America.

The habits of this form are similar to those of the Montana black-spotted trout as described for that species.

3. *Salmo gairdnerii* Richardson. Rainbow trout.

Range: Northern United States and Canada, as far south as California. Introduced into many lakes and streams of eastern North America. Common in certain lakes and streams of the park.

The rainbow trout was taken in the park by the survey in numerous localities east of the Divide, where it is farily abundant, but only in three places (small tributary to Middle Fork of Flathead River near Walton Ranger Station, McDonald Lake, and its tributary Fish Creek) west of the Divide. The rainbow trout grows to a fair size in the park and is one of the important game fishes.

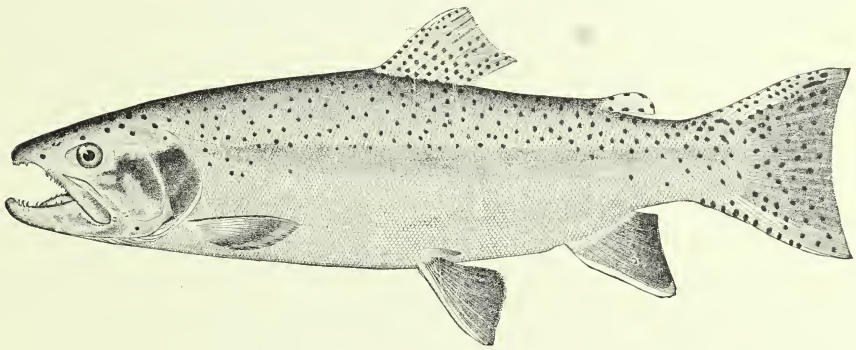

FIGURE 4.—*Salmo gairdnerii*, rainbow trout.

Salmo gairdnerii is said to spawn in the park region from April to June.

4. *Salvelinus malma spectabilis* (Girard). Dolly varden. Bull trout. Charr.

Range: Coastal streams from Alaska to northern California and in the upper Saskatchewan River. Abundant.

The dolly varden or bull trout is abundant in the larger lakes and streams tributary to the Flathead system. It is abundant on the east side in the South Fork of Kennedy Creek and in other streams tributary to the Saskatchewan River, but the survey did not take it in the Missouri system. No doubt this species is native to the Saskatchewan drainage as Jordan (1889) reported its occurrence in South Saskatchewan.

This charr spawns on gravelly riffles in streams during the autumn. In July it may be seen around the mouths of creeks, tributary to lakes, while a month later the instinct of migration has sufficiently

developed to cause its ascent of the stream. The larger males observed in the South Fork of Kennedy Creek were between 1 and 3 feet long; those almost ready for spawning had a slightly arched lower jaw and a curved snout similar to the breeding males of the Pacific salmon but less developed. The young were first observed in the

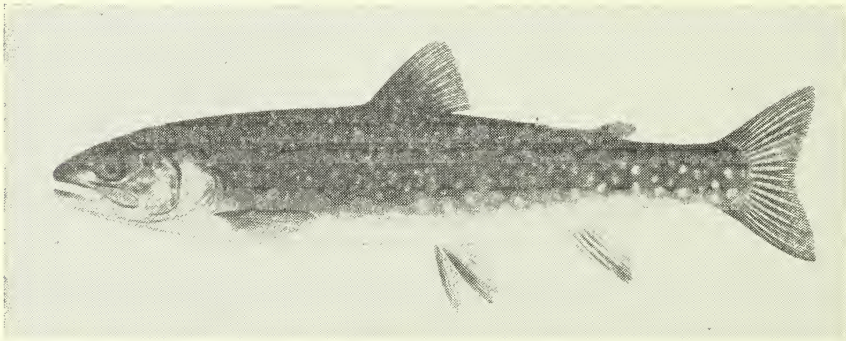

FIGURE 5.—*Salvelinus malma spectabilis*, dolly varden or bull trout. Reproduced through the courtesy of Dr. J. R. Dymond.

streams, among gravel, during June. They were from 1 to 2½ inches long. In the Flathead River young dolly vardens ranging from 3 to 4 inches up to a foot or more in length were taken during the summer in side channels and backwater.

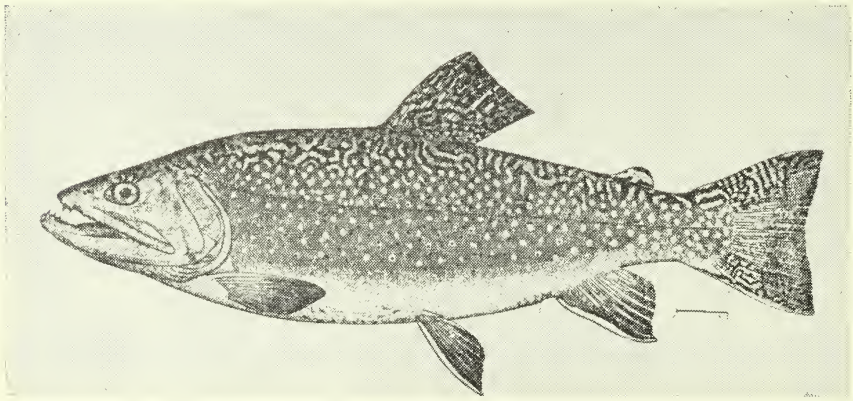

FIGURE 6.—*Salvelinus fontinalis*, eastern brook trout. After Jordan and Evermann.

Many of the older publications refer to the dolly varden as *Salmo parkei* or *Salmo bairdii*. The nomenclature used by recent authors is *Salvelinus malma spectabilis*, which name is apparently valid. This species is variable, too, but much less so than the cutthroat trout. No doubt the charr population in Isabel Lake (Park Creek

drainage) and in other lakes may represent local races, the proof of which would require a detailed study.

5. *Salvelinus fontinalis* (Mitchill). Charr. Eastern brook trout.

Range: Northeastern North America, introduced into northwestern and western North America. Common in certain mountain lakes and streams of the Park.

The eastern brook trout is abundant in Two Medicine River, its tributaries, and the Two Medicine Lakes, as well as in other mountain lakes where it has been introduced east of the Divide. West of the Divide, it is found only in Lake Ellen Wilson where it is the only species present, and grows to a weight of 4 pounds, but averages a little less than a pound. It rises to a fly throughout the summer and furnishes the best of fishing.

Eastern brook trout spawn during late autumn in spring water which flows up through the gravel or over it.

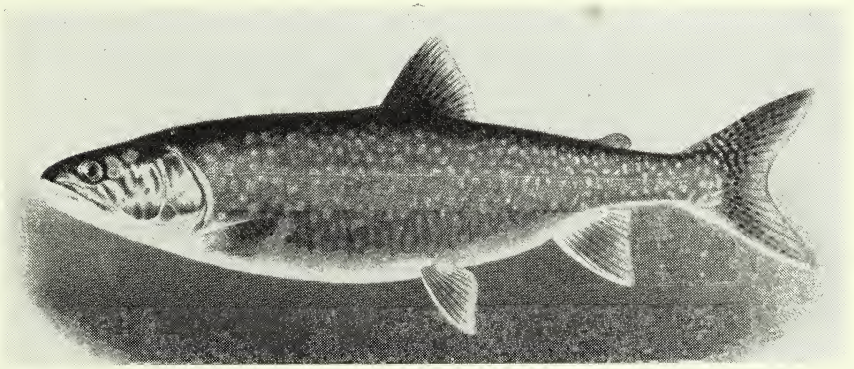

FIGURE 7.—*Cristivomer namaycush*, lake trout. Courtesy former U. S. Bureau of Fisheries.

6. *Cristivomer namaycush* (Walbaum). Lake trout. Great Lakes trout. Mackinaw trout.

Range: Northern United States to the Arctic Circle. Locally common.

The lake trout occurs in Lower Two Medicine Lake and in Waterton, Crossley, Glenns, and St. Mary Lakes on the northeastern side of the park in the Saskatchewan drainage. It was not taken in the Flathead drainage of the park, although it occurs in Flathead Lake. Many of the lakes with suitable spawning areas west of the Divide appear to be well suited for lake trout, yet this species was not found. Lake trout up to 15 pounds in weight or more are taken from the lakes of the park.

The lake trout spawns in late autumn among rocks and rubble along the shore and in fairly deep water.

7. *Oncorhynchus nerka* (Walbaum). Little Redfish. Landlocked salmon. Silver trout.

Range: Lakes in the coastal drainage from Alaska to Oregon, and in the headwaters of the Saskatchewan River in Swiftcurrent Lake where it was introduced. Not common.

The little redfish was introduced into Swiftcurrent Lake and during 1932 adults were taken which were nearly ready to spawn. Although this form was planted in Lake McDonald only a few adults have been seen and none were taken by the survey.

This landlocked salmon becomes mature, at a length of about 10 inches, in late summer, at which time its color changes from brilliant silvery to bright red. The males, with scarlet red sides, and the females, mostly greenish-red, migrate into streams for spawning pur-

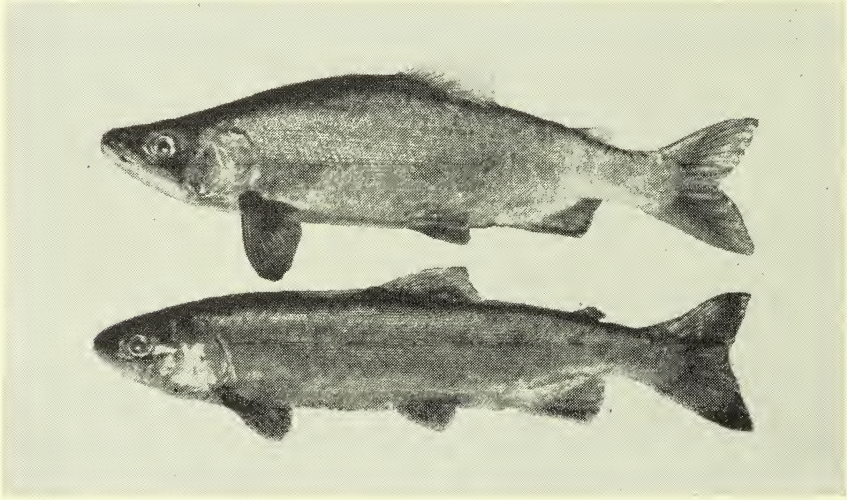

FIGURE 8.—*Oncorhynchus nerka*, a landlocked salmon or little redfish. A pair of redfish during the breeding season. Upper, male. Lower, female.

poses. They lay their eggs on coarse gravel riffles in the lower courses of the streams usually within a few miles of the lake. It is said that redfish spawn along the shores of certain lakes although we have not been able to verify this. During the spawning activities, redfish segregate themselves into pairs which remain over small areas of the stream bed, sometimes in water so shallow that their backs are exposed.

The process of nest building, the most obvious activity over the nest, is done largely by the females, although now and then certain males take part in it. Usually during the 2 to 4 seconds that it takes the female to flex her body for purposes of disturbing and lifting the gravel so that the current will carry it downstream, the male stands by near the lower part of the nest. The nest, about 18

by 24 inches, and 2 to 4 inches deep, is jealously defended by both sexes against invading fish by rushing at them, or by the male escorting an intruder upstream or to one side. Little redfish exhibit definite courtship activities between the intervals of nest building. If the redfish are not disturbed, the courtship acts of "nudging" and "quivering" increase in frequency and may or may not end in spawning. The spawning act was observed by Arthur D. Welander and Daniel Merriman. (See Schultz and students 1935: 74–75.) The female continues her digging undulations immediately after the spawning act, thus covering the eggs with gravel. During the breeding season numerous recently dead fish that are spawned out lie along the banks and in the pools, suggesting that death occurs soon after the completion of spawning, as has been observed for other species of Pacific salmon.

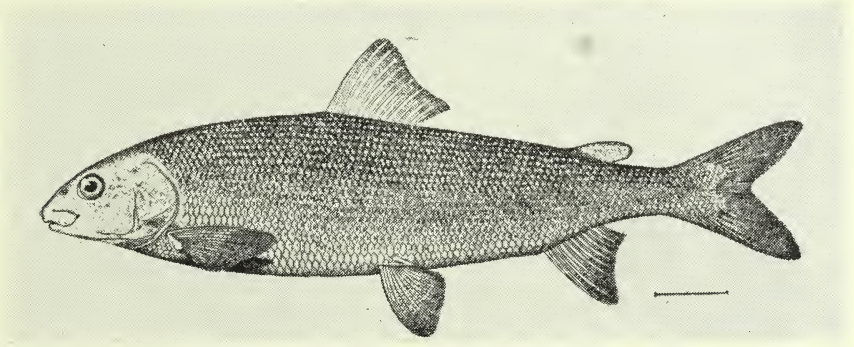

FIGURE 9.—*Prosopium williamsoni*, Rocky Mountain whitefish (adult). After Jordan and Evermann.

Family 2. Coregonidae. Whitefishes

8. *Prosopium williamsoni* (Girard). Rocky mountain whitefish. Pea nose.

Range: Streams and lakes from the Fraser River and Jasper Park southward to the Truckee River, Lahontan Basin of Nevada, and the headwaters of the Saskatchewan and Missouri systems. Abundant.

The Rocky Mountain whitefish is the most abundant Coregonid of Glacier National Park. It occurs in great numbers in all of the lower lakes and larger streams. Milner (1874a) working on Dr. Coues' collections from "Chief Mountain Lake" (Waterton Lake) described this fish as *Coregonus couesi*. Cope (1879, 1892) recorded it from the upper Missouri and upper Saskatchewan Rivers and recently Bajkov (1927) found it in Jasper Park in the headwaters of the Mackenzie system.

The Rocky Mountain whitefish rises to a fly occasionally, and puts up a fair fight. Its flesh is sweet and palatable, and by some persons is considered to be better than trout. The young whitefish, from 1½ to 3 or 4 inches in length, occur along the shores of the lakes and in the backwaters of streams. At times they may be seen rippling the water as they rise to the surface to take adult midges. In the evening, during June, July, August, and September, the half-grown young and adults congregate around the mouths of streams tributary to the lakes. As darkness approaches many move into the streams where they can be seen by a gasoline lantern. This bright light apparently blinds them so that the observer may walk within a few inches without frightening them away. The daily migration into the stream mouth shortly after sunset appeared to be for feeding purposes or for protection, but not once did we note the slightest indication of breeding activities. The Rocky Mountain whitefish

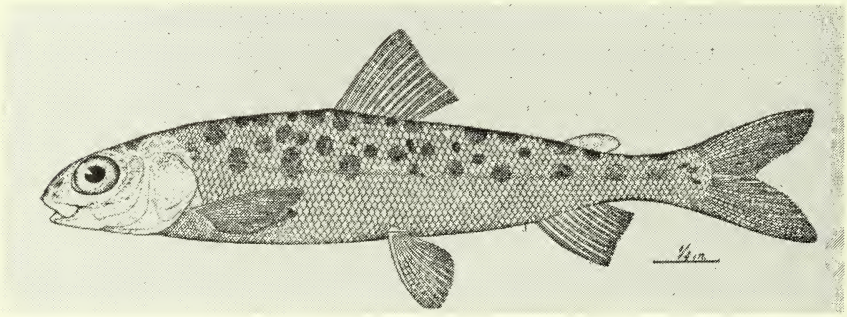

FIGURE 10.—*Prosopium williamsoni* (young, showing color marks on sides). After Jordan and Evermann.

have been observed in spawning colors during the autumn when they probably spawn in the streams.

Our preliminary study of the whitefish of Glacier National Park indicates that the species shows no great morphological variation among the headwaters of the three drainage systems nor do we find significant differences between the fish in this region and the form in the lower Columbia River system. Thus *Coregonus couesi* Milner and *Coregonus williamsoni cismontanus* Jordan, are considered as synonyms of *Prosopium williamsoni.*

9. *Prosopium coulteri* (Eigenmann and Eigenmann). Brown-backed whitefish. Coulter's whitefish.

Range: Alaska (Kendall 1917, 1921) to headwaters of the Columbia River. Rare.

The brown-backed whitefish, never reported from the park before, and which seldom attains a length of 5 inches, was taken by the survey in the mouth of Fish Creek and in the mouth of McDonald Creek, trib-

utary to Lake McDonald. The nearest locality to the park where *P. coulteri* has been found is at Field, British Columbia (Cope 1892), although Snyder (1917) gives a record for Diamond Lake, Stevens Co., Wash. Myers (1932) reports 21 specimens from the Chignik River, Alaska. The tributaries of Lake McDonald appear to be the third locality in the Columbia River basin where *coulteri* has been found. Our specimens, 10 in number and measuring 65 to 96 mm. in length, were almost sexually mature. A large series, collected in November 1936 from the outlet of Lake McDonald, was received recently in the National Museum. These were apparently in spawning condition.

Five specimens of *Prosopium coulteri* were found by Dr. A. S. Hazzard in 1932 by searching at night with the gasoline lantern in Fish Creek near its mouth in shallow water and in some of the deeper holes. Again in 1934, two other specimens were taken within 100

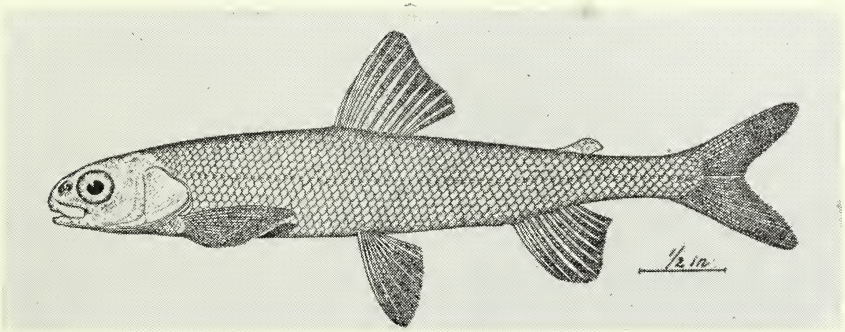

FIGURE 11.—*Prosopium coulteri*, brown-backed whitefish. After Jordan and Evermann.

feet of Lake McDonald, in the same creek, on August 25. The author and R. T. Smith took three on September 11 in the mouth of McDonald Creek, within 45 to 200 feet of the lake. A careful examination at night in pools and in shallow water, further upstream, indicated the absence of this characteristic whitefish. It was not found around the margin of the lake, either at night or during the daytime nor was it seen in the creek mouths during the day.

10. *Coregonus clupeaformis* (Mitchill). Whitefish. Lake whitefish.

Range: Great Lakes and the larger lakes of Canada and northern United States. Common in certain lakes.

The lake whitefish is common in Sherburne, Waterton, Lower St. Mary, and St. Mary Lakes. It was said to occur in Lake McDonald on the west side but it was not taken by the survey in the experimental gill net sets which causes us to conclude that this fish does not occur in the park waters west of the Divide. The largest specimen caught,

23 inches long, was taken in Waterton Lake where they appear to be plentiful in fairly deep water. They are seldom taken on hook and line and are not considered as game fish. This species appeared to be the chief food of the pike in Sherburne Lake during early September. According to a local fisherman it spawns in St. Mary Lake in January or a month or two later.

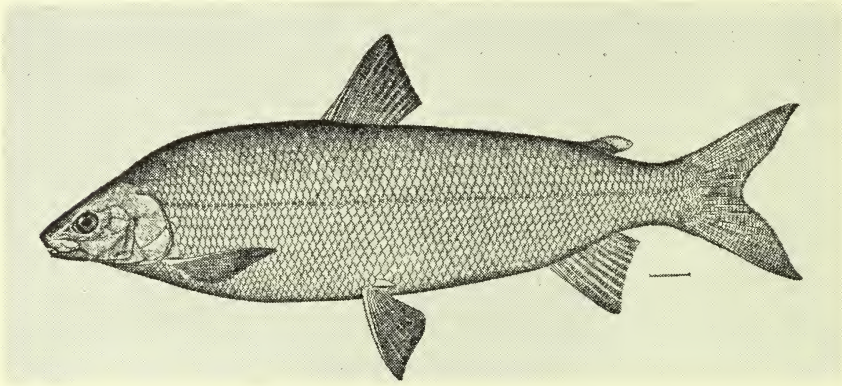

FIGURE 12.—*Coregonus clupeaformis*, lake whitefish. After Jordan and Evermann.

Family 3. Thymallidae. Grayling

11. *Thymallus montanus* Milner. Montana grayling.

Range: Streams of Montana. Locally common.

Milner (1874) described the grayling from Fort Shaw, Camp Baker, and Sun River near the headwaters of the Missouri system, but as

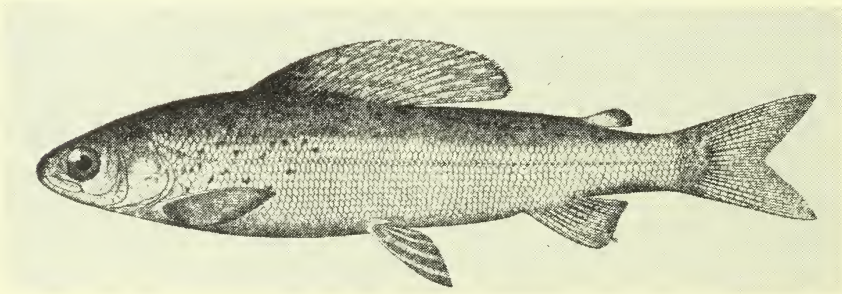

FIGURE 13.—*Thymallus montanus*, Montana grayling. After Jordan and Evermann.

early as 1860, Head (1874) took grayling above Great Falls, Mont. Since that time it has been found to be endemic in various other localities of Montana. Even though it has been planted as a game fish in numerous lakes in Glacier National Park, it occurs in relatively few of them now. (See tables on pp. 38 to 40.) The grayling is an im-

portant game fish, usually rising to the fly readily and putting up a beautiful fight. Mr. L. O. Vaught of Jacksonville, Ill., a regular visitor in the park for more than 35 summers since 1898, reports that a single grayling was caught in Lake McDonald during the summer of 1934, the only record of its occurrence in the lake that we have been able to find and the only record west of the Divide in the park. Unfortunately it has been introduced into some lakes of the park which do not possess suitable conditions for its spawning. A notable example is the lake, Moran's Bath Tub (located above Sherburne Lake on a high ridge) which has neither inlet nor outlet and in which the grayling have been unable to spawn. This lake in 1934 was dominated by a sucker and two minnows, all of which were serious competitors for food. The grayling which remained were emaciated, merely a little flesh and skin covering their bones.

Family 4. Catostomidae.[15] Suckers

12. *Catostomus macrocheilus* Girard. Coarse-scaled Columbia River sucker.

Range: Columbia River system, and coastal streams from Sixes River, Oregon northward to the Puget Sound drainage of Washington. Common.

The coarse-scaled sucker of the Columbia River drainage is found only west of the Divide. See tables, pp. 38 to 40. It is common in all

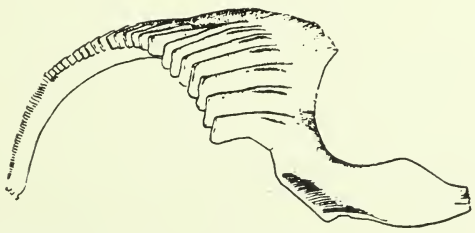

FIGURE 14.—Pharyngeal teeth of *Catostomus macrocheilus*. After Jordan and Evermann.

of the larger lakes and the larger streams of the Flathead drainage in Glacier National Park. It reaches a large size. Numerous specimens taken by the survey measured as much as 450 mm. (17.8 inches).

[15] *Pantosteus jordani* Evermann (1894), the mountain sucker, ranges in the Columbia River basin and upper Missouri system. It was not taken by the survey nor has it been reported from the park, but since it occurs in the headwaters of the Missouri system and in the Columbia River it no doubt may occur in Glacier National Park. *Pantosteus jordani* is a stream-inhabiting species, usually living in swiftly flowing water, among the stones, where it is difficult of capture. Corkerell (1908) records *Carpiodes velifer* (=*Carpiodes damalis*) Girard (1857) from the Milk River.

This sucker spawns in the spring, usually in April and May, when large numbers migrate up the streams and deposit their eggs on the gravel riffles in swiftly flowing water. The eggs, which measure about 3 mm. in diameter and are yellowish in color, adhere to the stones and gravel on the bottom of the stream, which prevents them

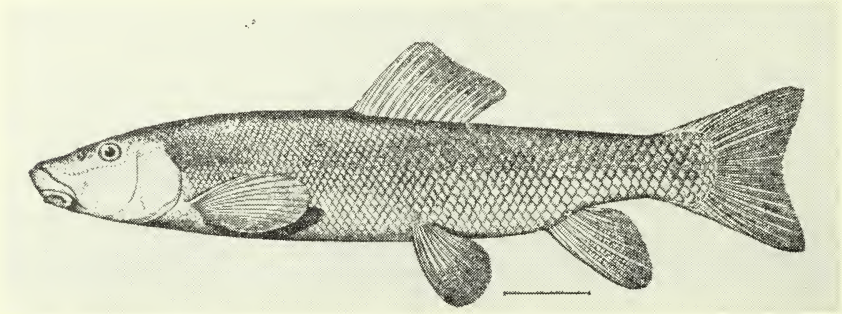

FIGURE 15.—*Catostomus macrocheilus*, coarse-scaled Columbia River sucker. After Jordan and Evermann.

from being swept away. The fry hatch in about 2 weeks, and soon move downstream until they find some backwater which is quiet or continue down until they reach a lake. Here they may be found, between 11 and 50 mm. or more in length during the summer, among logs, weeds, and in other protected places near shore in shallow water.

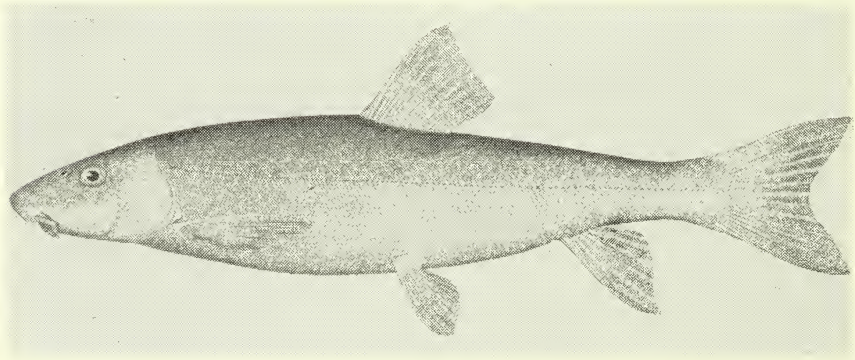

FIGURE 16.—*Catostomus catostomus griseus*, long-nosed sucker.

During the evening and at night the adult suckers approach the shore in large schools which swim close to the bottom in shallow water. They thrust their mouths out against the rocks, stopping here and there in search of food. The large adults appear to be most numerous around the mouths of the creeks tributary to the lakes.

13. *Catostomus catostomus griseus* Girard. Long-nosed sucker. Fine-scaled sucker.

Range: Upper sections of the Missouri, Columbia, and Saskatchewan River systems. Common.

This sucker occurs in all of the drainage systems of the park and is abundant in the larger lakes and streams where it reaches a length of 400 mm. or longer. It is the most abundant sucker in the park, occurring on both sides of the Divide. (See tables, pp. 38 to 40.) The largest adults were taken in the larger lakes. The young from 3 to 6 or 7 inches appeared to be most abundant in the quieter waters of sloughs and side channels of the larger streams. Some were taken, however, around the outlets and inlets of lakes. In the evening and at night (by use of the gasoline lantern) this sucker can be seen foraging about near shore, when it is most easily caught by use of nets. Associated with it are other species of fish, namely, the Rocky Mountain whitefish, other suckers, and sculpins.

The long-nosed sucker, like its relative *C. macrocheilus*, migrates upstream in the spring and deposits its eggs on the stones of the riffles in rapidly flowing water. Ripe males with milt were seen as late as June 12, 1932, in Two Medicine River. However, most of the spawning occurs in April and in May. The fry, soon after hatching, which takes from 10 days to 3 weeks, depending on the temperature, make their way into quiet water downstream, usually into a lake where they remain the rest of the summer among logs, weeds, or in other protected areas in water but a few inches deep. During the summer of 1934, half grown suckers occurred abundantly in the side channels and sloughs of the Middle Fork of the Flathead River near Nyack.

C. c. griseus was one of the first species of fish to be known to range in the headwaters of the Missouri and Columbia systems. It was reported for the first time by Girard (1857, 1857a) as *Catostomus* (*Acomus*) *lactarius* from the Milk River and as *Catostomus retropinnis* by Jordan (1878) from the same stream. Since that time Evermann (1893) reported it as *Catostomus catostomus* from localities near Glacier National Park in the Little Blackfoot River near Ravalli. Eigenmann (1894) took it in the Swiftcurrent River and recently Bajkov (1927) reports its occurrence in Jasper Park, Alberta, Canada.

Our study of the ample material collected by the survey and that collected by Hubbs and Schultz in 1926 in the region south of the park, indicates that this form should be referred to the species *Catostomus catostomus griseus*. We have not had the opportunity to investigate the eastward extension of the range of *Catostomus syncheilus* in the Columbia system nor the western range of *Catostomus*

catostomus griseus which is closely related to *Catostomus pocatello* Gilbert and Evermann (1894) of Idaho, as was suggested by Hubbs and Schultz (1932). It is not known exactly how *griseus* differs, if at all from *C. c. catostomus*, since only a few specimens of the latter subspecies were available. *Catostomus catostomus lacustris* Bajkov (1927) is another form very much like *griseus*. The final nomenclature of the fine-scaled suckers must await a careful study.

14. *Catostomus commersonii* (Lacépède). White sucker. Common sucker.

Range: Quebec, Great Lakes west to Montana, and in the headwaters of the Saskatchewan River; also in Colorado, and southward to Missouri and Georgia. Abundant.

The common sucker occurs only east of the Divide, where it has been taken frequently in Waterton Lake, Moran's Bath Tub, Two

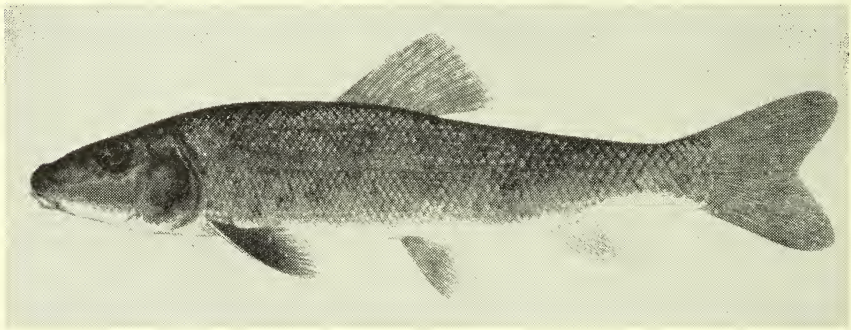

FIGURE 17.—*Catostomus commersonii*, common sucker. After Forbes and Richardson.

Medicine River, and in Lower Two Medicine, Lower St. Mary, and St. Mary Lakes by the survey. Girard (1858) reported this species, *C. sucklii*, from the Milk River, and Jordan (1878) as *Catostomus teres* from the same stream. Eigenmann in 1894 collected it in the Swiftcurrent River. The occurrence of this sucker and two minnows in Moran's Bath Tub, a lake lying on a high ridge with neither inlet nor outlet suggests it was brought there by man, perhaps as bait, because the lake appears never to have had any connection with an adjoining river.

The spawning habits of the white sucker are similar to those of the two other forms described above. It is most abundant in the larger lakes and during the spring occurs in large numbers in the streams.

Family 5. Cyprinidae.[17] Minnows. Dace

The cyprinids are represented by 5 species in Glacier National Park, three east of the Divide and two west of it. *Rhinichthys cataractae dulcis* is the only minnow which occurs in all three drainage systems, but was taken only in the Saskatchewan by the survey.

15. *Ptychocheilus oregonensis* (Richardson). Squawfish.

Range: Columbia River drainage, Puget Sound drainage and coastal streams of Oregon and Washington. Common in larger lakes and streams.

The squawfish occurs only west of the Divide where it is common in the Flathead system in the larger lakes close to the main river. This species is one of the larget of the "minnows" in North America for it has been said to attain a length of nearly 3 feet. The largest specimen, 20 inches long, was taken by the author in Logging Lake.

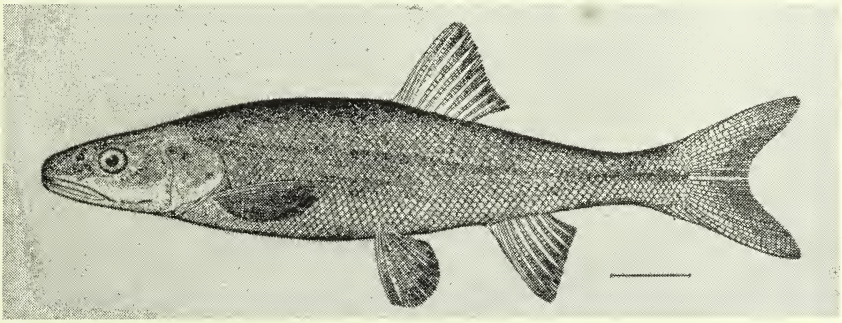

FIGURE 18.—*Ptychocheilus oregonensis*, squawfish. After Jordan and Evermann.

The adult squawfish is pikelike in general habits, feeding voraciously on other aquatic animals, mostly fish, as indicated by Clemens and Munro (1934). Its jaws, like other cyprinids, are toothless, but the powerful crushing teeth on the pharyngeal bones, which occur far back in the throat, serve the same purpose very well. In general the squawfish is considered as an undesirable form in the same lake with trout.

It is said to migrate upstream in the spring to spawn on gravel riffles but the exact details have never been published.

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[17] *Apocope oscula* was reported as *"Agosia nubila"* from Jasper Park by Bajkov (1927) along with *Platygobio gracilis* and *Margariscus nachtriebi athabascae*. Cockerell (1908) records *Platygobio gracilis, Hybognathus argyritis,* from the Milk River and *Macrhybopsis montanus* from the upper Missouri. Eigenmann (1894) reported *Pimephales promelas* from the Swiftcurrent River; Girard (1857) reported *Macrhybopsis gelida* from the Milk River. *Mylocheilus caurinus* occurs in Flathead Lake. None of the above forms have been found in Glacier National Park, although they occur nearby.

16. *Richardsonius balteatus balteatus* (Richardson). Red-sided bream. Shiner. Red-sided minnow.

Range: Fraser and Columbia River system and streams and lakes of Washington and Oregon. Common.

The red-sided bream is found only west of the Divide, where it is locally common in lakes, sloughs, and the quieter waters of the larger streams. It prefers warmer and quieter water, conditions which are not common in the trout streams of the park; therefore its distribution is limited to the lower lakes, particularly the outlets of these lakes. In Glacier National Park, it was abundant in Camas Creek drainage, especially in Rogers Lake and opposite Rogers Ranch in Camas Creek, both bodies of water being warm and shallow, and well suited for suckers and minnows. The red-sided minnow grows to a length of 5 inches, but the largest specimens collected by the survey were only 4½ inches in length. Because of its small size and nonvoracious feed-

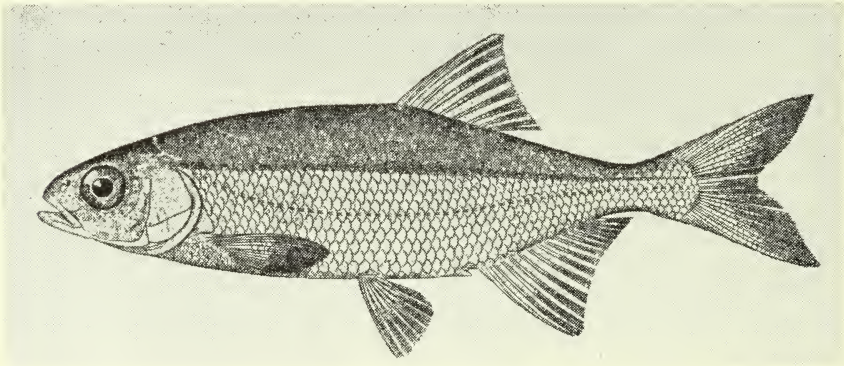

FIGURE 19.—*Richardsonius balteatus balteatus*, red-sided minnow. After Jordan and Evermann.

ing habits this species is one of the most useful and valuable forage fishes in the park. It abounds in the upper Columbia River system as Eigenmann (1895) reports it from Golden, B. C., Brown's Gulch, Silver Bow, and Flathead Lake, as well as in other localities in Montana. The author has collected it extensively in Washington, Oregon, Idaho, and Montana.

During the breeding season, which occurs in the spring and early summer, the sides of the males become scarlet red, while those of the females are slightly duller. Breeding adults have been observed in spawning colors on gravel riffles in June. These brilliant red colors cause many tourists to regard these minnows as young trout.

17. *Rhinichthys cataractae dulcis* (Girard). Long-nosed dace. Black-nosed dace.

Range: Upper Missouri, Platte, Arkansas, Rio Grande, and Colorado Rivers; Columbia River, Utah Basin, and coastal streams of Washington and Oregon. Common locally.

The long-nosed dace was taken by the survey among the rubble of the beach in the breaking waves along the lower end of St. Mary Lake and in the outlet on the riffles. It was also taken in Swiftcurrent Creek above Sherburne Lake and in the Belly River. This

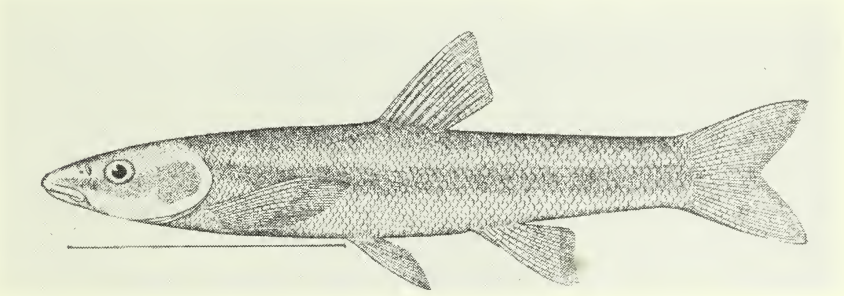

FIGURE 20.—*Rhinichthys cataractae*, long-nosed dace. After Jordan and Evermann.

species does not appear to be distributed extensively in the park, as it was not taken in the streams on the west side where it was also expected to occur. The long-nosed dace was reported from the Milk River as *Rhinichthys maxillosus* by Jordan (1878a), and from the Swiftcurrent River by Eigenmann (1894). Bajkov (1928) found it in the Hudson Bay drainage.

FIGURE 21.—*Couesius dissimilis*, lake chub, from Moran's Bath Tub.

18. *Couesius dissimilis* (Girard). Lake chub. Minnow.

Range: Upper Missouri, Black Hills, and upper Saskatchewan River systems. Locally common.

The range of the genus *Couesius* extends as far west as Lake Pend Oreille of the Columbia system, and in the headwaters of the Fraser River, the species there being *C. greeni* Jordan (1894). In Glacier National Park it was taken by the survey in Moran's Bath Tub and in Waterton Lake. The lake chub was not found on the west side

of the park although the area was carefully studied. This species was first taken by Dr. Coues in 1874 in the Milk River (Jordan 1878a) and next by Eigenmann (1894) in the Swiftcurrent River.

The spawning habits of the lake chub have not been published although females with ripe eggs and males with small nuptial tubercles are found most of the summer.

FIGURE 22.—*Margariscus margarieta nachtriebi*, northern dace, from Moran's Bath Tub.

19. *Margariscus margarieta nachtriebi* (Cox.) Northern dace.

Range: Maine, Great Lakes, westward to Montana. Locally common.

The northern dace occurs in great abundance in Moran's Bath Tub where it was probably introduced accidentally through its use as bait. Specimens in breeding condition were taken in a small tributary of

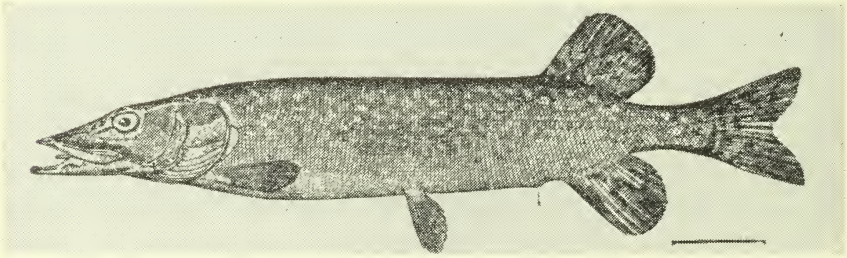

FIGURE 23.—*Esox lucius*, pike, or pickerel. After Jordan and Evermann.

Two Medicine River below the Ranger Station just above Lower Two Medicine Lake. In Moran's Bath Tub *Margariscus* and *Couesius* appear to have hybridized to a limited extent. The spawning habits of this minnow were recently described by Langlois (1929).

Family 6. Esocidae. Pike. Pickerel

20. *Esox lucius* Linnaeus Pike. Pickerel.

Range: New York to Ohio, westward to Montana and northward to Alaska, also in Europe and Asia. Locally common.

The pike was taken by the survey in Sherburne Lake where it is reported to atttain a weight of 18 pounds. Numerous dead and decaying specimens were observed impaled on the large brush and tree jam at the irrigation dam near the outlet at the lower end of the lake. *Esox lucius* was taken by Dr. Coues in 1874 as reported by Jordan (1878a) from the Swiftcurrent River, where Eigenmann (1894) again reported it. The pike in Sherburne Lake feed mostly on whitefish (*Coregonus clupeaformis*). Our specimens, weighing from 4 to 6 pounds, were caught in the experimental gill net by their teeth as they tried to eat gilled whitefish.

Family 7. Gadidae. Cods. Ling

21. *Lota lota maculosa* (Le Sueur) Ling. Burbot.

Range: Rivers and lakes of northern United States, Great Lakes to the Columbia River basin and northward to Arctic Seas.

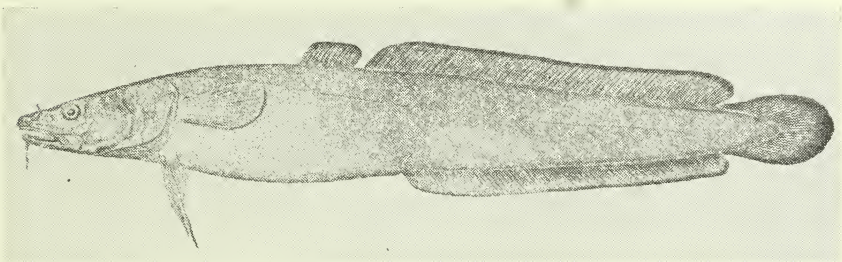

FIGURE 24.—*Lota lota maculosa*, ling or burbot. After Jordan and Evermann.

Eigenmann (1894a) was the first to record the ling in the vicinity of Glacier National Park when he reported that it occurred at Calgary, Alberta, Canada, in great numbers during the spring of the year. The survey obtained specimens from St. Mary Lake, St. Mary River, Lower St. Mary Lake, and Waterton Lake. The young, 3 to 6 inches long, were found abundant in the inlet to Waterton Lake. They were first observed at night by use of a gasoline lantern as they lay curled around stones of the stream bed. The next morning by stirring and moving large rubble along one margin of the stream bank, dozens of the young ling were seen and more than 50 captured. They leave the protection of loose stones and swim about in the river at night, but during the day not one could be seen on the stream bottom.

Family 8. Cottidae. Sculpins. Bullheads

22. *Cottus punctulatus* (Gill). Rocky Mountain bullhead.

Range: Headwaters of the Columbia, Missouri, and Green (Wyoming) Rivers in Montana, Idaho, Utah, Wyoming, northern New

Mexico, and Colorado, also Jasper Park, Alberta, Canada. The records for Oregon and Washington probably are for other species. Locally common.

Cottus punctulatus is common in most of the trout streams of the Flathead and Missouri systems of the park. Bajkov (1927) records this species from Jasper Park, Alberta, but unfortunately he does not give standard measurements of length, which make comparisons difficult. This bullhead inhabits the gravel riffles, hiding among the loose stones on the bottom or in deeper pools. The young and half grown are most abundant among the small rubble and gravel along the margin of a stream or along the shore of a lake exposed to wave action.

Sculpins of the genus *Cottus* spawn in the spring of the year; the female deposits her eggs on the under side of a stone, where they

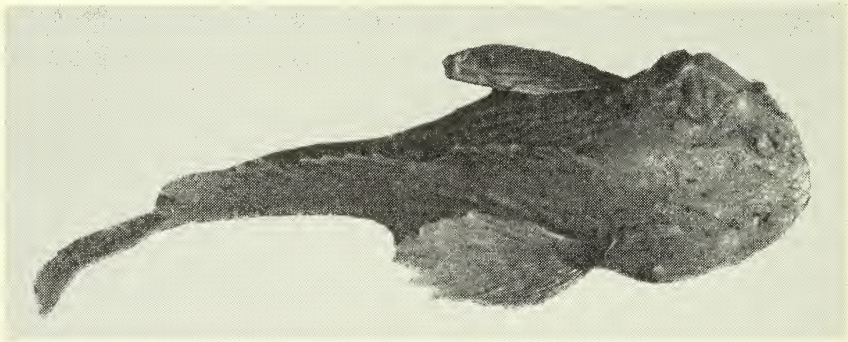

FIGURE 25. *Cottus punctulatus*, Rocky Mountain bullhead.
Sculpin. Blob. Muddler.

adhere in a small cluster. Hatching occurs in 1 or 2 weeks depending on the temperature of the water. The young fry seek shallow and quiet water where they feed and grow to a length of about an inch during the first year. Sculpins are used extensively for bait by trout fishermen in western United States since the trout take them eagerly. They may be considered as forage fish, although it is doubtful if this quality any more than compensates for their habit of eating small aquatic animals when these are plentiful and convenient.

Cottus punctulatus is a variable species, structurally, because the lateral line ends under the spinous or soft dorsal fins (most frequently under the middle third of the soft dorsal fin), and the anus varies in position from either in front or behind the middle of the body (standard length). The anal and dorsal rays are also variable. Most of the

characters appear to be fairly constant for any particular lake or stream. If the investigator had but a few specimens and these from but one, two, or three localities he might be inclined to describe some of them as new subspecies. However, when all of the collections are taken as a whole, the variations overlap greatly, causing us to delay naming any additional subspecies until the problem is more thoroughly studied. Thus we conclude that the *Cottus* of this type should be referred to the species *punctulatus*, until the group is carefully reviewed.

23. *Cottus ricei* Nelson. Prickly bullhead. Prickly sculpin.

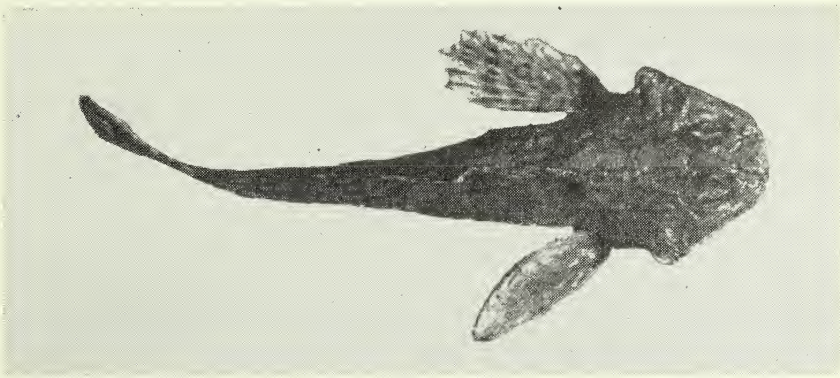

FIGURE 26.—*Cottus ricei*, prickly bullhead, from outlet of St. Mary Lake.

Range: Saskatchewan basin and the Great Lakes basin. Not common.

Cottus ricei is a species that has been rarely taken by naturalists and very few records of its occurrence are known. Eigenmann and Eigenmann in Cope (1892) described it as a new species, *Cottus onychus*, from the Bow River, at Calgary, Alberta, Dymond (1928) recorded it as *Cottus ricei* from Old Man River, tributary to the South Saskatchewan River from a secimen collected by R. T. Rodd. Hubbs (1926) was the first to synonymize *ricei* with *onychus*, with which opinion the author agrees after making further comparisons.

The specimens collected by the survey were obtained from shallow water in the inlet to Waterton Lake, and in the outlet just as it leaves St. Mary Lake.

TABLE 1.—*Distributional records of fishes in the Missouri River drainage of Glacier National Park*

Locality	*Salmo clarkii lewisi*	*Salmo gairdneri*	*Salvelinus fontinalis*	*Salvelinus malma spectabilis*	*Cristivomer namaycush*	*Thymallus montanus*	*Coregonus clupeaformis*	*Prosopium williamsonii*	*Catostomus catostomus griseus*	*Catostomus commersonii*	*Margariscus margarieta nachtriebi*	*Lota lota maculosa*	*Cottus punctulatus*
Cut Bank Creek	xp	p	xp			p							x
Lakes head of creek	xp												
Lake head of Atlantic Creek:													
(Triple Divide Lake)	p	xp											
Morning Glory Creek	p												
East Lake	p												
West Lake	p												
South Fork Cut Bank Creek	x	x											x
Two Medicine River	xp	xp	xp					x	x	x			x
(Tributary) ½ mile below Ranger Station	x		x						x	x	x		
Midvale Creek	xp	xp	xp										x
Railroad Creek			xp										x
Lower Two Medicine Lake	xp	xp	xp		x	p		x	x	x	x		x
Spring Creek			x										x
Old Man Lake	xp												
Pond at outlet Two Medicine Lake	x	x	x										x
Two Medicine Lake (middle)	x	xp	xp			p							x
Appistoki Creek	xp		xp			p							
Aster Creek		p	x										x
Paradise Creek		xp	x										x
Cobalt Lake	xp												
Lake in Bighorn Basin			xp										
Upper Two Medicine Lake		xp	p			p							
South Fork Two Medicine River (N)													
Summit Creek	x	x											
Summit Lake			p										

(N) Not visited by survey.
x Indicates the presence of this species.
p Indicates this species was planted, and it may or may not have been endemic at this locality.

TABLE 2.—*Distributional records of fishes in the Flathead drainage of Glacier National Park*

Locality	*Salmo clarkii clarkii*	*Salmo clarkii lewisi*	*Salmo gairdneri*	*Salvelinus fontinalis*	*Salvelinus malma spectabilis*	*Cristivomer namaycush*	*Thymallus montanus*	*Oncorhynchus nerka*	*Coregonus clupeaformis*	*Prosopium coulteri*	*Prosopium williamsoni*	*Catostomus macrocheilus*	*Catostomus catostomus griseus*	*Ptychocheilus oregonensis*	*Richardsonius balteatus balteatus*	*Cottus punctulatus*
North Fork Flathead River:																
Kintla Creek		x											x			
Kintla Lake		xp			x						x		x			
Upper Kintla Lake					x											
Indian Creek																
Indian (Oil) Lake		x			x						x				x	
Bowman Creek		xp										x	x		x	x
Bowman Lake		xp			x						x	x	x		x	x
Mud Lake												x	x			
Quartz Creek		x			x											
Lower Quartz Lake		x									x	x				
Middle Quartz Lake											x	x				
Quartz Lake		xp			x						x	x	x			
Cerulean Lake		x			x						x					
Logging Creek																
Logging Lake		xp			x						x	x	x	x	x	x
Grace Lake		xp														
Second Lake above Logging		x														
Anaconda Creek		x														
Camas Creek		xp									x	x	x		x	x
Dutch Creek		x					p									x
Rogers Lake		x									x	x			x	x
Trout Lake		xp														x
Arrow Lake		xp			x											
Camas Lake		p														
Evangeline Lake		p														
Middle Fork Flathead River		x	x		x						x		x			x
McDonald Creek (lower)		xp	p		x		p			x	x	x	x			x
McDonald Lake		xp	xp	p	x		x	p		x	x	x	x	x	x	x
Fish Creek		xp	xp	p	x					x	x		x			x
Howe Lake		x														
Snyder Creek		p														
Lower Snyder Lake		x														
Upper Snyder Lake (N)		p														
Sprague Creek		xp														
Fish Lake		xp														
Avalanche Creek																
Hidden Lake		xp														
Avalanche Lake		xp														
McDonald Creek (upper)		xp	x													
Mineral Creek		p														
Lincoln Creek		x														
Lincoln Lake		x			x											
Lake Ellen Wilson		p		xp												
Harrison Creek																
Harrison Lake		xp		p	x						x	x	x			x
Nyack Creek	x	xp									x					
Halfmoon Lake																
Coal Creek		x			x											x
Muir Creek		x														
Park Creek		x			x											x
Lake Isabel		x			x											
Upper Isabel Lake		x			x											
Ole Creek		x			x											
Lake Katherine		x														
Bear Creek		x														
Shields Creek		x														

(N) Not visited by survey.
x indicates the presence of this species.
p indicates this species was planted and it may or may not have been endemic at this locality.

TABLE 3.—*Distributional records of fishes in the Saskatchewan drainage of Glacier National Park*

Locality	*Salmo clarkii lewisi*	*Salmo gairdnerii*	*Salvelinus fontinalis*	*Salvelinus malma spectabilis*	*Cristivomer namaycush*	*Thymallus montanus*	*Oncorhynchus nerka*	*Coregonus clupeaformis*	*Prosopium williamsoni*	*Catostomus catostomus griseus*	*Catostomus commersonii*	*Margariscus margarita nachtriebi*	*Couesius dissimilis*	*Rhinichthys cataractae dulcis*	*Esox lucius*	*Lota lota maculosa*	*Cottus ricei*
Waterton River:																	
Waterton Lake	p	p	x	----	xp	----	----	x	x	x	x	----	x	----	----	x	x
Boundary Creek	p	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lake Wurdeman	(*)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Olson Creek	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lake Janet	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lake Francis	----	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pass Creek	----	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Kootenai Creek	----	p	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Kootenai Lake No. 1	----	----	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Belly River	p	p	----	----	----	p	----	----	----	----	----	----	----	----	----	----	----
Middle Fork Belly River	x	x	----	----	----	----	----	----	x	----	----	----	----	----	----	----	----
Crossley Lake	p	----	----	----	x	----	----	----	x	----	----	----	----	----	----	----	----
Glenns Lake	p	----	----	----	x	----	----	----	x	----	----	----	----	----	----	----	----
Lois Lake	----	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1st Lake above Glenns (L)	----	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Margaret Lake	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
South Fork Belly River	----	----	----	----	----	x	----	----	----	----	----	----	----	----	----	----	----
Elizabeth Lake	----	xp	----	----	----	xp	----	----	----	----	----	----	----	----	----	----	----
St. Mary River	p	p	----	----	----	----	----	x	x	----	----	----	----	----	----	x	----
Kennedy Creek	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
North Fork Kennedy Creek	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Slide Lake	x	----	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----
South Fork Kennedy Creek	x	----	----	x	----	----	----	----	x	----	----	----	----	----	----	----	----
Lower Kennedy Lake	----	p	----	----	----	p	----	----	----	----	----	----	----	----	----	----	----
Swiftcurrent Creek	x	p	x	----	----	----	----	----	x	x	----	----	----	x	----	----	----
Boulder Creek (N)	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lake Sherburne	x	----	----	----	----	p	----	x	x	x	----	----	----	----	x	----	----
Moran's Bath Tub	----	----	----	----	----	xp	----	----	----	----	x	x	x	----	----	----	----
Cracker Lake	p	xp	----	xp	----	----	----	----	----	----	----	----	----	----	----	----	----
Swiftcurrent Lake (McDermott)	p	xp	xp	----	----	p	xp	----	----	----	----	----	----	----	----	----	----
Cataract Creek	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lake Josephine	x	xp	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Grinnell Lake	xp	xp	x														
Swiftcurrent Lake:																	
No. 1 (Stump)	p	p	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
No. 2 (Bullhead)	----	p	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
No. 3 (Ladyhead)	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Wilbur Creek	----	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iceberg Lake	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Ptarmigan Lake	xp	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Elrod Lake	----	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lower St. Mary Lake	x	----	----	----	----	----	----	x	----	x	x	----	----	----	----	x	----
Divide Creek	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
St. Mary Lake	xp	xp	----	x	x	----	p	xp	x	x	x	----	----	x	----	x	x
Roes Lake	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lost Lake	xp	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Red Eagle Creek	xp	x	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----
Red Eagle Lake	xp	xp	----	x	----	----	----	----	----	----	----	----	----	----	----	----	----
Virginia Creek	----	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Reynolds Creek	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Twin Lakes	p	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Gunsight Lake	xp	xp	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

* Golden trout planted. (N) Not visited by survey. x Indicates the presence of this species.
p Indicates this species was planted and it may or may not have been endemic at this locality.

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