Francis P. Farquhar
San Francisco
November 1920

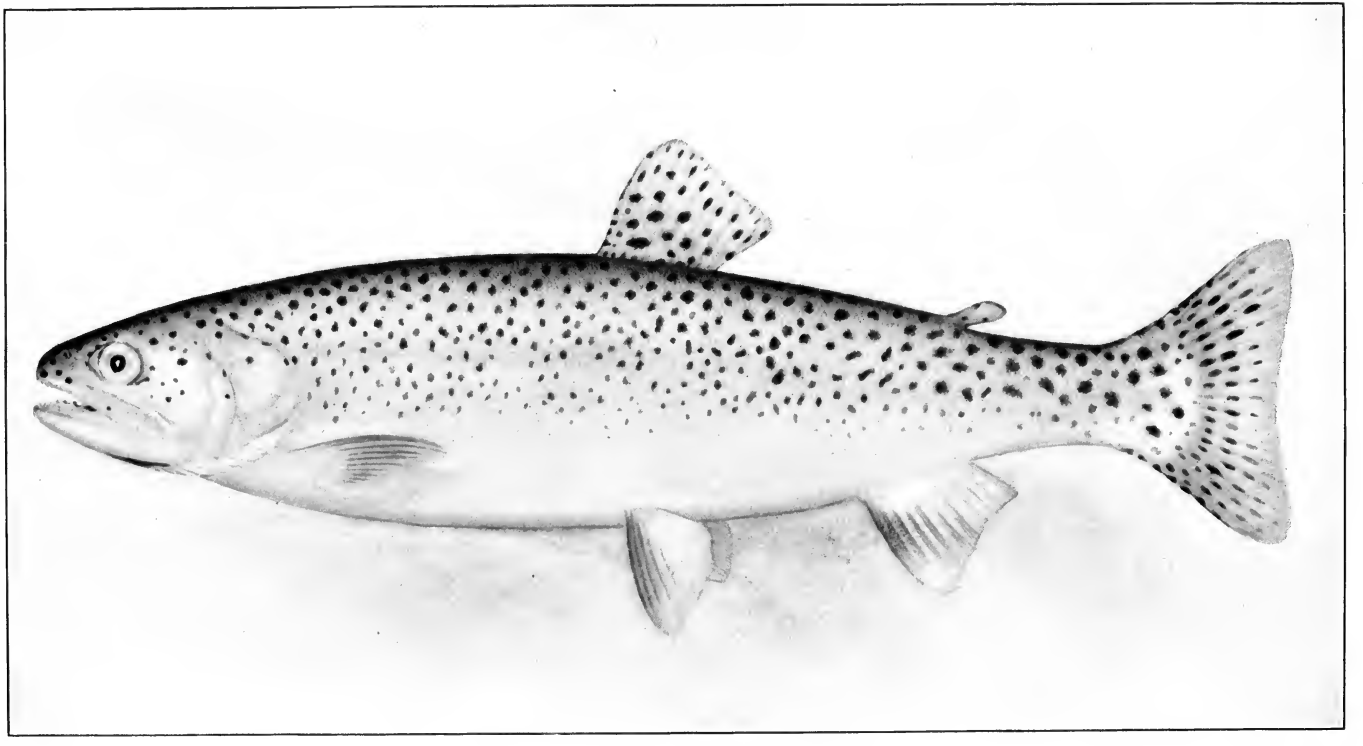

FIG. 3.—NATIVE TROUT; CUTTHROAT TROUT; BLACKSPOTTED TROUT.

DEPARTMENT OF COMMERCE
BUREAU OF FISHERIES
HUGH M. SMITH, Commissioner

THE FISHES OF THE YELLOWSTONE NATIONAL PARK

By W. C. KENDALL
Assistant, United States Bureau of Fisheries

APPENDIX VIII TO THE REPORT OF THE U. S. COMMISSIONER OF FISHERIES FOR 1914

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THE FISHES OF THE YELLOWSTONE NATIONAL PARK.

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INTRODUCTION.

The natural fish fauna of the Yellowstone National Park consists of but a few species, owing to the facts that distribution must have occurred in recent geological times and that all of the streams leaving the lava beds do so by means of vertical waterfalls situated in deep canyons. Except in Yellowstone River and its tributaries, in Gibbon River, and in Lava Creek, no fishes have been found above these falls except where their presence may be accounted for by imperfect watersheds separating these streams from others.

The known species of natural occurrence in the park are longnose sucker, rosyside sucker, chub, silverside minnow, longnose dace, whitefish, cutthroat trout, grayling, and blob. Of these only the trout and grayling were recognized as game fishes, although the whitefish might justly be so considered. While these fishes were wonderfully abundant in the waters inhabited by them, the annually increasing number of tourists, many of whom were anglers, made it desirable to stock some of the previously barren waters with game fishes.

An examination of the park waters by Forbes in 1890[a] showed that many of these waters were well supplied with crustacean and insect food and were otherwise suited to certain species. Referring to the supposed obstacle to the spread of fish life in the park, Dr. Jordan said that the waters of the geysers and other calcareous and silicious springs appeared not to be objectionable to fishes. In Yellowstone Lake trout were found especially abundant about the overflow from the Lake Geyser Basin, where the hot water flowed for a time at the surface, and trout could be taken immediately under these currents. It was noted also that trout had been known to rise to a fly through the scalding hot surface current and that they lingered in the neighborhood of hot springs in the bottom of the lake. Dr. Jordan suggested that this was probably owing to the abundance of food in those

[a] A preliminary report on the aquatic invertebrate fauna of the Yellowstone National Park, Wyo., and the Flathead region of Montana. By S. A. Forbes. Bulletin U. S. Fish Commission, vol. XI, for 1891, p. 207–258, and pl. XXXVII–XLII. 1893.

warm waters, but the fact is evident that geyser water does not kill trout. Heart Lake was also mentioned where trout were found most plentiful about the mouth of warm Witch Creek and in Boiling River, which drains the Mammoth Hot Springs and flows into Gardiner River, where trout abounded about the mouth, and where the conventional trick of catching a trout in cold water and scalding in hot water is possible.

The first fish-cultural distributions in the park waters were in 1889, when several species were transplanted and introduced. From that time to the present many fish of various species have been planted, according to available records, as follows:

Native whitefish (*Coregonus williamsoni*)	12,980
Native trout (*Salmo clarkii*)	9,009,968
Rainbow trout (*Salmo irideus*)	61,390
Loch Leven trout (*Salmo levenensis*)	17,195
Landlocked salmon (*Salmo sebago*)	9,000
European brown trout (*Salmo fario*)	9,300
Lake trout (*Salvelinus namaycush*)	42,025
Eastern brook trout (*Salvelinus fontinalis*)	41,650
Largemouth black bass (*Micropterus salmoides*)	750

PRINCIPAL FISHING IN THE PARK.

Of the foregoing, the landlocked salmon and black bass have shown no evidence of their survival, but more or less of the others have become established and some of them abound even in waters previously uninhabited by fish.

In many of the localities the fishing is reported to be excellent, not only for the introduced forms but for native trout, otherwise called blackspotted or cutthroat trout. Where whitefish and grayling naturally occur they are usually plentiful.

The season does not begin much, if any, before July, by which time, according to one of the following authorities, "the plethora of water has disappeared and the streams flow swift, clear, and cold. At this season of the year trout fishing is at its best."

Information regarding the fishing in various localities may be found in the reports of the superintendent of the park, particularly that of 1897, and the following publications:

Fish in the National Park and tributaries of Snake River—propagation of whitefish. By J. E. Curtis. Bulletin U. S. Fish Commission, vol. IV, for 1884, p. 335–336.

A reconnoissance of the streams and lakes of the Yellowstone National Park, Wyo., in the interest of the United States Fish Commission. By David Starr Jordan. Bulletin U. S. Fish Commission, vol. IX, for 1899, p. 41–63, with map and many plates.

A reconnoissance of the streams and lakes of western Montana and northwestern Wyoming. By Barton W. Evermann. Bulletin U. S. Fish Commission, vol. XI, for 1891, p. 3–60, with plates and maps.

A woman's trout fishing in Yellowstone Park. By Mary Trowbridge Townsend. Outing, vol. XXX, no. 2, May, 1897, p. 163–164.

Wyoming summer fishing and the Yellowstone Park. By Ralph E. Clark. Outing, vol. LII, no. 4, July, 1908, p. 508–511.

Fly fishing in wonderland. By Klahowya (O. P. Barnes). 1910. 56 p.

The following annotated up-to-date list of fishing localities is mainly derived from information kindly furnished by Col. L. M. Brett, United States Army, the present acting superintendent of the park, to which a few notes from the previously mentioned writers have been added:

YELLOWSTONE LAKE.

The lake abounds in native trout eager for the fly or other lure. There appears to be no other species in the lake, the landlocked salmon planted in 1908 and 1909 not having been seen since. Rainbow trout planted at the same time in some of the affluents have shown no evidence of establishment.

YELLOWSTONE RIVER ABOVE THE FALLS.

Native blackspotted trout are plentiful. Whitefish planted in 1889 and in 1890 have not been reported.

Cascade Creek.—Native trout are abundant.

YELLOWSTONE RIVER AND BRANCHES BELOW THE FALLS.

Native trout are plentiful and whitefish are native to the waters but seldom found higher up than Crevice Gulch.

Tower Creek.—The waters above the falls were barren previously to the planting of eastern brook, rainbow, and blackspotted trouts, and these have as yet shown no evidence of establishment.

Geode Creek.—Rainbow trout planted in 1909.

Blacktail Deer Creek.—Native trout are abundant and eastern brook trout were planted in 1912, 1913, and 1914.

GARDINER RIVER AND BRANCHES.

The main stream.—Loch Leven trout are found in abundance, probably planted by mistake. Native trout and whitefish are common.

East Fork or Lava Creek.—Blackspotted and eastern brook trouts were introduced and both are abundant. Rainbow trout were also introduced but are not much, if at all, in evidence.

The main stream above the falls.—This section of the river, together with its branches, the Obsidian, Indian, Panther, and Straight Creeks, also Grizzly Lake and Glen Creek, above the falls, were previously barren waters in which eastern brook trout are now abundant.

GIBBON RIVER ABOVE FALLS AND GREBE LAKE.

Rainbow and eastern brook trouts are now abundant in these previously barren waters. Blackspotted trout were planted in Grebe Lake in 1912, but the results are not yet known.

MADISON RIVER AND BRANCHES.

Firehole River, Gibbon River below the Falls, Nez Perce Creek, Little Firehole River, etc.—Native blackspotted trout, whitefish, and grayling are abundant, as are also Lock Leven and brown trouts. Eastern brook trout and rainbow trout are numerous in Gibbon River. Mr. Clark wrote:

> The junction of Yellowstone and Lamar Rivers is noted for fine fishing. If you find the waters high, swift, and roily, you will probably try your flies in vain. Put on a spinner or a little spoon and watch the fish rise to it, almost touch it, and then go away. They are after live bait and wont touch anything else. The grasshoppers are abundant; catch a few, bait your hook carefully, and let it float down with the current. A large trout will rise to it, and if you are not very careful he will steal it from you.

SHOSHONE LAKE AND CREEK; LEWIS LAKE.

Lock Leven and lake trouts are abundant, and eastern brook trout abound in Shoshone Creek. Mr. Clark wrote that the Shoshone and Lewis Lakes region was probably the best fishing in the park:

> These two lakes and their outlet, Lewis River, are full of native trout and have been stocked with Mackinaw and Lock Leven trout, which are increasing in size and number most successfully. These fish will not rise to the surface and take the fly as do the regular native trout, and it is necessary to go down into the water for them. In the lakes you can catch them by trolling, if you can find the particular cove where they happen to be running. However, in spite of the uncertainty of the lake trolling, there is one place where you can troll with assurance of success, and that is in the canal between Shoshone and Lewis Lakes. This is a natural body of water with little or no current and not very wide. In Lewis River just below Lewis Falls, in the deep pools where the eddies are covered with foam, you are sure to find good fishing.

Duck Lake (near Thumb of Yellowstone Lake).—Blackspotted trout are abundant, but landlocked salmon planted in 1908 have not since been observed

MINOR WATERS.

Pelican Creek.—Stocked with blackspotted trout from the Yellowstone Lake hatchery. Mr. Clark says:

> One mile east of Yellowstone River outlet is Pelican Stream which rises in the cold snows of the mountains and empties its waters into the lake. Here you catch quantities of uncontaminated trout, large, beautiful, fat, and gamy, as free from worms as the fresh cold waters they swim in are free from pollution.

Clear Creek, Eleanor Lake, Middle, Crow, and Jones Creeks, and Sylvan Lake.—All of these are stocked with blackspotted trout from the hatchery.

Small lake near Sepulchre Mountain.—Eastern brook trout were planted in 1912, but the results are as yet unknown.

Swan Lake (connects with Glen Creek and upper Gardiner River).—The planted eastern brook trout seem to have left the lake for the small streams, as they have never been found in the lake.

Twin Lakes.—Whitefish were planted in 1899, but have never been heard of since.

Beaver Lake (connects with Obsidian Creek).—Eastern brook trout are plentiful in the lake, but the rainbow trout also planted there have never been heard of.

De Lacy Lake.—The rainbow trout planted in 1895 have not been observed.

Ice Lake (near Gardiner River).—Eastern brook trout planted here have never been reported.

Ice Lake (between Fountain and Excelsior Geysers).—Blackspotted trout planted in 1905 have not been heard of.

Upper Basin Lakes (in Firehole Basin).—Black bass planted in 1895 never have been observed.

FISHING RULES AND REGULATIONS.

The following rules and regulations applicable to fishing in the park have been prescribed by the superintendent:

Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

PARASITES OF THE TROUT.

It has long been known that in certain waters of the Yellowstone Park trout are infested with parasitic worms, while in other park waters they were free from this parasite. Yellowstone Lake fish appear to be the most seriously affected, and the fact of this parasitism has been of no little concern to anglers, consumers of fish, and fish culturists in that region.

This parasite is a tapeworm, to which the late Prof. Joseph Leidy, who first described the species, gave the name of *Dibothrium cordiceps.* In the larval stage this worm occurs in cysts among or on the viscera of the trout, free among the viscera, beneath the peritoneal lining of the abdominal cavity, or in the muscular tissue.[a]

It is only the larval or intermediate stage that occurs in the trout, the host of the adult appearing to be an entirely different animal, as is the case with all tapeworms. Briefly, its life cycle seems to be as follows: Starting with the egg in the water, it develops into a ciliated

[a] A full discussion of this subject will be found in the following paper: A contribution to the life history of *Dibothrium cordiceps* Leidy, a parasite infesting the trout of Yellowstone Lake. By Edwin Linton. Bulletin U. S. Fish Commission, vol. IX, for 1899, p. 337-358, with plates.

embryo. This passes into the trout, where it becomes established and assumes the form commonly observed. The fish is eaten by the pelican, and in the intestinal tract of this bird the parasite attains its adult and reproductive stage, and its round of life is there completed. The eggs pass from the bird into the water, and a new generation is begun.

This parasitism of the trout is of much concern to the angler because the fish thus affected are likely to be lazy or inactive. To the consumer such fish are more or less objectionable, not only because they are "wormy," for the worm is a "tapeworm" of proverbial aversion and dread, but because the fish are sometimes deteriorated in quality and flavor and considered unfit to eat. To the fish culturist, whose concern comprises both of the foregoing, there is the fear of spreading the infection to other waters. As the most seriously affected trout are found in the warmer waters, the angler can get some relief by fishing in cool waters.

As an answer to the query of the consumer, it may be said that no known tapeworm for the adult of which man acts as host finds its intermediate host in fishes. Furthermore, as cooking destroys the vitality of the worm, there would be little or no danger from that source, besides which there is probably no edible fish that is not more or less affected with some kind of parasitic worms.

However, it may dispel apprehension to state that similar tapeworms in some places are actually eaten as food and considered delicacies. In Italy a parasite of the European tench and other cyprinid fishes is sold in the markets under the name of *maccaroni piatti* and eaten, usually under the mistaken notion that it is the roe of the fish. The same or a similar parasite is also eaten by many persons in Lyon where it goes by the appropriate and truthful name of *ver blanc* (white worm). It is stated on good authority that in this country a choice portion of another fish not infrequently contains encysted parasitic worms which the consumer, not knowing its nature, selects as a delicate morsel. However, since these facts are not likely to completely remove a deep-seated prejudice or lead to a general demand for tapeworms on the menu of the park hotels, it would be desirable to be rid of these parasites or even to reduce the number.

Several methods, more or less feasible, have been suggested. The most practical and at the same time the most desirable of these is the introduction of other fishes into Yellowstone waters to detract the attention of the native trout from itself as a food; for it is not improbable that the intensity of this parasitic infection of the Yellowstone Lake trout is increased by cannibalism, since there are no other fishes for the large trout to eat. Also, these additional fishes not being subject to infection by this trout-pelican parasite, by affording

other fish than trout as food for the pelicans, would reduce the output of tapeworm eggs from that source. The fish best suited to that end is the chub (*Leuciscus lineatus*) and perhaps the silverside minnow (*Leuciscus hydrophlox*), both of which abound in Heart Lake and Witch Creek.

Tapeworms would probably disappear from trout transferred to other waters where there are no pelicans, unless by chance some other fish-eating bird may be or might become a host for the adult.

LIST OF THE FISHES.

As has been indicated, 10 species of fishes are known to be native to the waters of the park, of which only 3 are reputed to be game fishes. However, 6 others, all game fishes, have been introduced and all but two of them have become acclimatized and afford good fishing.

A brief discussion of each kind of native and introduced fish follows, preceded by a key intended as an aid to the angler in the identification of his catch.

The key is arranged on the alternative plan and is to be used in the following manner: Trace the characters of the specimens with what is said under each succeeding letter, until there is a disagreement, or the name of the fish is reached. When a disparity occurs, go to the double of the letter under which it occurs, thence proceed as before until another disagreement or a name is found, and so on. For example, take the brown trout, assuming that it is not recognized; compare it with statement A, with which it agrees; proceed to B, with which it does not agree, having fewer rays in the dorsal fin. Turn to BB, with which it agrees, and by the name in parenthesis it is found to belong to the Salmonidæ or salmon family. Then go to *b*, with which it is found to disagree in having a large mouth and coarse teeth and more scales than stated. Turn, therefore, to *bb*, where an agreement and the subfamily to which it belongs are found. Proceed regularly then to *d*, which is also found to agree. Continue to *e*, with which it does not agree, as it is not profusely blackspotted and has not 130 scales in lengthwise series. Turn to *ee*, with which it agrees. Proceed to *g*, with which it does not agree. Then turn to *gg*, with which it agrees in the number of scales and color description,[a] and the numbered name of the brown trout is reached. The number indicates its place in the annotated list of fishes which follows the key.

If it is desired to ascertain the name of a specimen of fish without an adipose fin, which, of course, is found not to conform to the statement A, turn to AA and proceed as in the foregoing example.

[a] The color description of each species as given can not always be relied upon to exactly fit a specimen in hand, owing to the great variability in this respect. However, there will always be more or less approach to the general color scheme as stated, which no other species will show.

ARTIFICIAL KEY TO THE FISHES.

A. Adipose or gristly fin on back situated behind a soft, jointed-rayed dorsal fin. Salmonoid fishes.

B. Anterior dorsal fin long and high, with 19 or 20, or more, fully developed rays. Graylings (Thymallidæ).

a. Coloration: Back bluish gray with purplish reflections; sides and gill covers lighter, with purple and silvery reflections, beautifully iridescent; scales with pearly luster; belly pure white; a few V-shaped black spots between head and middle of dorsal fin but none posteriorly; two oblong, bluish black blotches in cleft between opercle and gill membrane rays (branchiostegals), more pronounced in the male; a line on upper border of belly from ventral to pectoral fins, dark and heavy in the male, very faint in the female. Dorsal fin edged with a red or rosy border; four to seven rows of red or rosy roundish spots, ocellated with white between the dorsal rays; dark blotches forming lines between the rows of red spots. Ventral fins with three rose-colored, branching stripes along the rays, darker between. Pectoral and anal fins plain, with dark border.....Montana grayling, 1.

BB. Anterior dorsal fin short with not over 15 fully developed rays. Salmon family (Salmonidæ).

b. Mouth small, teeth sparse, fine bristle-like or none; fewer than 100 fully developed scales in a lengthwise series from the upper end of gill opening to base of tail. Whitefish (Coregoninæ).

c. Scales in longitudinal series 78 to 88; coloration, bluish or grayish olivaceous above, silvery on sides, whiter below; sometimes with dusky, or yellowish or brassy tinge; all fins usually tipped with black; tail and adipose fins bluish or olivaceous. No spots; young with parr marks.
Native whitefish, 2.

bb. Mouth large, teeth strong and sharp; scales comparatively small, more than 100 in lengthwise series. Salmons, trouts, and chars (Salmoninæ).

d. Scales in lengthwise series fewer than 200, body always more or less black spotted. (Salmo.)

e. Scales more than 130 in lengthwise series; body profusely black spotted.

f. Scales in lengthwise series about 160 to 170; spots rather large, profusely scattered and irregular, usually none on the belly; red blotches on the lower jaw and membrane between always present. Extremely variable in coloration and form.....Native trout, 3.

ff. Scales in lengthwise series about 135 to 145; profusely black spotted with only slight if any appearance of red on and between lower jaws. Coloration more or less variable but usually bluish or olivaceous above, sides silvery, everywhere profusely spotted, the spots extending on the sides of the belly and on the vertical fins; upper ray of pectoral spotted; spots on tail small, belly nearly plain; both males and females with more or less diffuse red or rosy lateral band and blotches; often much red on cheek and gill cover.
Rainbow trout, 4.

ee. Scales in lengthwise series fewer than 130. Not profusely black spotted; no rosy wash, band, or blotches along the side.

g. Body comparatively slender, more or less silvery, with no ocellated red spots; black spots irregular in shape, the shape determined by the number of scales occupied; sometimes cross, double-cross, or triple-cross shape.

h. Scales in lengthwise series 118 to 130; in oblique cross series from lateral line to upper base of ventral fin 26 to 30. Upper part

bluish or greenish olive, sides silvery with a varying number of X-shaped or crescentic black spots; sides of head with roundish black spots; tip of pectoral blackish; anal and tail fins unspotted, varying much in coloration in different waters. Loch Leven trout, 5.

hh. Scales in lengthwise series about 115 fully developed; 21 to 23 in oblique series from lateral line to upper base of ventral. Color very variable but typically greenish olive on back, silvery on sides; belly white; irregular black spots on back and sides; sometimes two rows on base of dorsal fin; none on tail; variable number, but usually three or four roundish black spots on gill cover. Young often with unocellated bright red spots along sides.....Landlocked salmon, 6.

gg. Body comparatively short and deep; scales in lengthwise series about 120, and about 30 in oblique series. Dark colored, olive or brownish, with numerous irregular black or dark brown spots above lateral fin below; usually ocellated red spots along side; orange or yellow margin on upper part of dorsal and anal and outer part of ventral. Light-colored young much resemble young landlocked salmon but distinguished by the red spots having bluish areolas.....Brown trout, 7.

dd. Scales in longitudinal series usually 200 or more. No black spots whatever.

i. Scales in longitudinal series usually 200 or more (180–205); never any ocellated red spots on sides; no rivulations on back, dorsal fin, or tail. Tail always strongly forked. Coloration extremely variable, generally grayish or yellowish gray, profusely covered with round pale spots, sometimes almost white, again deep orange, usually pale yellow; yellowish spots on dorsal and partial dusky cross bars on upper and lower basal half of tail. Young sometimes with faint mottling on back slightly resembling the brook trout.....Lake trout, 8.

ii. Scales in lengthwise series 215 to 230; red spots on sides always ocellated with bluish; back usually yellowish gray and always vermiculated or rivulated with dusky; dorsal and tail with wavy dusky bars and rivulations; pectorals, ventral, and anal reddish with white outer rays margined behind by a narrow black streak. Coloration highly variable with age, locality, and season.....Eastern brook trout, 9.

AA. No adipose fin; one or two dorsal fins.

a′. Dorsal fins more or less continuous, the anterior of spines or simple unjointed rays; the posterior of soft or jointed rays.

b′. Anterior dorsal composed of strong sharp spines. General color, dark green above, sides and belly greenish; an irregular blackish stripe along the side from opercle to middle of base of tail, growing indistinct and disappearing with age; three oblique dark stripes across cheek and gill covers; some dark spots above and below lateral line. Coloration somewhat variable and quickly changeable.....Black bass, 10.

bb′. Anterior dorsal composed of weak flexible spines or simple rays; small curved hook at edge of gill cover. Coloration olivaceous, everywhere punctulate with dark spots, conspicuous on top of head, four or five dark blotches on back suggesting cross bars; dorsal, pectorals, and tail with wavy streaks and series of spots; anal and ventral white, or sometimes dusky.....Blob, 11.

aa'. Dorsal fin single, the fully developed rays all soft and jointed.
c'. Mouth wholly inferior with thick papillose lips, especially the lower lip.
d'. Scales in lengthwise series very small, reduced and crowded anteriorly, 90 to 110. Snout long. Coloration dusky brown, sometimes with a broad red flush or irregular stripe.....Longnose sucker, 12.
dd'. Scales in lengthwise series 70 to 72, not particularly reduced or crowded anteriorly. Snout not long. Coloration blackish above, males with more or less rosy flush or stripe in breeding season..Rosyside sucker, 13.
cc'. Mouth more or less terminal or oblique, sometimes slightly inferior, but lips never thick or papillose.
e'. Mouth oblique.
f'. Anal rays 8; scales in lengthwise series 55 to 63; mouth very oblique, lower jaw somewhat projecting. Coloration blackish, everywhere dark; scales much dotted and with dark edges; often forming lines along the rows of scales. Males without red.....Chub, 14.
ff'. Anal fin rays 10 to 13, usually 10 or 11; scales about 58, mouth oblique, short, jaws about equal. Coloration greenish silvery; the back dusky; a dark blue or blackish lateral band between two silvery stripes; the lateral band and below bright orange-red in the males, the red usually ceasing at front of anal; a bright silvery or golden crescent on chubs; a golden streak from snout above eye to gill opening. Very pale in alkaline waters.
Silverside minnow, 15.
ee'. Mouth subinferior.
g'. Upper jaw not protractile, the upper lip continuous with the skin of the forehead, muzzle long and projecting, color silvery, darker above; a dusky lateral shade most distinct in young, males largely rosy.....Longnose dace, 16.
gg'. Upper jaw protractile, i. e., the upper lip capable of being drawn out from the snout; muzzle not particularly long. Color usually dark grayish above becoming paler below, a faint lateral band of dark extending through the eye and around snout.
Dusky dace, 17.

1. Montana Grayling (*Thymallus montanus*).

The Montana grayling originally existed only in tributaries of the Missouri River above Great Falls.

In the park it occurs naturally in Madison and Gallatin Rivers and branches, Fan Creek, Grayling Creek, and the Firehole River below the falls. It is reported as very abundant at the junction of Firehole and Gibbon Rivers. It is said to ascend, in summer, as far as Firehole Falls and to be found in the Gallatin River in the northwestern part of the park.

The Montana grayling is a most graceful and beautiful fish, of shapely proportions and exquisite coloration. The adult averages from 10 to 12 inches in length and from about ½ to 1 pound in weight.

It prefers swift, clear, pure streams, with gravelly or sandy bottom. It is quite gregarious, lying in schools in the deeper pools, in plain sight, and not, like the trout, concealed under bushes and overhanging banks. In search of food, which consists principally of insects

and their larvæ, it occasionally extends its range to streams strewn with bowlders and broken rocks.

Unlike the native trout, the grayling will go long distances, if necessary, to find suitable spawning grounds. They spawn in April and May on gravelly shallows. In the north fork of the Madison River, where the water is comparatively warm, coming from the Firehole River in the Yellowstone Park, the grayling spawns a month earlier than in any other waters in Montana.

In point of activity it even excels the native trout, when hooked breaking the water repeatedly in its effort to escape, which the trout seldom does. It takes the artificial fly eagerly, and if missed at the first cast will rise again and again from the depths of the pool, whereas the trout will seldom rise a second time without a rest. It will also take various baits, such as caddis-fly larvæ, grasshoppers, and worms. Among the recommended flies are professor, Lord Baltimore, queen

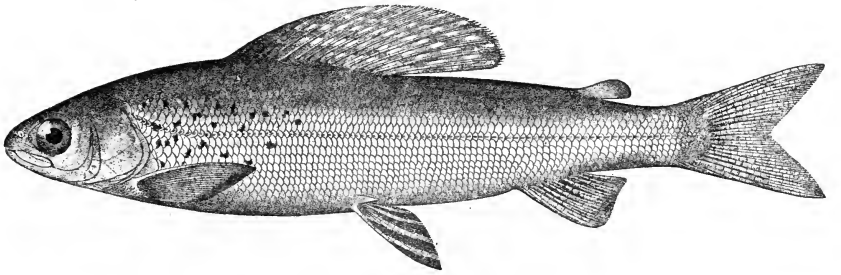

FIG. 1.—Montana grayling.

of the water, grizzly king, Henshall, coachman, and various gauze-winged flies, with no. 10 and 12 hooks.

As a food fish it is even better than the trout. Its flesh is firm and flaky, very white, and of delicate flavor.

2. NATIVE WHITEFISH; ROCKY MOUNTAIN WHITEFISH (*Coregonus williamsoni*).

The Rocky Mountain whitefish occurs in all suitable waters on the west slope of the Rockies from Utah to British Columbia. A scarcely, if at all, distinguishable variety or subspecies bearing the name of *Coregonus williamsoni cismontanus* is found in certain waters of the upper Missouri Basin.

In some localities this fish is miscalled grayling,[a] with which it should not be confused, as it is a very different species; and there seems to be a local Yellowstone River name, the phonetic spelling of which is "sterlet" or "steret."

[a] Referring to the fishing in the canyon of Sunlight Creek, Clark Fork, Mr. Clark probably made this mistake in writing the following: "You will probably first catch a scaly fish which looks like a long sucker. It is the Montana grayling and there are many down there."

In the park it naturally occurs in the Yellowstone River below the falls as far up as Crevice Gulch, beyond which it is seldom found; also in Madison and Gallatin Rivers below the falls; and has been reported also from the junction of Firehole and Gibbon Rivers.

Young whitefish, 2 to 5 inches long, from Montana, were planted in park waters as follows: In 1889, 2,000 were placed in Twin Lakes and 980 in Yellowstone River above the falls, and 10,000 more were planted in the latter place in 1890. It is considered doubtful if any of these have survived, owing to the number and size of voracious trout in the Yellowstone River and the mineral character and high temperature of Twin Lakes.

This fish prefers clear, cold lakes and streams, where the usual length of adults is about a foot or so, although it is known to have attained a weight of 4 pounds. The *cismontanus* form is essentially a river fish rather than an inhabitant of lakes, and is most abundant

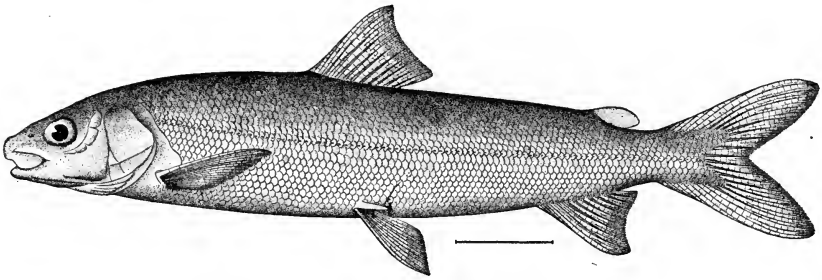

FIG. 2.—Native whitefish; Rocky Mountain whitefish.

in the eddies or deeper places of swift streams. It spawns in late fall or early winter.

It is a slender graceful fish, readily taking the artificial fly like a grayling or trout, as well as natural baits, such as worms and insects, and even fresh meat. However, owing to the smallness of its mouth, the hook should be no larger than no. 10 or 12, and when hooked the fish requires careful "playing" owing to the tenderness of the mouth parts. It is a game fighter. It ranks high as a panfish, for, when in condition, it is of surpassing sweetness and delicacy of flavor.

3. NATIVE TROUT; CUTTHROAT TROUT; BLACKSPOTTED TROUT (*Salmo clarkii*).

(See Frontispiece.)

In its numerous varietal, subspecific, or specific forms the cutthroat or blackspotted trout is of extensive distribution on the Pacific slope. In the park a form previously designated as *Salmo lewisi* is found naturally in both the upper Snake and upper Missouri Waters, having doubtless gained the latter from the Snake River by the way of

Two Ocean Pass, and it is not unlikely that an interchange of individuals still takes place.

Yellowstone Lake and Yellowstone River from its source to many miles beyond the park are inhabited by it. The abundance of trout above the falls is remarkable.

Trout are known to naturally occur in the following park waters:

Lower Yellowstone River.
- Sour Creek.
- Trout Creek.
- Alum Creek.
- Antelope Creek.
- Lamar River.
  - Cold Creek.
  - Willow Creek.
  - Timothy Creek.
  - Miller Creek.
  - Calfee Creek.
  - Cache Creek.
  - Soda Butte, Pebble, and Amphitheatre Creeks.
  - Slough and Buffalo Creeks, Lake Abundance, etc.
- Hellroaring Creek.
- Blacktail Deer Creek.
- Gardiner River.
  - Lava and Lupine Creeks.

Yellowstone Lake.
- Beaverdam Creek.
- Rocky Creek.
- Trail Creek.
- Chipmunk Creek.
- Riddle Lake and Solution Creek.
- Arnica Creek and Beach Lake.
- Columbine Creek.
- Clear Creek.
- Bear Creek.
- Pelican Creek.

Upper Yellowstone River.
- Atlantic Creek.
- Jay Creek.

Upper Yellowstone River—Continued.
- Bridger Lake and Creek.
- Falcon Creek.
- Thoroughfare Creek.
- Escarpment Creek.
- Cliff Creek.
- Lynx Creek.
- Phlox Creek.
- Mountain Creek.
- Badger Creek.
- Trappers Creek.

Madison River.
- Canyon Creek.
- Cougar Creek.
- Maple Creek.
- Gneiss Creek.

Snake River.
- Fox Creek.
- Crooked Creek.
- Sickle Creek.
- Pacific Creek.
- Heart Lake and Heart River.
  - Witch Creek.
  - Beaver Creek.
  - Surprise Creek.
- Basin Creek.
- Coulter, Harebell, and Wolverine Creeks.
- Red Creek.
- Forest Creek.
- Falls River.
  - Mountain Ash Creek.
  - Bechler River.

Gibbon River has no trout above the falls. In the Firehole River trout occur naturally below the falls.

In the Gardiner River trout are abundant from the foot of the falls to its junction with the Yellowstone. Trout have not been seen above Osprey Falls.

In Soda Butte Creek trout are numerous until obstructed by falls in the upper part.

Hellroaring Creek is well stocked in the lower part.

In Canyon Creek trout abound below the falls.

In Lupine Creek, notwithstanding the barrier offered by Undine Falls, it is stated on good authority that trout have been taken in Lava Creek above the falls.

In Riddle Lake trout are numerous.

Alum Creek is said to be one of the best trout streams in the park.

Lake Abundance is reported to be full of trout.

In Heart Lake and at the mouth of Witch Creek trout are numerous.

The following are United States fish-cultural records of distribution of young native trout in park waters:

1889, East Fork of Gardiner River above the falls	968	1912, Natural Bridge Creek	350,000
1904, Duck Lake	290,000	1912, Second Creek	300,000
1904, Yellowstone Lake	22,000	1913, Boat House Creek	725,000
1906, Ice Pond	47,000	1913, Cub Creek	400,000
1908, Duck Lake	175,000	1913, De Lacy Creek	850,000
1908, Fisheries Creek	225,000	1913, Duck Lake	50,000
1909, Cub Creek	1,600,000	1913, Grebe Lake	300,000
1909, Fisheries Creek	890,000	1913, Hatchery Creek	460,000
1910, Cub Creek	400,000	1913, Indian Creek	100,000
1911, Fisheries Creek	75,000	1913, Number Two Creek	400,000
1912, Boat House Creek	600,000	1913, Soldier Creek	300,000
1912, Cub Creek	100,000	1914, Transportation Creek	350,000

It appears that the plant of trout made in 1889 was obtained from Howard Creek, Idaho, in September and planted in Lava Creek above the falls which previously contained no trout according to the superintendent of the park. However, it was subsequently ascertained that trout had possible access to this locality from Blacktail Deer Creek, which has no falls and was abundantly supplied with trout.

It has been said that there seem to be two varieties of native trout in the park, the larger ones of the Yellowstone, with bright yellow bellies, and the smaller kind more silvery in appearance and exhibiting much greater activity and game qualities, of which Tower Creek fish are examples. Also trout of Yellowstone Lake seem to differ from those of Heart and Henry Lakes in having more distinct and rather less numerous black spots. However, in this respect very much individual variation is shown.

The size attained by trout in the park waters, as elsewhere, varies much with locality and conditions. Fish of over 4 pounds have been reported.

This trout in some waters is a highly esteemed game fish and can be taken in all sorts of ways—spoon, phantom, natural bait, artificial flies, etc. Mary Trowbridge Townsend writes of it in the Firehole River:

> The father of the Pacific trout, the blackspotted "cutthroat" with the scarlet splotch on his lower jaw, was most in evidence, with long symmetrical body, grad-

uated black spots on his burnished sides. He is a brave, dashing fighter, often leaping salmon-like many times from the water before he can be brought to creel. We found him feeding on the open riffs or rising on the clear surface of some sunlit pool.

Ralph E. Clark wrote (l. c.) that "the dark, silvergray trout of the West seem to favor flies more in harmony with their own coloring" and mentioned the gray hackle, brown hackle, coachman, grizzly king, Seth Green, black gnat, and white moth.

It is an excellent food fish when fresh from cool waters.

4. Rainbow Trout (*Salmo irideus*).

The rainbow trout has its geographical range in the mountain streams of the Coast Range and the west slopes of the Sierra Nevada Mountains, but the natural abode of the rainbow trout of fish-cultural fame is the McCloud River, Cal. In fish books this form is recognized as a subspecies and there bears the name of *Salmo irideus shasta*. It has been successfully introduced into many

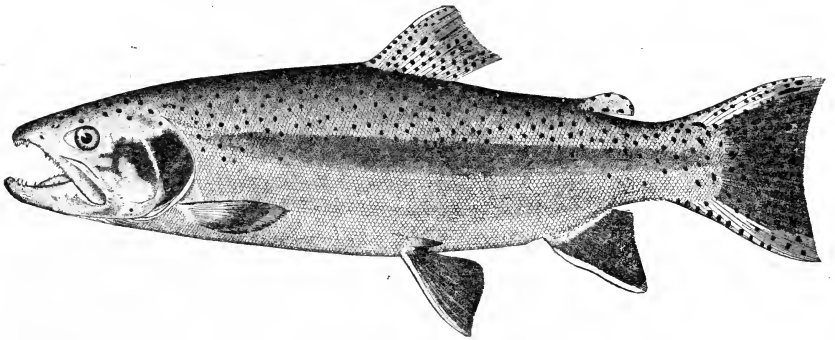

Fig. 4.—Rainbow trout.

streams in different parts of the United States where it was not previously found. The following plants have been made in the Yellowstone Park:

1889, Gibbon River (Grebe Lake above Virginia Cascade)	990	1908, Tributaries of Yellowstone Lake	3,700
1896, De Lacey Lake, near Mammoth Hot Springs	——	1909, Gibbon River	7,000
1906, Gibbon River	10,000	1909, Grebe Lake	8,500
1908, East Fork of Gardiner River	200	1909, Little Blacktail Creek	3,000
1908, Gardiner River	10,000	1910, Rock Lake	10,000
		1910, Gibbon River	15,000

The size attained by the rainbow trout varies greatly and is dependent upon volume of water, temperature, food supply, etc. Under certain conditions it reaches an extraordinary size, but in the ordinary environment 6-pound or 8-pound fish are to be regarded as large. In general it may be said that the fish does not overrun 2 pounds. Its food is composed largely of insects.

In the McCloud River its spawning season is from February to May, but in the park it appears to spawn somewhat earlier. Many persons who have had experience in angling for rainbow trout say it is one of the best, and some pronounce it the very best, of the trouts. It often dashes from the water to meet the descending fly, and leaps repeatedly and madly when hooked. It has been said that it takes the fly so readily that there is no reason for resorting to other lures. However, its activity and habits, as in the case of most fishes, are modified more or less by its surrounding conditions. The same is true of its food qualities, which are ordinarily very good.

Mary Trowbridge Townsend (l. c.) had the following to say relative to her experience with the rainbow trout in Firehole River:

> The California rainbow trout proved true to his reputation, as absolutely eccentric and uncertain, sometimes greedily taking a fly and again refusing to be tempted by the most brilliant array of a carefully stocked book. During several days fishing we landed some small ones, none weighing over 2 pounds, although they are said to have outstripped the other varieties in rapidity of growth, and tales were told of 4-pounders landed by more favored anglers.

This fish has been reported from the Gibbon River both above and below Virginia Cascades. Regarding this stream, the superintendent's report for 1897 shows that the fish planted above the cascades seemed to have come down over the falls, as but few were found above, while below the stream was well stocked to its junction with the Firehole.

Grebe Lake, Blacktail Deer Creek, Madison, Firehole, and Little Firehole Rivers all contain rainbow trout. Referring to the last-named stream in 1897, the superintendent of the park wrote that several good specimens had been taken near its mouth, for which he could not account, as it seemed impossible for any fish to ascend the lower falls of the Little Firehole.

5. Loch Leven Trout (*Salmo levenensis*).

This trout originated in Loch Leven, the lake made famous by Scott's poem, "The Lady of the Lake." Typically it was peculiar to this loch, where it seldom if ever attained much over a pound in weight.

The claim has been made that it is merely an ontogenetic development of the common brown trout and that when transferred to other waters its progeny can not always be distinguished from the common brown trout. On the other hand, information derived from persons familiar with Loch Leven indicates that both this trout and the brown trout exist in the same lake and that in that body of water they can always be distinguished at whatever age or condition.

It is not impossible that confusion has arisen by brown trout from that lake having been propagated under the supposition that they

were Loch Leven trout. There are parallel instances of such mistaken identity in this country in respect to other species, and so-called Loch Leven trout have been propagated for a long time in this country. In the early years the progeny of Loch Leven eggs could easily be distinguished from brown trout hatched at the same time, especially when they had attained a few inches in length. Recently, however, there is reason to suspect that many of the so-called Loch Leven plants have been brown trout. Be that as it may, trout under each name have been introduced into Yellowstone Park waters and there are records of both having been subsequently taken.

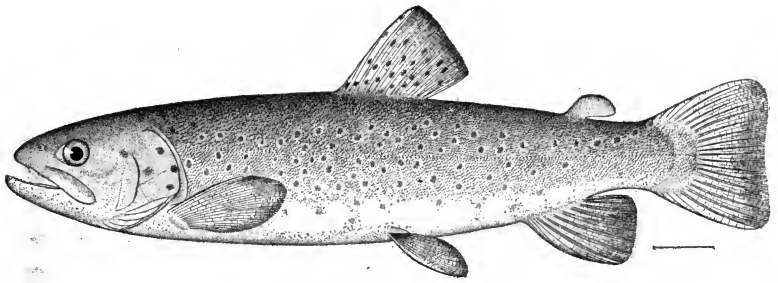

FIG. 5.—Loch Leven trout.

In describing the fishing in the Firehole River, Mary Trowbridge Townsend said:

> One other fish proved a complete surprise. He was of silvery gray color, covered with small black crescents. Some park fishermen called him a Norwegian trout, others the Loch Leven. Any country might be proud to claim him with his harmonious proportions, game fighting qualities, and endurance.

This trout is naturally a lake fish and its peculiarities would suggest a peculiar environment. Whether it will develop and thrive in streams and retain its peculiarities is uncertain. As a game fish it is not excelled by any of its introduced congeners and as a food fish, in its native waters at least, it is unsurpassed in delicacy of flavor. The Loch Leven is primarily an insect feeder and preeminently an artificial-fly fish.

It has been introduced into park waters as follows:

1889, Firehole River, upper courses	995
1890, Lewis Lake	3,350
1890, Shoshone Lake	3,350
1903, Tributaries of Firehole River	9,500

Loch Leven trout have been reported from the following park waters, in some of which they are plentiful: Firehole, both above and below the cascades, Madison, Gibbon, and Gardiner Rivers, Heron Creek, north end of Shoshone Lake, Lewis Lake, "canal" between Shoshone and Lewis Lakes, and upper Snake River waters.

6. Landlocked Salmon (*Salmo sebago*).

In the United States this species originally was known from a few localities in Maine, but has been widely distributed by fish culture. It has become acclimatized in many waters but in others seems not to have become established.

The Sebago salmon requires cool water and plenty of food, which in its natural abode and in those waters where it has thrived best consists chiefly of smelts.

The size attained depends largely upon its food supply and perhaps upon the size of the lake in which it lives. The largest fish of this species have been taken from the largest lake, i. e., Sebago, where two fish of over 35 pounds each have been recorded, and many from 15 to 20 pounds have been taken by anglers.

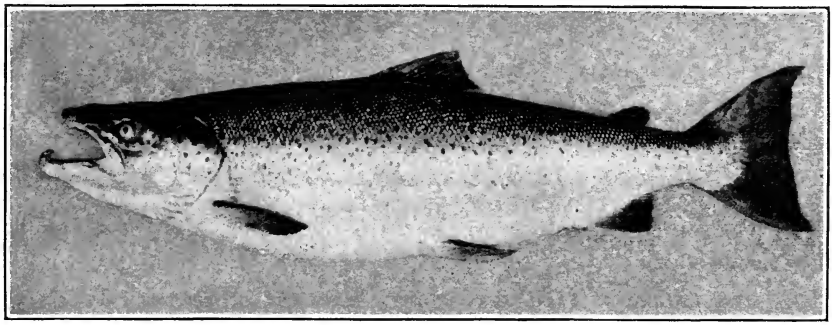

Fig. 6.—Landlocked salmon.

It spawns in the fall, the height of the season in Maine being in the first part of November. Usually the fish ascends inlets or descends outlets for the purpose.

Besides subsisting upon smelts and other kinds of small fishes, it eats quantities of insects at times. It is a highly esteemed game fish, and is accounted by many anglers the prince of game fishes. However, the game qualities are greatly affected by its environment, and the method of fishing has something to do with it.

The usual method of angling for the Sebago salmon is by trolling with lures, which may be a smelt or other small silver fish, artificial minnow or phantom, various spinning contrivances, or artificial fly, and usually these are reinforced by a spoon as a supposed attraction. Whether in lake or stream, this salmon will often take the fly, but the stream salmon are by far the best fly fish. In fact in some localities fly fishing is the only method employed. When taken by this method in a quick-water stream, the Sebago salmon is hard to beat as a game fish.

Among the many taking flies, the silver doctor, grizzly king, Seth Green, Montreal, Jock Scot, brown hackle, and the like are con-

sidered by many to be the most effective. General favorites in the way of trolling lures are whitebait and blueback phantoms, although there are others more or less successful.

This fish when properly prepared and cooked is most excellent as food. Baked salmon with sage dressing is highly recommended by those who have tried it.

The only plants of landlocked salmon in the park appear to have been in 1909, when 2,000 were placed in Duck Lake and 7,000 in Yellowstone Lake.

A Department of the Interior bulletin, "General Information Regarding the Yellowstone National Park," issued in 1912, states that the salmon planted in the park apparently did not thrive, as they have never been heard of since they were planted.

7. Brown Trout; Von Behr Trout (*Salmo fario*).

The brown trout is widely distributed in continental Europe and the British Isles, inhabiting lakes as well as streams, but it is the

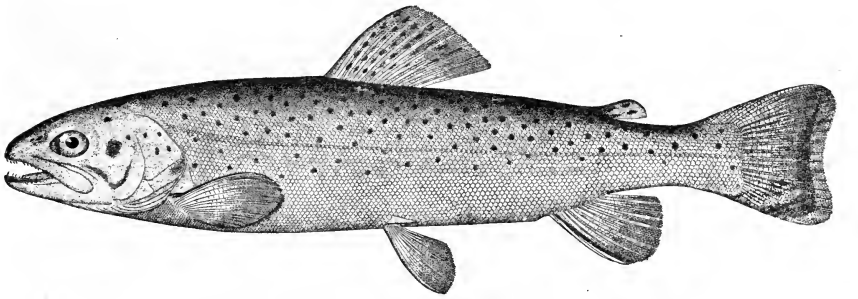

Fig. 7.—Brown trout; Von Behr trout.

"brook trout" of the European countries. Under favorable conditions it is known to grow to over 20 pounds, but as a true brook trout it seldom registers over one-half or 1 pound in weight.

The brown trout thrives in clear, cold, rapid streams and at the mouth of streams tributary to lakes, having much the same habits as our eastern brook trout. It is by some regarded highly as a game fish, taking either bait or artificial fly. The best fly fishing is usually toward night. As a game and food fish it is in its prime from May to September. Its flesh is very agreeable in flavor. Spawning begins in October.

In 1890, 9,300 brown trout were planted in Nez Perce Creek. The brown trout has been caught in Nez Perce Creek, Madison, Gibbon, and Firehole Rivers, in the latter locality from its junction to the lower falls, or Keppler Cascade, and in the Little Firehole below Mystic Cascade and in Iron Creek.

Mary Trowbridge Townsend (l. c.) mentioned one from the Firehole River:

> A good 4-pounder, and unusual marking, large yellow spots encircled by black, with great brilliancy of iridescent color. * * * I took afterward several of the same variety, known in the park as the Von Behr trout, and which I have since found to be the same *Salmo fario*, the veritable trout of Izaak Walton.

8. Lake Trout (*Salvelinus namaycush*).

The lake trout, otherwise known as laker, lunge, togue, mackinaw trout, etc., is of wide northern distribution. In British America it ranges from the Atlantic to the Pacific coasts and northward to the Arctic Ocean. In the United States it is found in many of the larger and deeper lakes in New England, New York, and in the Great Lakes Basin, and in a few localities in the Western States, as Montana and Idaho. It occurs also in Alaska. It has also been spread by fish-cultural operations into waters where it did not previously exist.

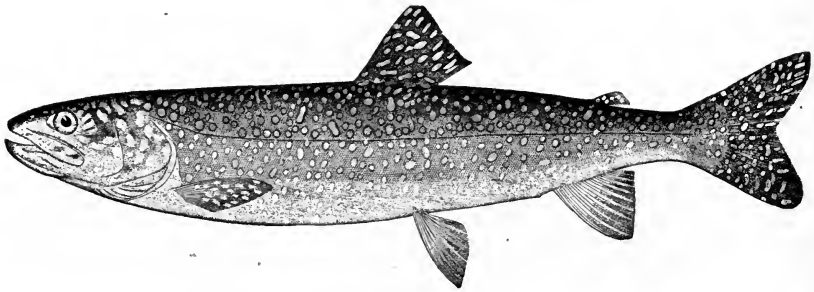

Fig. 8.—Lake trout.

The only plants of this fish in the Yellowstone Park seem to have been 30,012 in Shoshone Lake and 12,013 in Lewis Lake in 1890.

It is, as its name implies, a lake rather than a stream fish. In some waters it attains a very large size. Examples weighing over 100 pounds have been reported from the Great Lakes, and in former years the average weight of the fish in the commercial fisheries of those waters was stated at 20 to 30 pounds. At this time, however, 10 to 15 pounds can be considered large.

Its large size affords its chief attraction as a game fish, for it is not ordinarily a very active fighter, although a powerful antagonist. It is usually caught by deep trolling, but is sometimes found at the surface and is occasionally taken on an artificial fly. Opinions differ regarding its table qualities, and, as with most fishes, much depends upon how it is prepared and cooked. It is a very oily fish and often of an unpleasant, strong, oily flavor. This may be obviated, however, by removing the skin before the fish is cooked. The best method of cooking it is by boiling, serving with mayonnaise dressing or egg sauce.

The lake trout has become established at least in Shoshone Lake, from which in 1914 Dr. H. M. Smith saw brought in by an angler one of 14 pounds and several smaller ones. In his report for 1897 the acting superintendent of the park wrote that he had never heard of any fish being taken from Shoshone or Lewis Lakes, although he had seen fishes apparently of 3 or 4 pounds weight in Shoshone Lake, and the skeleton of a fish that would perhaps have weighed 10 pounds was found on the shore of the same lake. Some soldiers reported having seen schools of trout 2 feet long near the mouth of De Lacey Creek in Shoshone Lake.

These are quite possibly lake trout, although Loch Levens had been planted in the same waters. However, Mr. Clark (l. c.) wrote in 1908 that lake trout were plentiful in Shoshone Lake and Lewis Lake and River, and that they could be caught in the "canal" between Shoshone and Lewis Lakes as fast as one could throw in a trolling spoon, and he remarked that they were large and fat.

9. Eastern Brook Trout; Speckled Trout (*Salvelinus fontinalis*).

The natural western limit of this brook trout in the United States is northeastern Minnesota. It inhabits lakes as well as streams, and

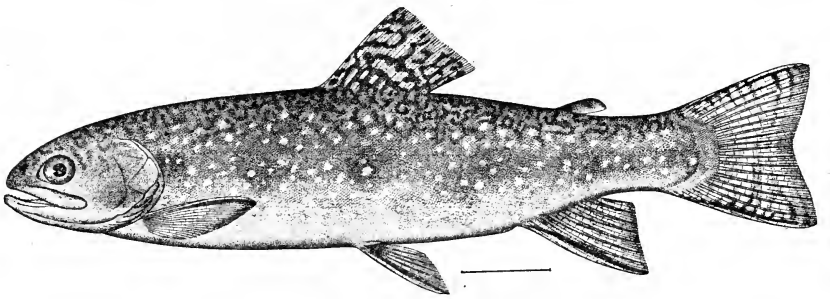

Fig. 9.—Eastern brook trout; speckled trout.

varies in size according to locality. It does not flourish in temperature of over 68° F., and about 50° F. is preferable. The largest trout of this species authentically recorded weighed some over 12½ pounds. In some lakes trout of 5 or 6 pounds are not uncommon, but such large fish are seldom found in streams unless the streams are tributary to fairly large lakes. In streams of moderate size trout of 1 or 2 pounds weight are to be considered large, and in most brooks a trout of one-half or three-fourths pound is an exception, at least in recent years. Its spawning season is in fall.

The brook trout is one of the most noted and esteemed of American game fishes, but there must be something besides activity that makes it such a general favorite, as in that respect it is surpassed by several others. One appealing attribute is its beauty of coloration, and

another is its delicacy of flavor, which is hardly surpassed by any other fish.

The brook trout may be taken by almost any method known to anglers. In open streams fly fishing is the method par excellence. In streams where overgrowth prevents fly casting, angleworms, grasshoppers, or almost any bait will be taken when the trout is feeding. Everything will be disregarded when it is not feeding. The best flies to use in any body of water must be learned by experience, but the brown hackle is seldom a failure anywhere. Professor, queen of the water, Montreal, coachman, and many others are usually quite successful. Gauze-winged flies will sometimes succeed when others fail.

The best time to fish for this trout is in the morning and early evening. It lurks in eddies and pools and at the foot of rapids, or under overhanging banks, old stumps, or rocks.

The plants of eastern brook trout by the Bureau of Fisheries have been made in park waters as follows:

1889, Gardiner River	4,975	1907, Indian Creek	34,000
1890, West Fork of Gardiner River	7,875	1907, Willow Creek	63,800
1893, Shoshone Creek	4,500	1908, Indian Creek	27,000
1901, Willow and Glen Creeks	10,000	1908, Swan Lake	9,000
1902, Glen Creek	9,000	1908, Willow Creek	28,000
1902, Willow Creek	18,000	1909, Willow Creek	20,000
1902, Indian Creek	11,000	1910, Glen Creek	5,000
1903, Tower Creek	15,000	1910, Indian Creek	15,000
1905, Gibbon River above Virginia Cascade	17,000	1910, Willow Creek	20,000
1905, Willow Creek	27,000	1911, Lava Creek	5,000
1906, Willow Creek	45,000	1913, Blacktail Creek	22,500

The brook trout now occurs in Obsidian, Indian, Panther, Winter, Straight, Glen, and Willow Creeks; Grizzly Lake; upper Gardiner River, Firehole River above Kepler Cascades and between its junction with the Gibbon and the lower falls; Gibbon and Madison Rivers, Virginia Meadows, streams along the road from Wylie Camp to Apollinaris Spring, Shoshone Creek and Beaver Lake. The report of the superintendent of the park for 1897 calls attention to the fact that brook trout were very numerous in the Firehole River above Kepler Cascades, evidently having been planted there through mistake for Loch Leven trout, none of which had ever been observed. The same report stated that Shoshone Creek was literally alive with brook trout up to 1½ pounds in weight.

10. Largemouth Black Bass (*Micropterus salmoides*).

There were two introductions of black bass in park waters. In 1893 Gibbon River received 250 and in 1896 "lakes in Yellowstone National Park" are indefinitely mentioned as having received 500.

Which of the two kinds of black bass composed the first plant is not known, but the latter plant was composed of the largemouth form. According to the circular of information issued by the Department of the Interior in 1912, there is no indication that its introduction into park waters has been a success, as this fish has not since been reported. In the opinion of the Bureau of Fisheries, no further efforts should be made to establish the black bass in the park. This fish does not harmonize with trouts, and its predatory habits make it an unsafe species to introduce into these waters.

The largemouth black bass is widely distributed in the east, from Canada and the Red River of the North southward to Florida, Texas,

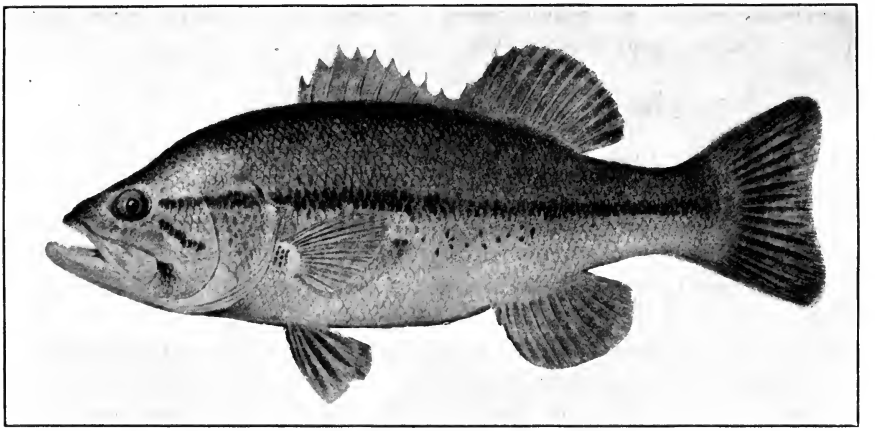

FIG. 10.—Largemouth Black Bass.

and Mexico; it everywhere abounds, especially in bayous and other sluggish waters.

In the north the maximum weight attained is about 8 pounds, and the average probably about 3 or 4 pounds, but in the south a much larger size is reached. It is a common market fish in many localities. The game qualities depend upon various factors, but in some parts of its range are of a high order.

11. BLOB (*Cottus punctulatus*).

This little fresh-water sculpin abounds in some of the waters of the park. It is stated to swarm in the grassy-bottom portions of Madison and Gibbon Rivers, also in Canyon Creek, and to be numerous in the Gibbon above the falls. It is also known from the Firehole below the falls.

It is probably justly accused of being destructive to the eggs of other fishes, and appears to be of little use, unless possibly as bait for large trout. It can be taken with a small baited hook.

12. Longnose Sucker (*Catostomus catostomus*).

This sucker is of wide natural distribution in northern waters, its geographical range being from the Pacific to the Atlantic coasts and into the Arctic regions.

It attains a weight of several pounds. Its spawning time is in the spring and early summer, when the males have their anal fin profusely tuberculate and the side of the body with a broad red stripe more or less diffuse on the edges. It is not sought as a game fish but sometimes takes a baited hook and fights fairly well.

When taken from cool water and cooked at once it is a good-flavored panfish, although somewhat bony.

It is abundant in Yellowstone and Gardiner Rivers below the Osprey, Undine, and Rustic Falls, and reaches a length of 18 inches.

13. Rosyside Sucker (*Catostomus ardens*).

This sucker is abundant in the Snake River Basin above Shoshone Falls, where it attains a length of 18 inches or more. It has been reported from Heart Lake and Witch Creek and is said to ascend the latter into very warm water. Like the longnose sucker, it spawns in spring or early summer. It will also take a baited hook, and is edible but not as palatable as the other sucker.

In Heart Lake and Witch Creek the alimentary tract of the sucker is infested by parasitic worms, which, although offensive to the eye, do not render the fish harmful as food. Affected fish, however, are likely to be lean and unpalatable.

14. Chub (*Leuciscus lineatus*).

This chub, known in the books as Utah Lake chub, is one of the most widely distributed of the genus and abounds in the Snake River Basin above Shoshone Falls; also in Yellowstone Lake and other places in the park.

Chubs from cool water are not to be despised in game and food qualities. This species reaches a length of 12 or 15 inches or more and is said to be destructive to the eggs and young of trout. No worms have been found in the alimentary canal of this fish. It spawns in spring and early summer.

Dr. Jordan says: "Chubs ascend Witch Creek until they reach water fairly to be called hot, and the sucker is not far behind," enduring a temperature of 88° F.

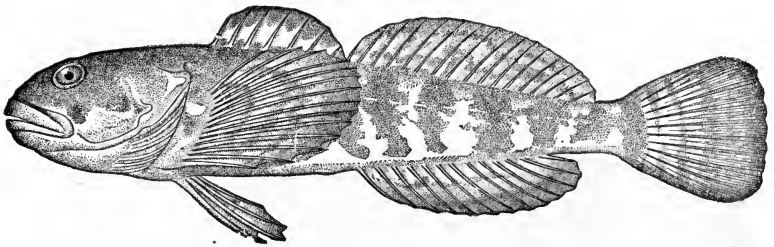

FIG. 11.—Blob.

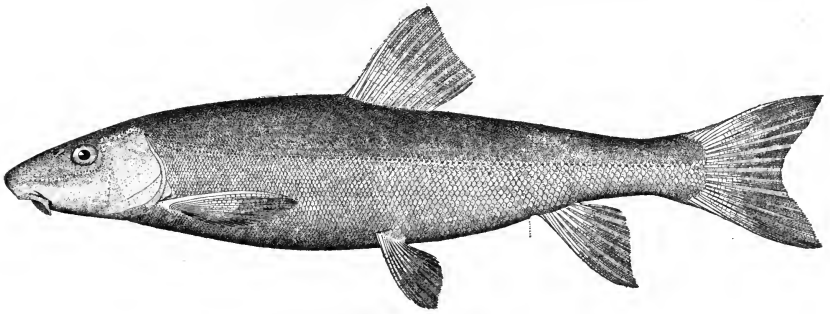

FIG. 12.—Longnose sucker.

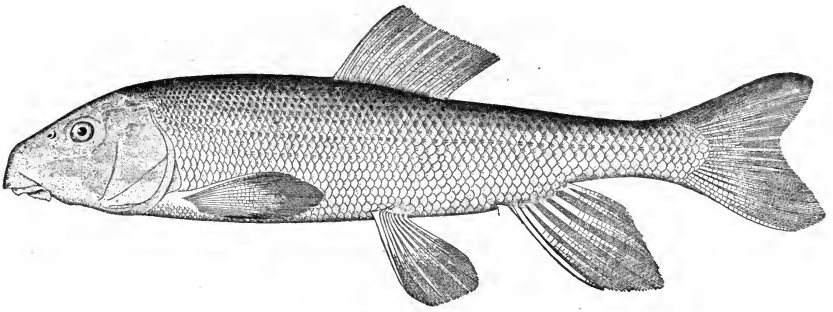

FIG. 13.—Rosyside sucker.

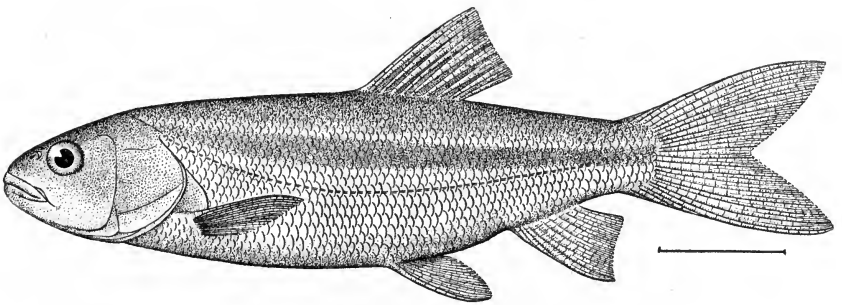

FIG. 14.—Chub.

15. Silverside Minnow (*Leuciscus hydrophlox*).

This little fish is too small to be of much use for other than food or bait for trout, attaining a length of only 3 to 5 inches. It occurs

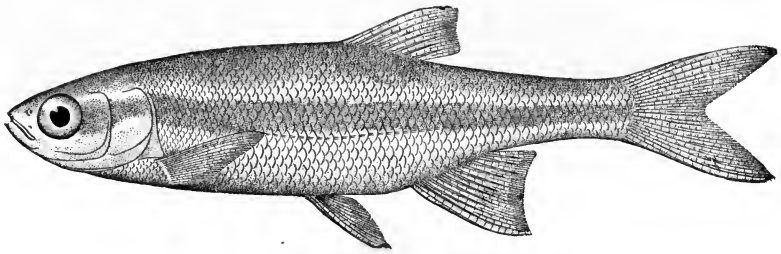

Fig. 15.—Silverside minnow.

in some of the Snake River sources in the park, particularly Heart Lake and Witch Creek. It spawns in the spring.

16. Longnose Dace (*Rhinichthys dulcis*).

This little fish, attaining a maximum length of only about 5 inches, is food for trout and useful as bait. It is found in Heart

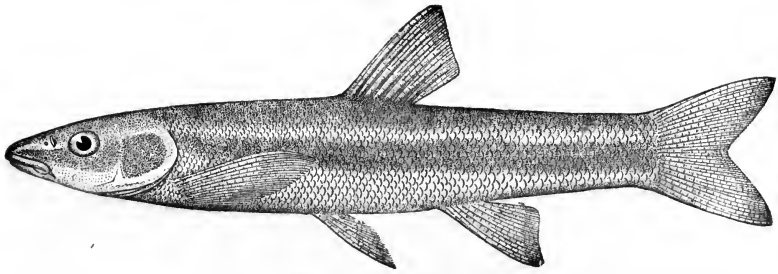

Fig. 16.—Longnose dace.

Lake and Witch Creek and also in Gardiner River below Osprey, Undine, and Rustic Falls.

17. Dusky Dace (*Agosia nubila*).

The little dusky dace, seldom over $3\frac{1}{2}$ inches in length, is extremely abundant and widely distributed in the Columbia River Basin. In

Fig. 17.—Dusky dace.

the park it has been recorded from Heart Lake and Witch Creek. It is useful as food for larger fishes and as bait for trout.

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