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Fishes of Yosemite National Park (1941, 1948) by Willis A. Evans and Orthello L. Wallis

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FISHES

of *Yosemite*

National

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Special Number

YOSEMITE NATURE NOTES

Price 35 cents



About the Authors

Willis A. Evans (1941 author)

Willis A. Evans was born in Ogden Utah Dec. 22, 1918 and moved to Pasadena when two. As a youth he spent much time hunting and fishing. He earned a Bachelor's degree in Fish and Wildlife Management at Oregon State University, and became a Ranger Naturalist in Yosemite National Park. Next, he was a Fisheries Biologist with the Department of Fish and Game (DFG) in Los Angeles where he studied the decimation of the sardine population.

During World War II he served in the US Army, but didn't go to Europe due to measles. After the war he transferred to Japan to help boost the country's fishing industry. After his military service, he returned to DFG to study salmon and steelhead runs in the San Joaquin River and lived in Marin. In 1967, he took a leave from DFG and served in West Africa for 5 years studying native river fish and taught indigenous peoples how to fish large lakes. After that he worked for the US Forest Service where he changed the design of fire road slopes to reduce environmental impacts. Finally he was Regional Supervisor with DFG.

Willis Evans died April 10, 2003 in San Geronimo, California. He was married and divorced twice and had two daughters and a son. Willis Evans Canyon and Creek in San Geronimo are named for him.

- Obituary, Point Reyes *Light* (April 24, 2003)

Orthello L. Wallis (1948 author)



*Orthello L. Wallis,
1952 (YRL)*

Orthello L. "Willy" Wallis was born May 1, 1921. He served as a Naturalist in Yosemite from 1950 to 1954, when he transferred to Lake Mead National Recreation Area. Wallis eventually became Chief Aquatic Science for the Park Service. He retired and starting in 1984 worked as a volunteer at Tuolumne Meadows during the summer for at least 4 years. Wallis resides in San Rafael, California. According to Shirley Sargent in *Protecting Paradise* (1998) he was

Sometimes called "Mr. Fish" because of his intense interest in the history and management of trout, Wallis was an outstanding man and wrote well. Not only was he on active duty with the Marines in WW II but was wounded on Okinawa. After the war he obtained his Masters degree in fish and game management before returning to Yosemite. . . . His research and writing of a comprehensive manuscript entitled "Yosemite Trout Investigation, 1951-1953," is held in the Yosemite Research Library.

Bibliographical Information

Willis A. Evans (1918-2003) and Orthello L. Wallis (1921-), *Fishes of Yosemite National Park* (Yosemite Natural History Association, 1944, 1949). Second edition, 1949. 32 pages + inside covers. Illustrated. 24 cm. Saddle stitched with paper wrappers. First published as *Yosemite Nature Notes* 23(1) (January 1944) and revised 1949.

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—Dan Anderson, www.yosemite.ca.us

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Yosemite Nature Notes

THE MONTHLY PUBLICATION OF
THE YOSEMITE NATURALIST DEPARTMENT
AND THE YOSEMITE NATURAL HISTORY ASSOCIATION

VOL. XXIII

JANUARY, 1944
Second Edition, 1949 (Completely Revised)

NO. 1

Fishes of Yosemite National Park

**By Willis A. Evans, Ranger Naturalist, 1941 and Orthello L. Wallis,
Ranger Naturalist, 19481**

1. Mr. Evans is now (1949) a fisheries biologist for the California Division of Fish and Game. Mr. Wallis is now a fishery research biologist, U. S. Fish and Wildlife Service, Stanford University.

Introduction

Could you, as the average American angler, recognize the various kinds of fish you caught on that trip last summer? Are you familiar with the life and habits of those speckled beauties that covered the bottom of your creel? To be quite honest, most of our national park visitors will answer in the negative and display a sincere desire for knowledge by asking many questions. It is the purpose of this booklet to present in simplified form, avoiding long scientific descriptions, an account of the fishes of Yosemite National Park, their habits and propagation, both natural and artificial. The visiting angler may not be interested in knowing the differences in anatomical structure which distinguish a certain fish, but he is interested in knowing the visible characters which determine one kind of fish from another. To facilitate such recognition, an identification key and descriptions of all fishes occurring in the park are presented in this guide.

Since the publication of the first edition of "Fishes of Yosemite National Park" by Willis A. Evans in 1944, (reprinted in 1946, revised in 1947 by George J. Ross, Jr., now park ranger in Colonial National Historical Park) some changes have been made in the common and scientific names of some of the species, three new native fishes have been discovered within the park, and other information has been collected. The names used in this edition are those approved by the American Fisheries Society and listed in its Special Publication No. 1, "A List of Common and Scientific Names of the Better Known Fishes of the United States and Canada."

The authors wish to acknowledge the assistance of the following persons whose helpful suggestions and criticisms of the manuscript have aided in making this edition more useful to the park visitor and angler: Messrs. Malcolm E. Wilson, Richard S. Croker and L. E. Nixon, California Division of Fish and Game; Dr. Carl L. Hubbs, Scripps Institution of Oceanography; Dr. W. I. Follett, California Academy of Arts and Sciences; and Dr. Harold Bryant and Lon Garrison, Grand Canyon National Park, Messrs. M. B. Evans, Duane Jacobs, Robert N. McIntyre, Donald Edward McHenry, Harry C. Parker and Dr. Carl P. Russell, Yosemite National Park, United States National Park Service.

We are especially grateful to Dr. Hubbs for his advice and counsel on the more technical aspects of this presentation and the identification of some of the specimens.

To Mr. Martin R. Brittan, Ranger Naturalist 1947 and 1948, who has drawn the illustrations of the non-game species for this edition and to the California Division of Fish and Game for the use of their black and white and color plates of the trout we are grateful.

NATIVE FISHES

Today as one visits the many alpine lakes and streams of Yosemite National Park it will be noted that nearly all of these waters are the home of some type of fish. A goodly portion contain various kinds of trout ready to match wits with the visiting angler. However, such conditions have not always existed.

The Pleistocene glaciers which scoured and ground their way down through the major stream canyons of the Merced and Tuolumne rivers destroyed all fish life that may have occurred in those areas before the coming of the Ice Age. After the glaciers had receded, aquatic life slowly began to return to these systems. The high, free-leaping waterfalls left in the wake of the glaciers prevented fish from ascending into the headwaters and repopulating these sections of the rivers. In a letter on file in the Yosemite Museum library written to Mr. Chester Verteeg on July 12, 1924, Colonel H. C. Benson, one of the early park superintendents, verifies this view.

Colonel Benson stated: "When we [the Army] went into the Yosemite Park [in 1892] these were no fish in the park except those which were enabled to come directly up the Merced River to the Yosemite Valley and up the South Fork of the Merced to within a mile or two east of Wawona and up the Tuolumne to the falls of the Hetch Hetchy except the fish that were brought in by old man Kibbe in 1877. He had put fish in Lake Eleanor and Lake Vernon but they were unable to get back into the country behind the falls of Lake Eleanor." The natural distribution of the fish in Yosemite National Park, therefore, was very limited.

The indigenous fish fauna also was very restricted in numbers, there being only six native species, representatives of four families. Until recently, it was thought that the rainbow trout and the Sacramento sucker were the only native species found within the park. Additional investigations have disclosed that the Sacramento squawfish, the hardhead, the Sierra chub-roach and the riffle sculpin are also native; but only the rainbow trout and the Sacramento sucker are of common occurrence.

In a recent **Yosemite Nature Notes** article, Hubbs and Wallis have discussed the native fish fauna in greater detail.²

2. Hubbs, Carl L. and Wallis, Orthello L. 1948. The native fish fauna of Yosemite National Park and its preservation. *Yosemite Nature Notes*, Vol. 27, No. 12. (December) pp. 131-144.

INTRODUCTION OF EXOTIC FISHES

Shortly after the coming of white men into the Yosemite region, the introduction of exotic game fishes began. This was initiated in an attempt to establish fishes in barren waters and later to supplement the limited fish present in heavily fished areas. As in the case of most introductions of exotics, some readily adapted themselves while others soon passed out of the picture. In general, the native rainbow trout is still the best adapted to most waters.

Eleven species of game fish have been introduced into the waters of Yosemite National Park. These are the rainbow, golden, eastern brook, brown, cutthroat and Dolly Varden trout and the American grayling. Today the grayling and the Dolly Varden trout do not appear to be present in any of the park waters.

In 1877; 14 years before the area, now within the park boundaries, had been set aside as a national reservation, the first recorded plants of rainbow trout were placed in the barren waters of Kibbie, Eleanor, Vernon and Laurel Lakes, which lie in the northwestern section of the park. Messrs. Kibbie, Parsons, and Smith, earlyday settlers, are credited with these first introductions. However, it is believed that some of the early day sheepherders may have removed trout from some streams and carried them to other waters which were accessible to their summer campgrounds even before 1877.

Mr. John L. Murphy planted trout in Tenaya Lake in 1878. In the same year plants of eastern brook trout were made in the Lyell Fork of the Tuolumne River.

The oldest record of trout planting in Yosemite Valley dates back to April 1, 1879, when Mr. M. A. Blade of Union City, Pennsylvania, wrote in the Grand Register of the Cosmopolitan House: "Came in with the Yosemite Fish Commissioners with 20 thousand young trout for the different streams of the valley."

More rainbows were planted in Lake Eleanor in 1880; then for several years no further plantings were recorded.

In the fall of 1892, Mr. W. H. Shebley of the California Fish Commission started from the old Sisson hatchery in Siskiyou County (now the Mt. Shasta hatchery) with a shipment of blackspotted, eastern brook, and rainbow trout to plant in Yosemite. Earlier attempts to plant hatchery trout had failed because of the long trip and the time required.

On this first successful stocking, the shipment arrived at Raymond by train, from whence it was sent in stages furnished by the Washburn brothers to Wawona. The fish were held overnight in a stream and the next morning transported via an Army ambulance wagon to Mono

Meadows, where they were transferred to pack trains for the final stretch of the journey. They were planted in Ostrander and Merced Lakes and in Bridalveil Creek.

After the entire region had been set aside as a national park, a general systematic stocking of the streams and lakes was undertaken. During the early days while the Army had charge of the administration of the park, Col. H. C. Benson took a great interest in fish planting and covered miles of trail stocking lakes and streams which previously had been devoid of fish life. Some of these streams have not been planted since and yet they are still abundantly stocked with reproducing trout.

Although the rainbow was native below the falls, it has been planted into barren back country lakes and streams as well as in the heavily fished Merced River in Yosemite Valley. The rainbow has been planted under the names of Shasta trout, McCloud River rainbow and steelhead.

The eastern brook trout, the beauty of eastern streams, was among the fish earliest brought into the Sierras. First planted in 1892 in Alder and Bridalveil Creeks, Merced and Ostrander Lakes, it now has a definite place in the cold, high country, spring-fed streams where conditions are more suitable for it than any other species.

Cutthroat trout were introduced into a few waters as early as 1892 but this species has never become well established in Yosemite.

Two forms of brown trout, the native European trout, have been introduced into the park. In 1897, the Loch Leven form was first planted and in 1905 the German brown variety. Dr. Carl L. Hubbs, noted ichthyologist, along with other leading students of fishes, has concluded that the differences between the two forms are insufficient to separate them as different species, and that the different stocks have long since lost their identity through interbreeding.

Another variety of rainbow trout, the golden trout, "the world's most beautiful trout," was first placed into Adair Lake in 1919. It has become established in several waters.

At some early, unrecorded date, the Dolly Varden³ was probably introduced into Chain Lakes on the southern boundary of the park and in the Merced River. It is possible that it occurred there as in other waters, as a remnant from its wide Ice-Age distribution. In recent years, catches of this species have not been reported. Together with the eastern brook trout, the Dolly Varden is a charr and not a true trout. It has light spotting on a dark background and red or orange spots on its sides. The Dolly Varden differs from the eastern brook trout in the fact that the distinctive mottled or vermiculated back pattern of the eastern brook is lacking.

A plant of American grayling⁴, a native of the north central portion of the country, was made in a lake high in the back country on June 19, 1930. The grayling belongs to the Family **Thymallidae** and its chief marks of distinction are the iridescent silvery gray color and the extremely long and high dorsal fin.

Former Park Naturalist C. C. Presnall wrote in 1932, that Peter Topp, Yosemite hatchery foreman, and Park Ranger Sam King investigated the Yosemite plant and reported that the graylings were not only growing at an amazing rate but that they were reproducing.⁵ Fish were found that had reached a length of 13 1/2 inches and a weight of three-fourths of a pound. Many young graylings were observed. Most of the fish had moved down into the stream below the lake. The success of planting graylings in Yosemite waters was only temporary; none have been reported since 1942. Investigations in 1947 and 1948 by Park Ranger M. B. Evans failed to reveal the existence of graylings in our waters at present.

3. *Salvelinus madam spectabilis*.

4. *Thymallus signifer tricolor*.

5. Presnall, C. C. 1932. Montana Grayling prove successful in Yosemite. *Yosemite Nature Notes*, Vol. 11: No. 9 (September) p. 4.

DESCRIPTIONS OF YOSEMITE FISHES⁶

FAMILY SALMONIDAE

Trout, Charrs and Salmon

This family includes the important game fish, the salmon, trout and charrs, which are restricted to the Arctic and North Temperate Zones. All of these fishes are active, carnivorous, cold water forms possessing extremely fine scales and an additional small fleshy fin on the back over the tail known as the adipose fin. Only the rainbow trout is native to the waters of Yosemite National Park.

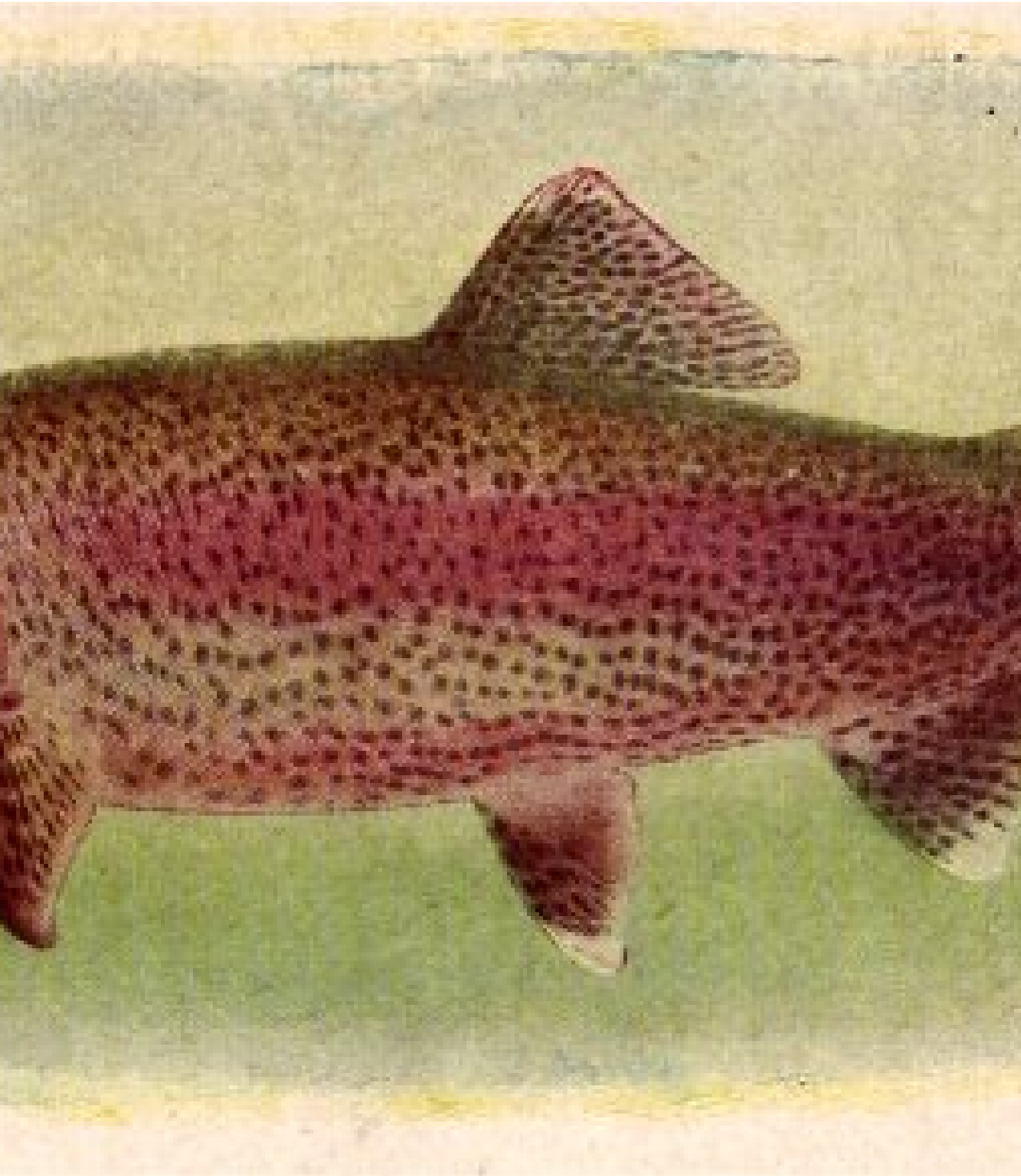
Special interest is centered around this family because of the extensive migrations of the salmon from the fresh water to the ocean to mature and the return to the cradle streams to spawn just once before death. Certain strains of trout and charrs will also migrate to the ocean and return to the freshwater to spawn but unlike the salmon the trout will spawn several times before they die. The trout of Yosemite are known as resident forms because they do not migrate to the sea but limit their movements to a restricted area in their habitat.

- Rainbow Trout
- Cutthroat Trout
- Golden Trout
- Brown Trout
- Eastern Brook Trout

6. Also, see Key to Species page 31.

RAINBOW TROUT

Salmo gairdnerii irideus Gibbons



RAINBOW TROUT—Courtesy *California Fish and Game*.

The rainbow trout is the only species of trout native to the waters of Yosemite National Park, all other kinds having been introduced. Originally it was found in the Merced and Tuolumne river systems below the high, free-leaping waterfalls which limited their upstream migration to Yosemite and Hetch Hetchy valleys.

The most gamy of trout, rainbow after being hooked will often exhibit aerial acrobatics—leaping high into the air time after time. It is an excellent fly fish, striking readily at feathered lures from the early summer on, after the streams and lakes have begun to lose their springtime volume.

This species may be distinguished by the uniform, tiny black spotting on its sides and back plus the rose-colored band extending the body length along either side.

The rainbow is one of the most adaptable of all trout. The hardiness is most apparent in streams where it is present with other kinds of trout. In Yosemite, the rainbow may thrive in certain places where species such as the eastern brook trout appear thin and unhealthy. This may be due to the fact that the rainbow seems to be able to forage for food more successfully than other species.

An intricate set of conditions keeps a trout in balance with its environment. Fluctuations in volume and temperature of water, lack of food, pollution, abundant predators, disease, and lack of shelter or spawning areas are just a few of the factors which make trout necessarily highly adaptive creatures. For its splendid survival under a variety of conditions and also since it is the native species in Yosemite, most emphasis in artificial propagation and planting is placed on the rainbow. It has been planted under the names of Shasta trout, McCloud River rainbow and steelhead trout. All of these forms are quite similar and it is difficult to distinguish one from another.

Rainbow trout spawn in the spring from March to June on a rising temperature depending upon the locality and the water temperature. In some of the high mountain waters they have been observed to spawn as late as midsummer. At spawning time, they tend to move upstream and seek the smaller tributaries, or in the case of those inhabiting lakes, inlets are utilized. The eggs hatch in about fifty days.

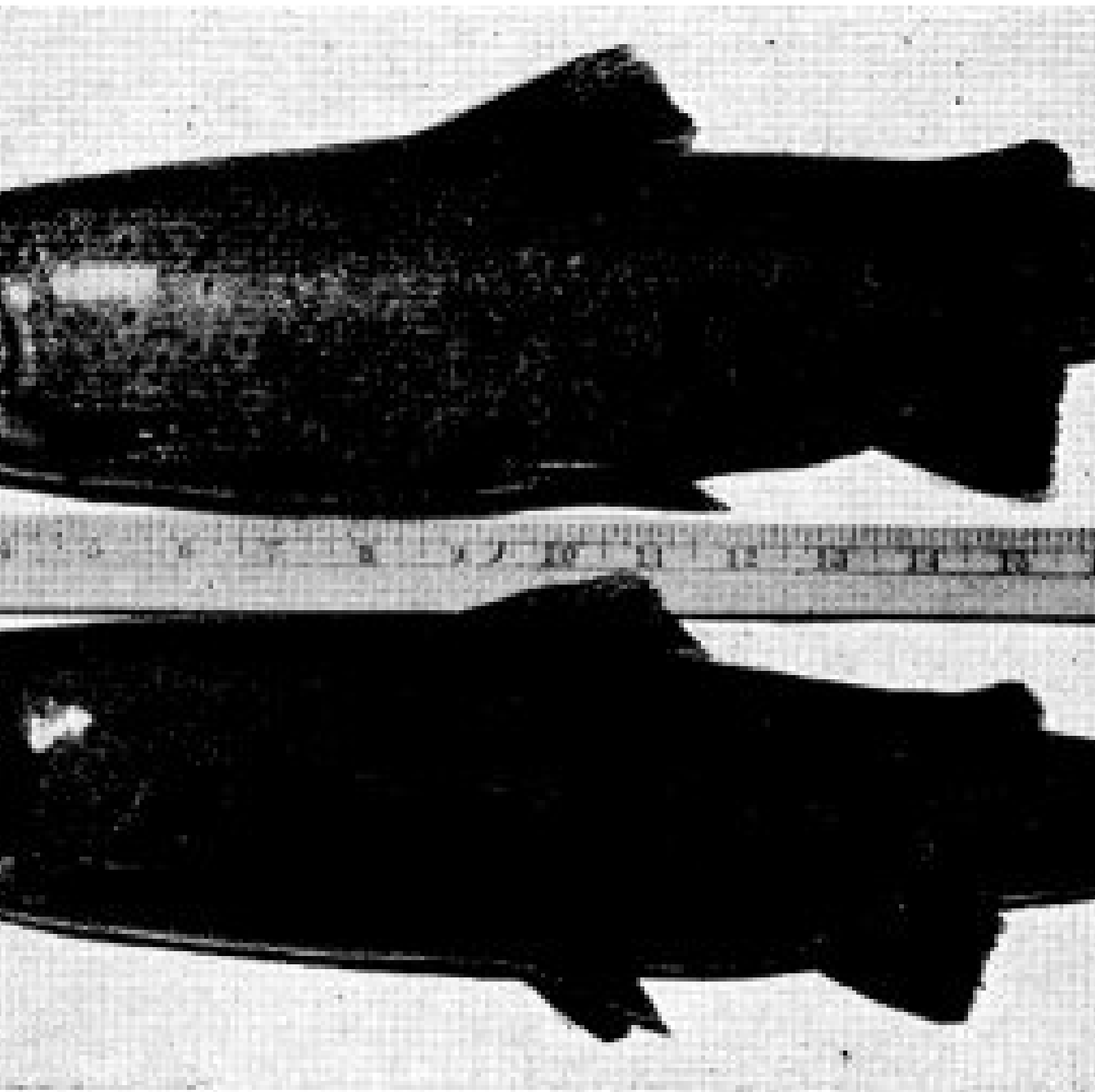
From the Merced River in the floor of the Valley up to high alpine lakes, this species is found. The rainbow is characteristic of the swifter, white water of the streams like that in the Merced canyon below the valley. In size it is somewhat limited, as even lake specimens are rarely caught which weigh more than three pounds. Nevertheless, it is more valuable from the sportsmen's standpoint than any other trout in the park and is much sought after wherever it becomes established.

The local form is referred to scientifically as **Salmo gairdnerii irideus**, which name is used for the wide-spread, generally nonmigratory, moderately coarse-scaled, relatively deep-bodied, big-headed and big finned type. The Yosemite form has been referred to as "Salmo shasta," the Shasta rainbow trout of fish culturists, but recent examination at Sanford University of the type specimens of **Salmo g. shasta** Jordan by Dr. Carl L. Hubbs and Dr. W. I. Follett, ichthyologists, failed to disclose any valid reason for even the sub-specific recognition of **shasta**.

CUTTHROAT TROUT

Salmo clarkii Richardson

The cutthroat trout is native and widespread throughout the western mountain areas. A multitude of names have been given to the slightly different types or subspecies occurring in the various portions of its range. These include: coastal cutthroat, Montana blackspotted trout,



CUTTHROAT TROUT—Courtesy *California Fish and Game*

and Tahoe trout, all of which types have been stocked within the park. To simplify the situation they may all be correctly referred to as cutthroat trout, *Salmo clarkii*.

The cutthroat trout can be distinguished from the rainbow trout, the species it most nearly resembles, by the presence of red dash marks on the membranes of the lower jaw (hence the name), by the presence of teeth at the base of the tongue (on the hyoid bone), and by the lack of the red stripe on the sides.⁷

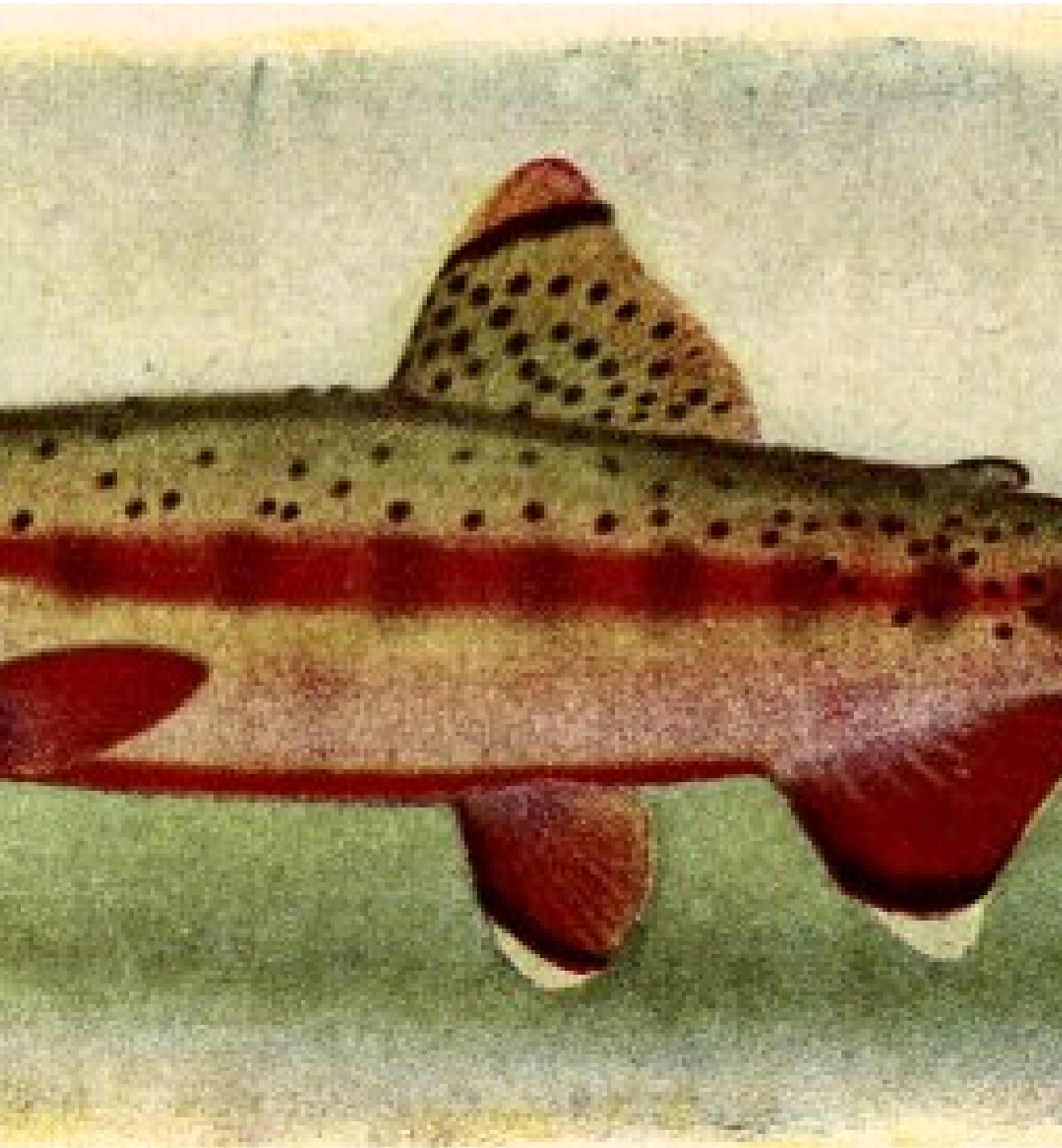
This trout has been introduced into Yosemite waters several times since it was first planted in 1892. Planting records reveal that this species has been stocked in the Tuolumne river at several locations, the Dana Fork of Tuolumne, Upper Bridalveil Creek, South Fork Merced, Lyell Fork Tuolumne, Yosemite Creek and in the following lakes: Ostrander, Gaylor, Peeler, Tenaya, Chilnualna, and Grant (Ten Lakes group) Lakes.

Generally the cutthroat trout has failed to become well established in any of the waters within the park. Concerning this fact, Dr. Carl L. Hubbs suggests that where rainbow trout have been stocked in the same waters, they almost invariably eliminate the cutthroats by competition and by hybridization.

The cutthroat has fared better in the lakes than in the streams of the park. Information at hand indicates that it is present in Tenaya lake, where specimens were taken in 1948 by trolling spinners in deep water. Lake specimens occasionally reach three to six pounds

in weight. In the spring, like the rainbow, they ascend the small tributary streams to spawn. Many regard this trout as inferior to other species in gaminess, but it is highly esteemed throughout other portions of its native range. At present, the cutthroat is considered of minor importance in Yosemite National Park.

7. The red dash may be absent, especially in immature cutthroats and the hyoid teeth may occasionally be lacking. Identification is, therefore, difficult at times.



GOLDEN TROUT—Courtesy *California Fish and Game*.

GOLDEN TROUT

Salmo aqua-bonita Jordan

It is the opinion of most fishermen that the prize for striking beauty belongs to the golden trout. The catching of one's first "goldie" is always a memorable event. **The brilliant coloration of bright golden-yellow sides with reddish belly and fins** is usually not apparent until the trophy is removed from the water. Dark olive bars or parr marks parallel each other vertically on both sides. The dark spots, when present, rarely extend below the midline on the sides.

Its specific scientific name, "aqua-bonita," means "pretty waters" and is quite appropriate in describing its aquatic home. Once this beauty was found only in a few of the high mountain streams of the Kern River drainage; especially Volcano Creek (now called Golden Trout Creek) in Sequoia National Park. Many of the rocky slopes of Volcano Creek are volcanic in origin, containing bright reds and yellow-browns. This may have influenced the coloration of the golden trout in its original home.

Although native only to this limited area, it has since been widely planted throughout the High Sierra. Here in a land of long winters and a short summer growing season they are found inhabiting a number of alpine lakes and streams today. Though limited in distribution in Yosemite, headwaters of both the Tuolumne and Merced Rivers contain such waters. Golden trout were planted at Upper Fletcher Lake and Adair Lake in Yosemite National Park in 1919-1920 and in Townsley Lake in 1922 at elevations of over 10,000 feet.

The golden trout seldom reaches a size larger than seven or eight inches in the streams but lake specimens often exceed one foot in length, some having been taken up to 18 inches in Yosemite. Though a spring spawner, similar to the rainbow, it is often found spawning in July and August, which is in reality when spring occurs in this high mountain country.

BROWN TROUT

Salmo trutta fario Linnaeus

Originally a native of European waters, this trout was introduced into this country during the early days of American fish culture. It has also been called the Loch Leven trout, after a form brought to America from Scotland. However, Dr. Card L. Hubbs, along with other leaders in this field, has concluded that the differences between the two are insufficient to separate the two as individual species. Thus all may be correctly termed brown trout. This trout spawns in the fall, while it will be recalled that the rainbow spawns in the spring.

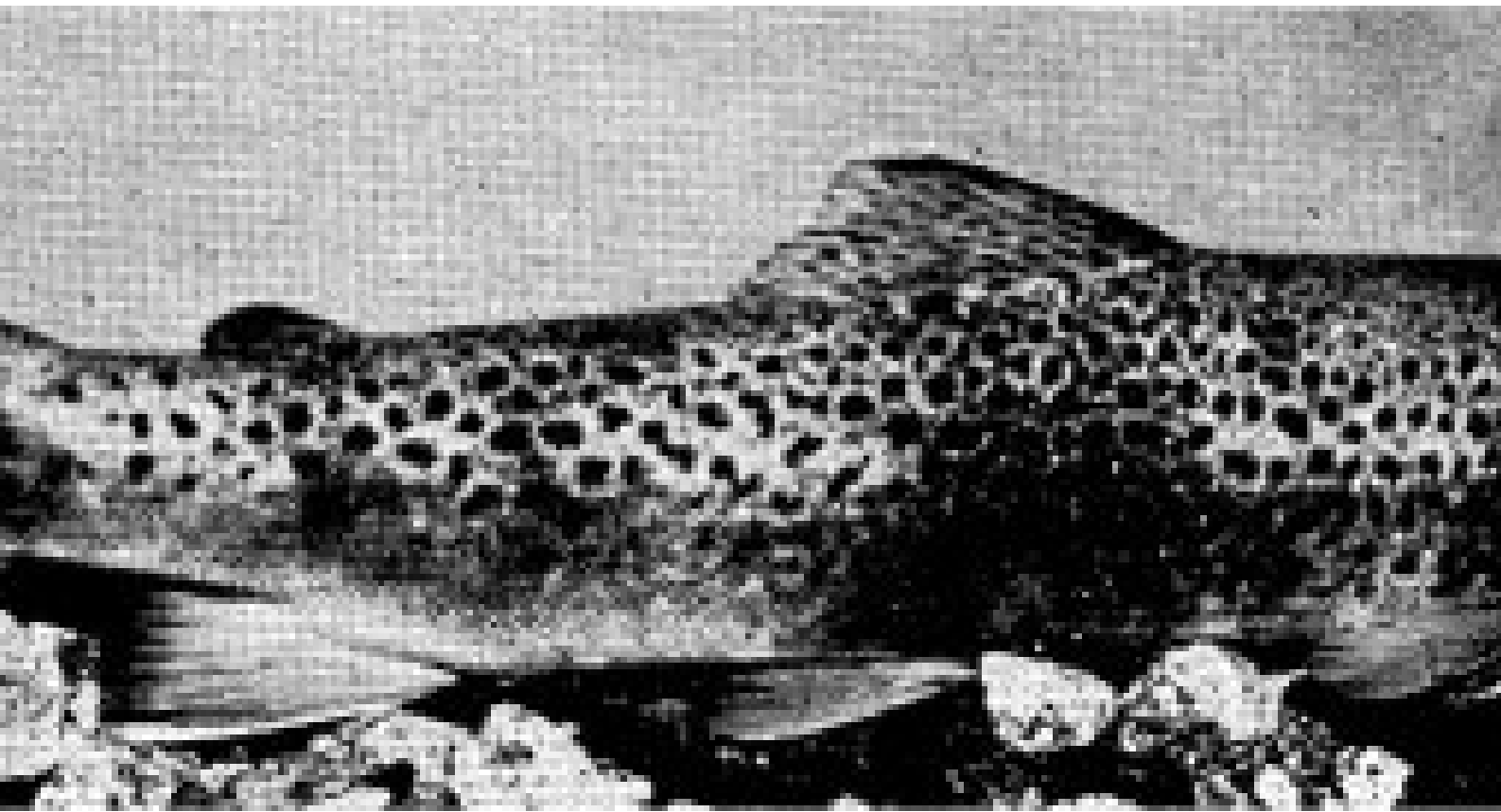
Its general coloration is brownish yellow with the sides covered by many large dark spots, often very black, with a few red ones intermingled. In the young, the black spots have no white ring and red spots are prevalent along the sides. With increasing age these crimson dots turn dark brown or almost black and a lighter colored ring surrounds most of the dark spots like a halo. A simple rule to remember is the **brown trout is the only trout with both black and red spots on its sides.**

In the slower, warmer waters of the lower reaches of our larger streams, generally below 7,000 or 8,000 feet, the brown trout has obtained the upper hand in competition with the native rainbow trout. During the summer of 1948, investigations disclosed that in Yosemite Valley where the rainbow trout once was dominant, brown trout are now abundant. In the riffles and faster waters of the Merced canyon below the Valley rainbow trout were more prominent.

The brown trout is generally considered to be more predaceous than the rainbow trout. It has a tendency to become "educated" to resist the tempting offerings of anglers much more rapidly than the rainbow. For this reason, brown trout are often able to persist and maintain themselves in waters where rainbow trout have long been caught out.

The larger brown trout are difficult to catch and are a match for the best of anglers. They seldom rise well to flies and tend to be bottom feeders. Of course, such "whoppers" are always the cause of much "tall" story telling among anglers.

Specimens up to seven and eight pounds are occasionally taken during the summer in the larger pools and rarely even larger ones are caught in Yosemite. The largest one on record from the park was caught by Mr. F. Hatch in the Merced river near the El Capitan meadow on July 17, 1932. This record fish was a



BROWN TROUT—Courtesy *California Fish and Game*.

female which measured 27 1/2 inches and weighed 12 pounds and 9 ounces. It was caught on a No. 6 hook with single gut leader and light tackle. For those who like to see a fish story some true it has been preserved in alcohol and is on exhibit at the Yosemite Museum in the Government Center.

Other record brown trout include the following:

9 pounds, 15 ounces. 28 1/4 inches. Merced River near Cascade Creek, lower Yosemite Valley. June 5, 1924. No. 4 hook baited with salmon eggs. U. N. Gilbo.

9 pounds, 3 ounces. 29 1/2 inches. Merced River near Pohono bridge. June 5, 1924. Albert Skelton.

5 pounds, 14 ounces. 24 inches. Merced River. No. 6 hook baited with angle worm. Tune, 1932. Dick Noall.

The planting of brown trout in our high country where low water temperatures prevail has done more harm than good. They are not readily adaptable to cold water and do not compare in such environment with the native rainbow trout. At one time the brown trout was one of the most extensively stocked trout in California, as a whole. Now, according to Mr. L. E. Nixon, foreman at the Happy Isles hatchery, the national parks are the main areas in the state in which this species is planted. However, no brown trout will be reared in the Yosemite hatchery or planted within the park in the future. In the California hatcheries, at present, about one brown trout egg is hatched for every 38 rainbow trout eggs.

EASTERN BROOK TROUT

Salvelinus fontinalis (Mitchill)

The eastern brook trout is one of the most popular game fishes found in Yosemite, especially in the high country. Together with related species such as the Dolly Varden and lake trout, they are often called charrs. All charrs are characterized by the lack of black spots and, technically, by the boat shaped structure of the tooth bearing bones in the roof of the mouth. The scales are small and fine compared to other trout such as the rainbow and brown trout.

The mottled olive marking, with a dark background, distributed over the back as well as dorsal and tail fins is a distinctive feature. The light spots on the sides are cream colored or red. Often the red spots are encircled with a blue halo. The lower fins are reddish orange, margined with bands of black and white. It is especially colorful during the spawning season when the underside of the male becomes brilliantly red or orange. **The combination of the mottled olive markings on the back and the light spots on a dark background will distinguish the brook trout from all other fishes found in these waters.**

The eastern brook trout, as the name implies, is native to the eastern part of our country, originally extending as far west as the Great Lakes region and Iowa. However, with modern methods of transporting eggs and fry it has been widely distributed. Consequently they have now been introduced successfully throughout the Western mountain areas. Often called "speckled trout" in the East, it provides excellent fly fishing as it tends to be more of a surface feeder.

Its beauty rivals that of its environment, which is among the swifter, colder mountain streams or gem-like alpine lakes. Eastern brooks are commonly found in Yosemite above 7,000 feet and seldom do well at lower elevations or in warmer waters. It was widely planted

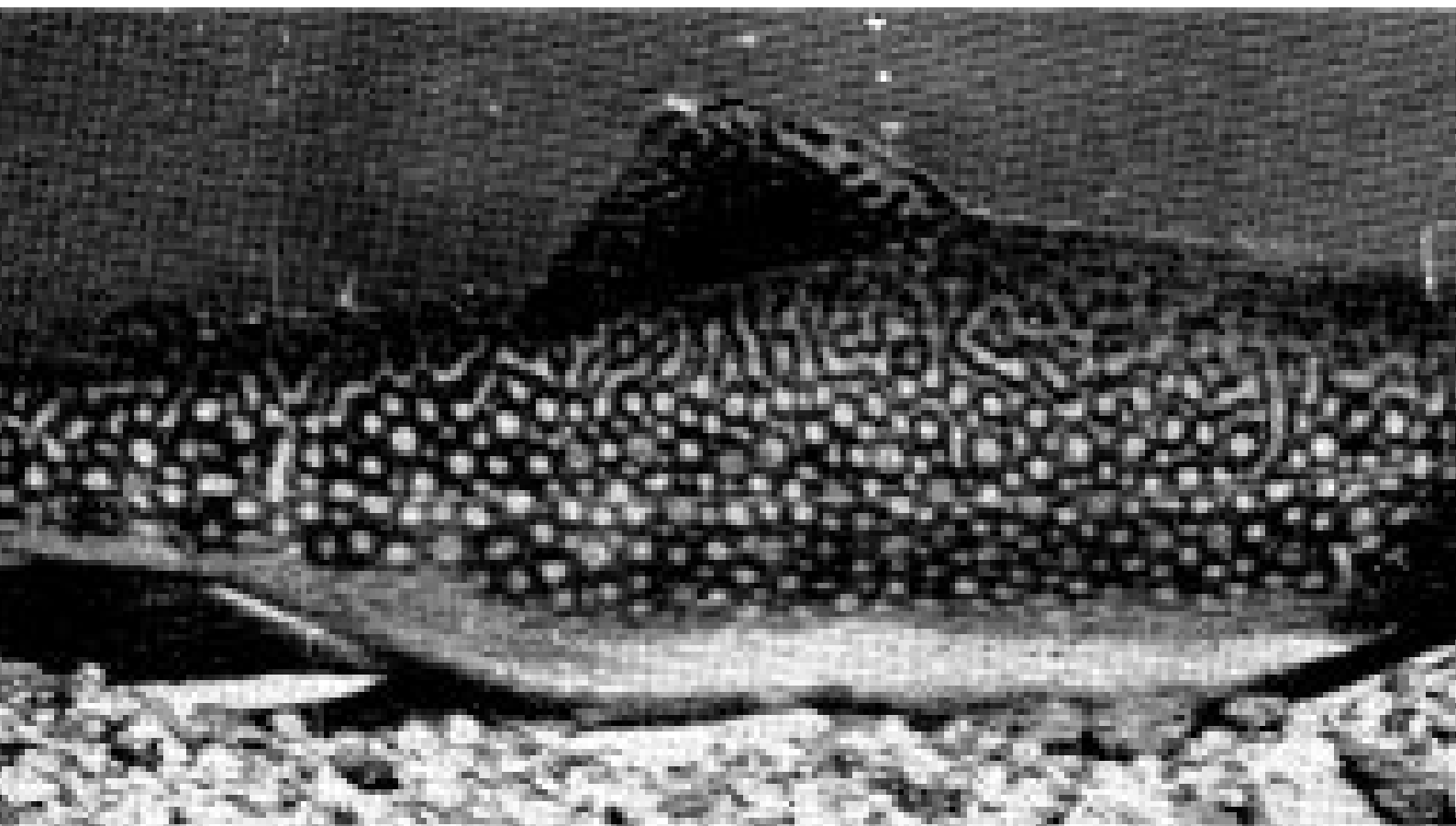
in the early days throughout the headwaters of the Merced and Tuolumne Rivers and can still be caught there in considerable numbers. In some lakes especially, they seem to do very well; but in most respects never become as completely at home as native rainbow trout in the same waters.

Size will vary greatly depending upon the environment into which it is placed. In small streams it will survive and mature at a length of six inches and in such conditions will not often exceed eight inches in length. In lakes with suitable and abundant food supply, it will grow to lengths up to 20 inches and will weigh several pounds.

In spawning requirements it is highly adaptable, often spawning in lakes without suitable inlets or outlets. In some places this characteristic will cause the trout to over-reproduce resulting in a population consisting of small fish. This is especially true in small streams. In most places where it has become established, natural reproduction is sufficient to keep the body of water stocked with brook trout without supplementary plantings. In fact, supplementary plantings are disadvantageous because they may cause undue competition among the fish for the small amount of available food found in the cold alpine lakes and streams.

Like the brown trout, the eastern trout spawns in the fall, with the lowering of the water temperatures. Since at this time of year the streams are at their lowest, the spawning activities of the brook trout in local waters are often hindered.

Though not a spectacular fighter, the brook trout furnishes considerable sport for the high country angler. It is a fish which is rather easy to catch, taking either wet or dry flies, salmon eggs or worms. Unlike the rainbow trout, it will strike several times for a fly if it misses the first time. Once hooked, the brook doggedly tug at the end of the leader.



EASTERN BROOK TROUT—Courtesy *California Fish and Game*

FAMILY CATOSTOMIDAE

Suckers

Suckers are bottom-feeding fishes with small sucking mouths. The Sacramento sucker is the only member of the family found within the park.

- Sacramento Sucker

SACRAMENTO SUCKER

Catostomus occidentalis Ayres

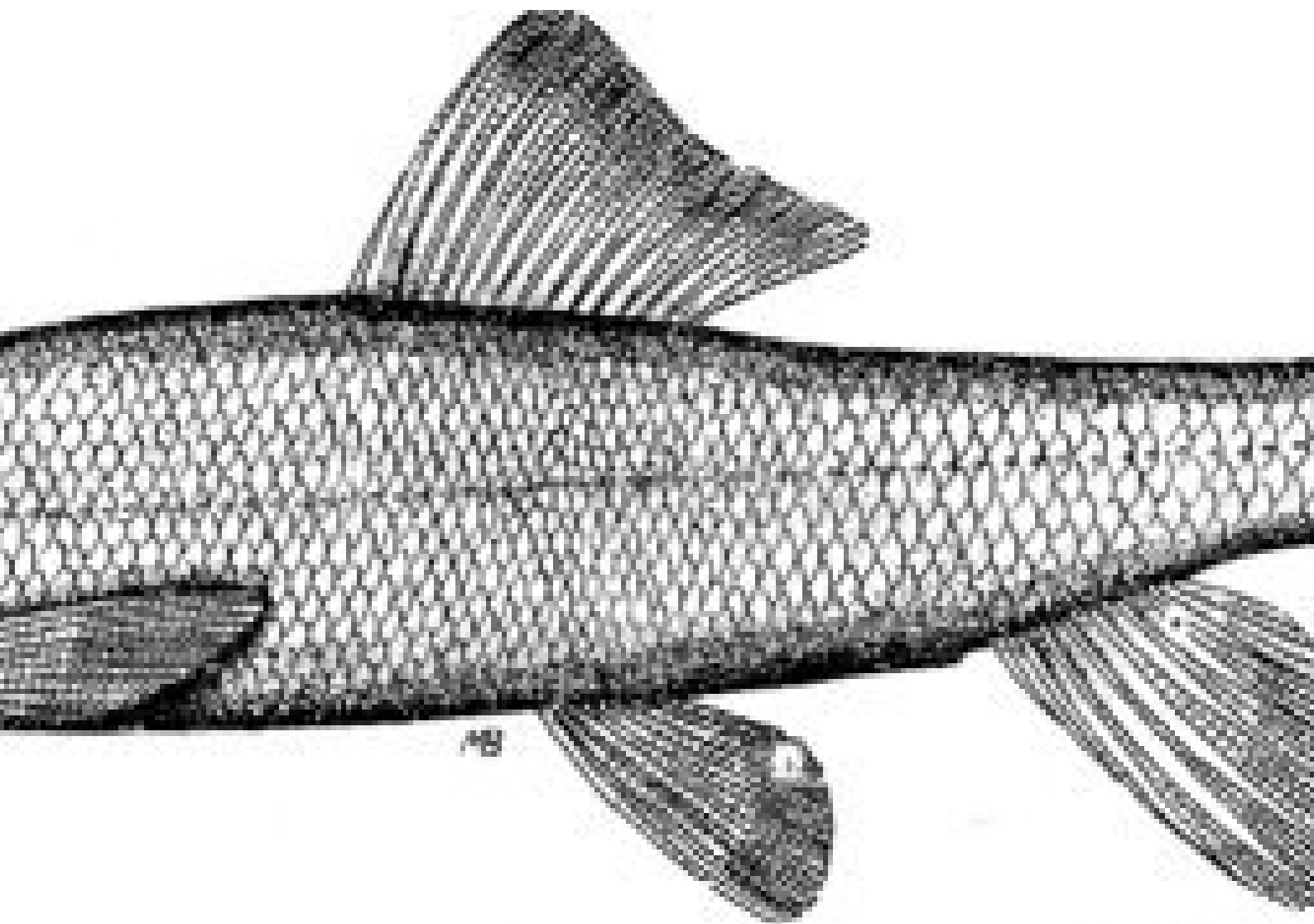
This sucker is a common native fish in the lower Merced and Tuolumne river systems. Although it is found abundantly in Yosemite Valley, it is probably not native above the high waterfalls. Sacramento suckers are found in Tenaya lake where supposedly they were introduced along with trout during early fish planting operations.

The sucker may be distinguished from all other fishes of Yosemite by its yellow-brown coloration and the disc-like protuberance of the upper lip which is flattened and protruding.

In the Merced river, they reproduce profusely in the spring. The eggs hatch in a week or so. The young live in the shallow quiet pools, and swim in dense schools at various water levels. During this stage they feed mainly upon plankton (minute life existing in the water).

The adults, which grow to lengths of over a foot, are more or less solitary inhabitants of the deeper pools of the Merced River. At almost any time during the day they may be seen leisurely mouthing their way over the rock surfaces in search of food. They are primarily bottom feeders and mainly herbivorous in food habits. In the spring of 1947, Assistant Park Naturalist Robert N. McIntyre caught a 19 inch sucker which weighed three and a half pounds.

They are occasionally taken by bait fishermen using worms or doughballs but they are usually discarded. Although it contains many small bones, the flesh of the sucker is flavorful, firm, and flaky when the fish are caught in cold mountain water. This fish is generally frowned upon by trout fishermen who accuse it of eating trout eggs or disturbing the stream bottom in which trout eggs have been laid. Although occasionally guilty of these charges, suckers are believed to be of little harm and the young suckers undoubtedly provide food for trout, which more than compensates for any damage done. The Sacramento sucker, in Yosemite, should not be destroyed but rather they should be preserved as part of the native fish fauna of the park.



SACRAMENTO SUCKER—Drawn by Ranger Naturalist Martin R. Brittan from figure published by Jordan and Evermann.

FAMILY CYPRINIDAE

Minnows

Minnows are the dominant fresh water fishes of the northern continents. The term “minnow” correctly refers only to fishes belonging to this family rather than to just any small fish. They generally prefer the slow moving warmer streams or lakes at lower elevations and thus occur rather uncommonly in Yosemite National Park. However, three kinds of minnows may be included in the native fish fauna of the park. Members of the minnow family are rather difficult to identify as there are so many kinds that are similar in appearance. Minnows collectively may be distinguished from other fishes by the possession of toothless jaws, a few teeth located on the throat (pharyngeal) bones and a single, soft-rayed fin in the middle of the back. They are usually small in size but a few forms grow to lengths of several feet.

- Sacramento Squawfish
- Hardhead

- Sierra Chub-roach

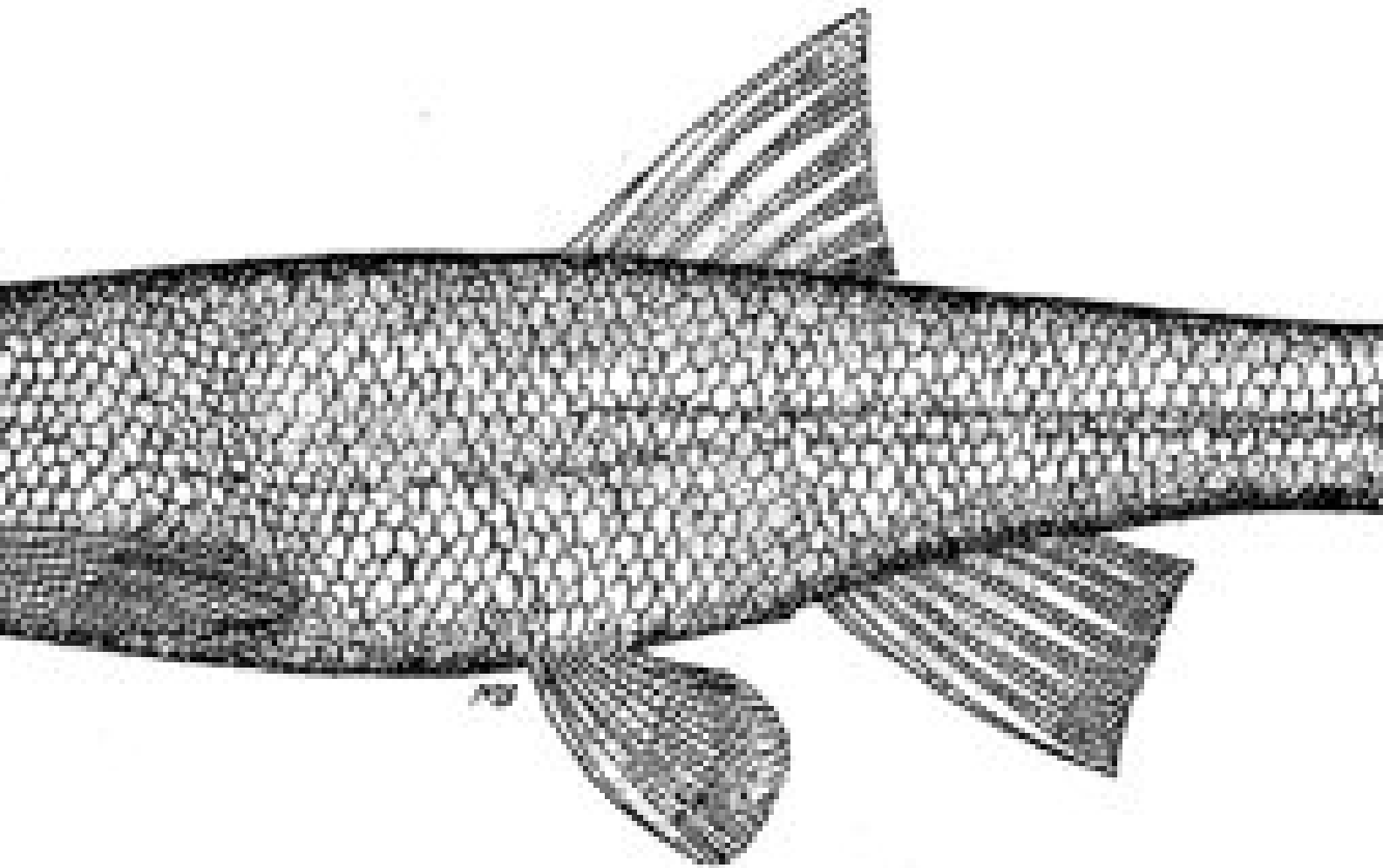
SACRAMENTO SQUAWFISH

Ptychocheilus grandis (Ayres)

The Sacramento squawfish is a large, voracious minnow which is a common native throughout the lowland valleys of the Sacramento-San Joaquin system. There are only two known records of the collection and preservation of specimens taken within the park in the lower reaches of the Merced River.

It is one of the largest minnows of North America attaining lengths of over three feet and weights occasionally up to four pounds. In coloration, the squawfish is muddy green all over, except for silver on the sides. It also has yellowish or red fins which become brighter during the spring spawning season. From other fishes in Yosemite waters, **it can be distinguished by the large head, large mouth, the lack of jaw teeth and adipose fin, and the elongated, pike-like body.** It is also locally known as a "pike" or "whitefish," though not related to either.

Fishermen occasionally capture it in the waters about El Portal and in the pools of the Merced Canyon. It furnishes excellent sport, fighting vigorously for a short time after being hooked.



SACRAMENTO SQUAWFISH—Drawn by Ranger Naturalist Martin R. Brittan from a 6 1/2-inch Specimen.

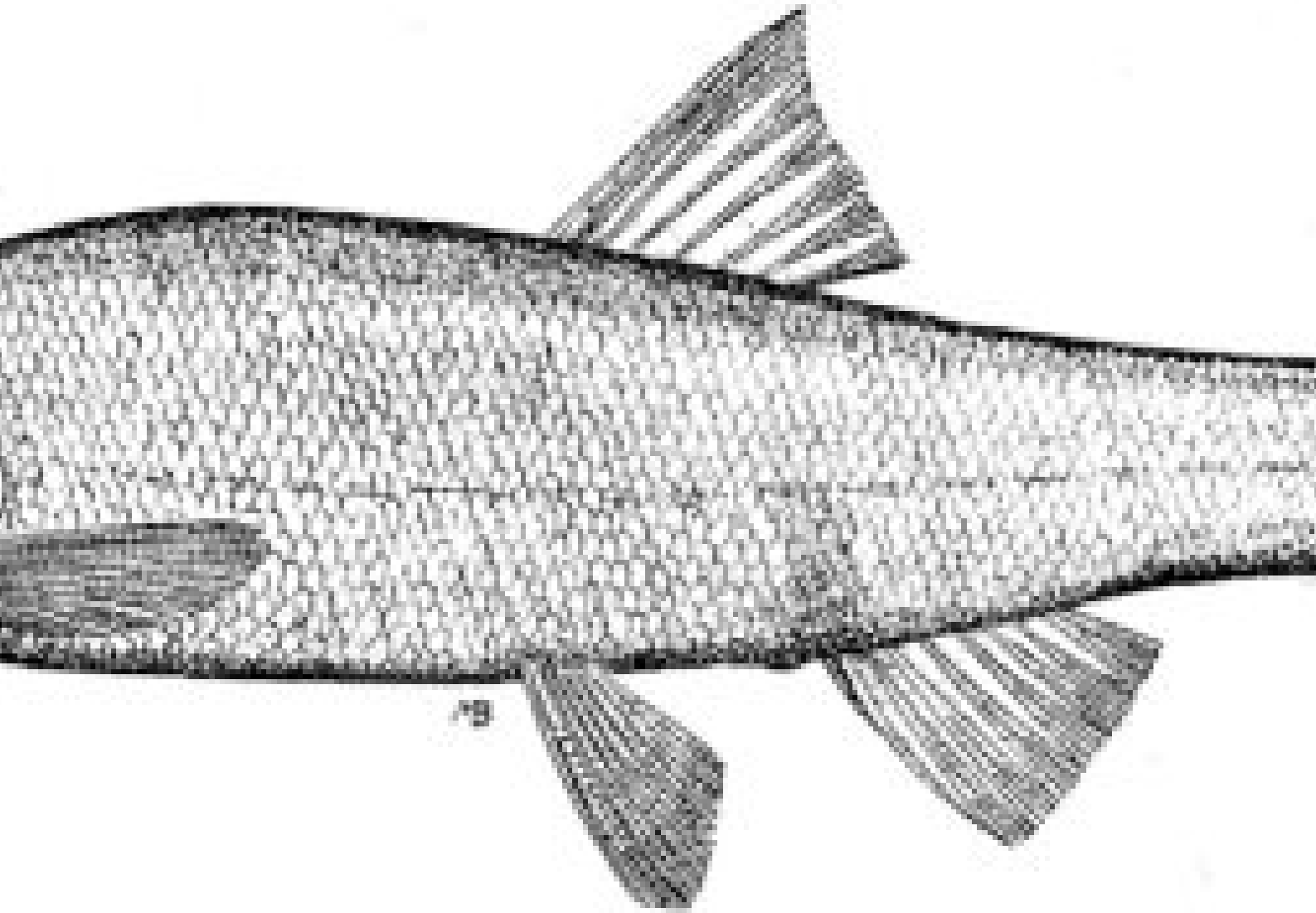
HARDHEAD

Mylopharodon conocephalus (Baird and Girard)

The hardhead is a large minnow, somewhat smaller than the squawfish, seldom reaching lengths of two feet. It has a smaller mouth and a less slender head. It differs sharply in having the upper lip non-protractile (bound to the forehead by a bridge of skin, the frenum) and in having a much shorter bony pharyngeal arch (in the throat), with molar rather than slender hook teeth. These differences in structure indicate that the hardhead is much less predaceous than the squawfish.

The hardhead is probably uncommon within the park and is almost certainly confined there to the lower elevations of the Merced canyon. The warm waters of the Sacramento-San Joaquin drainage throughout their lowland valleys is the native home of this species. This habitat preference makes it rarely taken within the park boundaries. The few that ascend the stream beyond the park boundary are perhaps strays from Indian Flat where many young and yearling specimens and some older ones were taken by a California Division

of Fish and Game survey party in 1933. The only specimen known from the park area was taken July 26, 1934, from the Merced River just within the western boundary and is now preserved in the Yosemite Museum collection.



HARDHEAD—Drawn by Ranger Naturalist Martin R. Brittan from figure published by Girard.

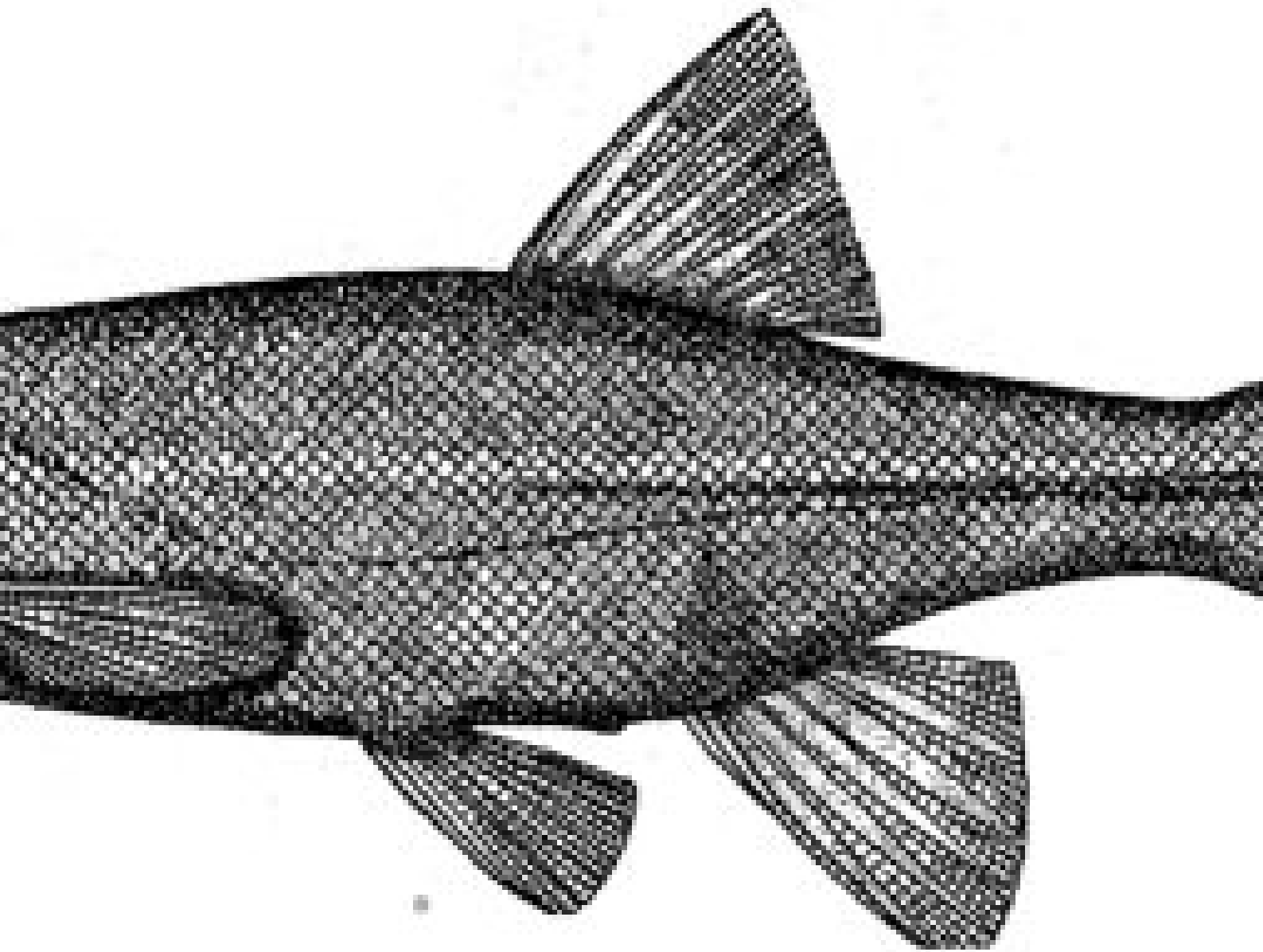
SIERRA CHUB-ROACH

Hesperoleucus symmetricus (Laird and Girard), subspecies

The Sierra chub-roach is described as a **speckled, finger-length minnow possessing a long head, pointed snout, narrow tail, long fins and large eyes**. It is a native of the lower stretches of the San Joaquin River drainage. It was first noticed to occur in Yosemite National Park when reported from the Hetch Hetchy Reservoir in 1930. It was assumed that it had been introduced by the dumping of live bait but it may have been native to the Tuolumne River in Hetch Hetchy Valley prior to the impoundment and did not build up a conspicuous population in the lake until 1930. During 1948, this species was found to occur and breed in the Merced River at the western boundary by Dr. Carl L. Hubbs.

These fish are generally scarce above 2,000 feet where they are inconspicuous, for in swift water they tend to seek retreat under boulders.

In Hetch Hetchy as in the Merced canyon, these fish undoubtedly contribute considerably to the food of the trout. Large brown and rainbow trout taken from Hetch Hetchy frequently contain several of these minnows.



SIERRA CHUB-ROACH—Drawn by Ranger Naturalist Martin R. Brittan from a 3 1/2-inch specimen.

FAMILY COTTIDAE

Sculpins

Most members of this large family live in the ocean. A few are found in fresh water where they are known by various names: miller's-thumbs, muddlers, bullheads, or sculpins. The fresh water sculpins are broadheaded, slender bodied, more or less tadpole shaped scaleless fishes with two dorsal fins. Only one member of this family is found within the park.

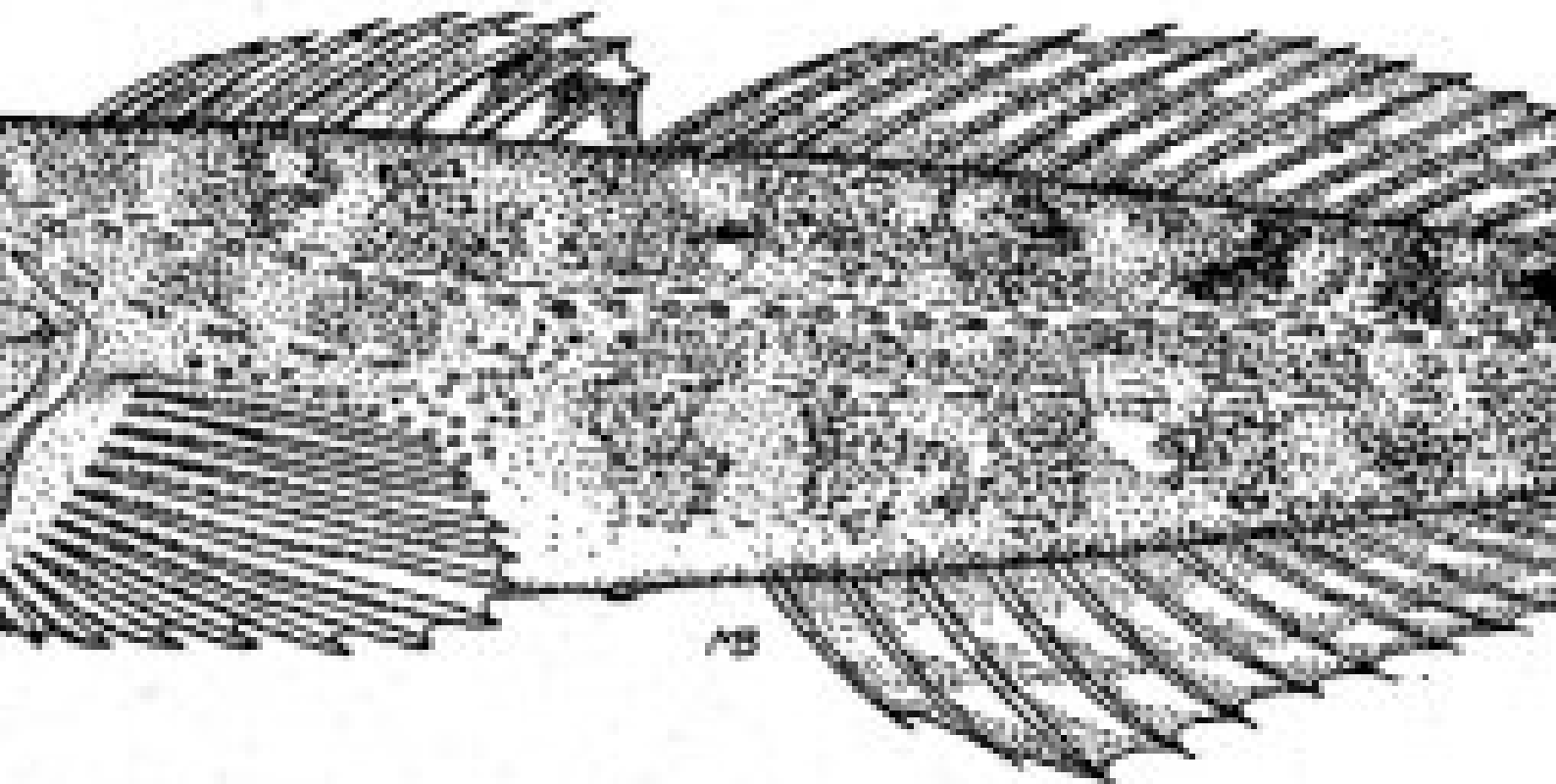
- Riffle Sculpin
-

RIFFLE SCULPIN

Cottus bairdii gulosus (Girard)

Odd in appearance because of its large, much depressed head and small eyes which are placed high on top of the head and its enlarged pectoral fins, the riffle sculpin ("muddler") is able to maintain itself among the loose rocks in the gravel of swift riffles. It is a small, scaleless fish which is rather dark and usually mottled in coloration. The average length of this sculpin is between three and seven inches.

The few records indicate that the riffle sculpin is uncommon within the park. First specimen recorded from the park was taken below the dam, above Arch Rock Ranger Station in 1934. Ranger Lon Garrison found one in a small puddle just above the Arch Rock immediately following the 1937 flood in early December. A few others were taken in 1938, near the Incline; in 1938, at Steamboat Bay; and in 1948 from the west boundary of the park.



RIFFLE SCULPIN—Drawn by Ranger Naturalist Martin R. Brittan from a 5-inch specimen.

NATURAL REPRODUCTION OF TROUT

All too little is known at present about the relative importance of natural reproduction in maintaining fish populations in the lakes and streams. It is known, however, that in many of the less accessible areas of the park, natural spawning alone has been responsible for maintaining the trout population after initial stocking. Thus the planting of trout is only warranted in waters which show that the natural reproduction is not capable of replenishing the supply of fish removed by anglers or lost through other causes.

The trout of our mountain areas such as the Sierra Nevada are resident; that is they do not make long migrations to spawning grounds as do salmon and trout of many coastal streams. An interesting thing to note is the fact that the salmon spawn once and die, while trout may spawn for several successive seasons.

The time of spawning among all trout varies with the temperature, season, locality and strain of fish. In Yosemite, the rainbow and golden trout spawn with rising water temperatures from early spring to midsummer depending upon the elevation while brook and brown trout spawn from late summer to late fall when water temperatures are falling.

The spawning trout tend to move upstream and seek the smaller tributaries, or in the case of those inhabiting lakes, inlets may be utilized. (Outlets and occasionally gravelly lake shores may be used if there is no suitable inlet.)

Eggs of trout are laid in nest-like depressions known as "redds," built by the female in gravel bottomed areas, where currents are fairly swift. In choosing a spawning place, a permanent water supply of even temperature is the most important factor. Digging of the nest is accomplished by vigorous head and tail movements of the female as she lies on her side. The male usually spends his time during this period pugnaciously driving off other males from the nesting area.

When the nest is prepared, both the male and female occupy a position directly above it. At the same moment that the eggs are deposited, sperm or milt is discharged over them by the male. The then fertilized eggs fall into the pit of the nest after which the female covers them by further digging movements that stir up the surrounding gravel. As indicated elsewhere, a high degree of efficiency results from this simple method of fertilization as almost all the eggs become fertile. One female may dig nests and deposit eggs several times within one season's spawning period. All parental care of the offspring ceases with the covering of the nest.

Before they hatch, the eggs remain in the gravel for several weeks or months depending upon the species and environmental factors. The newly hatched trout are known as "fry" and have a portion of the egg sac still attached. It is from the egg sac that the fry receives its first food. Shortly the sac is absorbed and the fingerling wiggles forth from the gravel and begins to feed upon minute aquatic organisms.

VALUE OF ARTIFICIAL PROPAGATION

In an area like Yosemite Valley the river is so heavily fished that few trout ever become old enough to spawn or lay eggs before being captured. Therefore, to maintain a constant trout population, great numbers must be planted each year. The Valley Floor is stocked with some 250,000 to 350,000 trout annually, depending upon the supply. The purposes of hatcheries are to help sustain fishing in heavily fished waters, to produce superior breeds of trout which have greater vitality and disease resistance, to supplement natural reproduction, and to introduce new species into an area. At present in Yosemite the hatchery operates to supplement natural reproduction and to aid

in sustaining fishing in heavily fished waters. According to the National Park Service fish policy, the Yosemite hatchery can no longer stock virgin waters without proper investigation and approval nor can it introduce further new exotic species. Few barren waters remain in the park and it perhaps is desirable to retain a limited number of them at least in their natural state without introduction of fish.

HAPPY ISLES FISH HATCHERY

Yosemite National Park has one fish hatchery within its boundaries located in the floor of the valley at Happy Isles. This hatchery, established in 1927, is operated and maintained by the California Division of



Happy Isles Hatchery and Exhibition Pool.

Fish and Game. Prior to 1927, trout for distribution and introduction into the streams and the lakes of the park were shipped in from other areas or were reared in the Wawona hatchery, which was built in 1895 by the Wawona Hotel Company at Wawona and was operated by the California Fish Commission.

Visitors are welcome at the hatchery during the open hours. It is located about a mile east of Camp Curry. Here the visitors are able to increase their interest in and knowledge of trout culture. A large, kidney-shaped concrete and granite retaining pond is situated outside the hatchery building. Many large trout are kept in this pool for demonstration purposes only. Within the hatchery there are 54 troughs in which thousands of young trout are hatched and reared. At certain times of the day, visitors may watch the young trout make the water “boil” as they rise to the surface for the food being fed by the hatcherymen. Behind the trough room, there is an exhibit hall where specimens of the various types of trout of the Yosemite waters are displayed in four aquaria.

All the trout planted within the park are reared at this hatchery. Over one million trout are raised each year. Most of these are of fingerling size, that is from two to four inches in length, when planted for it is felt that this size fish is more readily able to fit in with the “natural” conditions of our national park than the legal size trout. An agreement exists between the State and the National Park Service whereby at least half the trout raised in the hatchery from eggs supplied by the State must be utilized to plant waters within the park. In actual practice, however, about 80 per cent of the trout reared in the local hatchery are planted in the streams and lakes of the park. Since these operations are conducted by the state, a California State Angling License is required within the national parks of this state. Likewise, all fish produced from eggs secured in the park are available for park use, except that as Yosemite’s needs are filled, excess eggs may be shipped to other state hatcheries, there to be reared for planting in other California national parks. At present (1949) no eggs are being taken from within the park, although an egg taking station is located on Lake Eleanor.

SOURCES OF EGGS

Trout eggs for artificial propagation must be obtained from one or two sources. They must either be obtained by trapping wild trout of the desired species when the fish are ready to spawn or must be collected from a domesticated brood stock developed for that purpose.

Generally speaking, it is easier to use the latter method as the egg supply obtained from wild trout is often rather difficult to obtain and the quantity may vary considerably from year to year. However, in keeping with the National Park Service aim to preserve all fauna in as nearly natural condition as possible, it is generally considered that when possible the eggs from wild stock are more desirable for stocking park waters. Two species, the rainbow and the eastern brook trout, are being raised in the Happy Isles hatchery at present. The eastern brook trout eggs are spawned from hatchery-raised adult stocks at Creede, Colorado,

Formerly the rainbow trout eggs were collected from an egg taking station, established in 1933, at Lake Eleanor in the northern section of the park. Here the wild rainbow stock was captured for artificial spawning. At present, Lake Eleanor is the only body of water within the park boundaries closed to fishing. This action, of course, preserves the breeding stock. It is planned that within the next few years the Lake Eleanor station will be put back into operation again.

Although during the past few seasons, the rainbow trout egg supply has been secured from the Mt. Whitney Hatchery, the methods used in the taking of the spawn at Lake Eleanor will be described as they are characteristic of methods used elsewhere.

During the spring of the year large number of native rainbows run up stream out of Lake Eleanor into the tributaries to spawn. At the mouth of a large tributary, Frog Creek, the National Park Service has constructed a dam with fishways and traps in order to capture the migrating trout for egg collecting purposes.

After a sufficient number of fish have been captured in the live traps, operations begin. The first task is to place the males and females into separate holding tanks or "cars" (long boxes through which water circulates) by netting them out of the trap. Males may be distinguished by their brighter coloration, conformation or feel of the body and the sharply hooked lower jaws. The females must be further subdivided into those which are ready to spawn and those which must be held a few days.

After pans, buckets and other necessary equipment have been assembled, the spawning activities begin. The operator first dons woolen mittens, which not only protect the fish from injury but permit the operator to hold the fish firmly through the natural slime. For this reason, it is necessary to rinse the gloves often. Also, good quality, wool, finger gloves even though wet do provide a certain measure of warmth for the operator. It must be remembered that the spawning takes place in the early spring while snow is still on the ground and the water and air temperatures therefore quite cold.

A large female rainbow is selected. By the method called "stripping," the abdomen is gently squeezed and the eggs are forced out into a small enamel pan. By a similar procedure the milt or sperm of the male is forced out over the eggs, fertilizing them in about one to one and a half minutes. Usually a gentle stirring of the mass insures a high percentage of fertile eggs. Rainbow trout average 500 to 1400 eggs per female. After the spawning process, the trout are returned to the lake to provide breeding stock for another season.

The trout eggs are thus collected until actual bucketfuls are obtained. (The average-sized pail will hold around 100,000 trout eggs.) Eggs are very tender at first and must be left standing quietly in water for at least three-quarters of an hour before being transported.

The eggs are porous at first but when placed in water they swell slightly and develop a tough outer shell. This period is known to hatchery men as the "freeze" or "water harden" stage. Once past this danger period, eggs may be safely transported back to the hatchery. They are placed in quart jars set in moss for shipment. About 10,000 eggs are contained in one quart.

HATCHERY OPERATIONS

At the hatchery, the eggs are placed into wire-mesh baskets which are lowered into long narrow troughs filled with pure, cold running water. Each basket contains around 20,000 to 25,000 eggs. The hatchery rearing of trout consists mainly in raising them under rigid protection from enemies, disease and other adverse conditions so that a greater number can be assured of reaching maturity than under natural conditions.

Other than the necessary transportation of "green eggs" from the spawning station to the hatchery troughs, all movement is minimized for some time. They become so tender and sensitive when about three days old that even a slight jarring will kill many. Any attempt to ship at this stage would be fatal to all. The eyes of the young developing trout first appear visible through the transparent shell membrane when the eggs are approximately two weeks old in water at a temperature of 54 degrees Fahrenheit. This is known as the "'eyed stage," at which time the eggs are no longer sensitive and may be transported great distances. For long trips, the eggs are placed in trays in regular refrigerated packing boxes.

Upon hatching, the "'fry," as they are then called, are able to wriggle through the wire mesh of the egg basket into the trough below. A trout fry is a curious looking creature, with a large yolk sac consisting of stored food attached to the abdomen. During the first stage of its life this yolk sac, which gradually becomes absorbed, furnishes all its food.

With the sac entirely absorbed, the young trout swims up toward the surface of the water as if in search of food. This is the cue for the hatcherymen to begin feeding. At first finely ground beef liver comprises the main diet of these tiny fish in the Happy Isles Hatchery. After a few weeks, canned sardines are added to the liver in increasing amounts until the liver is two-thirds of the mixture. Some hatcheries use rough ocean fish or horsemeat for trout food.

The growth is fairly rapid and in two or three months after hatching, the young trout are perhaps 1 1/2 to 3 inches long and are called "fingerlings." This is the size at which trout are planted in the waters of Yosemite. Twenty-four hours before planting, feeding of the trout is discontinued; this aids in conditioning them for travel. Clean planting cans and pure water (free from chlorine) are other vital essentials for successful stocking of trout.

To count each trout individually is, of course, impossible. Therefore, the fingerlings are weighed and numbers calculated from the known number present per ounce by actual count. After loading the trout in large fish cans, each containing one to three thousand trout, they are ready to be transported anywhere in the park for planting.

FISH PLANTING

When the trout have reached the desired size for planting, the U. S. park rangers take over the fish planting, or the final phase of fish culture, from the California Division of Fish and Game hatcherymen who have fostered the fingerlings from the eggs.

Assistant Chief Ranger Duane Jacobs reports that 490 miles of stream waters and 150 lakes in Yosemite National Park have been stocked with trout prior to March 17, 1949. Some of these waters are now able to provide sufficient natural reproduction to more than care for the demands but others must be planted annually, biennially or triennially to supplement the natural spawn and take care of the anglers' demands upon them.

Some of the waters are easily accessible and can be reached by truck. This entails the loading of cans into the truck and hooking up an aerating device, which keeps the air circulating throughout the water of each can. Sufficient oxygen and constant, though moderate, water temperature (40°-50°F.) are the main factors considered in transporting trout. To stock the lakes and streams of the back country accessible only by trail, the cans are loaded onto pack animals.

Modern planting of trout by approved methods is far different from that of two decades ago. Formerly the planter's worries were over as soon as the cans of fingerlings were literally dumped anywhere in the lakes and streams that happened to be convenient. Large losses resulted, as naturally many trout in a small area created definite food competition and provided many easy meals for fish predators.

Nowadays fish planting is done



Tenaya Lake

—Photo by Anderson

more scientifically and requires a great deal more time and effort. Such factors as temperature equalization of the water in the can with that in the stream, food supply, predators and spawning conditions are given considerable attention. The fish are spread widely to avoid overcrowding and excessive loss to natural enemies. Young fingerlings are released a few at a place, along the margins of the lake or stream over long distances. Quiet water provided with sufficient food and shelter can be found with a bit of patience. This practice at least gives the small trout a fair start in life.

In Yosemite National Park about a million trout are planted in this manner each season by especially trained and skilled rangers. In spite of this vast number planted, many fishermen are disappointed with their small catches (small in both size and numbers), especially in heavily fished areas such as the Merced River in Yosemite Valley. As Dr. J. O. Snyder states it, "Depletion of the trout has lately attracted attention to almost every possible cause except the increased activities of anglers."⁸ The answer is simply that fishing intensity often badly overbalances the natural increase of trout. For instance, a rainbow trout does not spawn until it is two or three years old and around ten inches in length. Consequently, the majority of fish planted in the Merced River never mature before being captured. No heavily fished stream can long depend on light artificial stocking alone, but must be backed by natural reproduction, which is more effective than most people realize.

It would be beneficial if stream and lake surveys of all potential waters important to fishing could be made before plantings are undertaken. This would alleviate much waste of time and money by seeing that fish are stocked in waters providing a biologically sound environment for that particular species or strain. Many such survey programs are being conducted by fish biologists in various parts of the country today and their value has been amply demonstrated.

Research along such lines, plus creel censuses and fishermen questionnaires, have greatly increased our working knowledge of the game fish of inland waters. Only through public cooperation in promoting proper legislation, submitting accurate information, and abiding by legal restrictions can our fisheries resources be restored to the high level that once existed.

8. Snyder, J. O. 1940. The trouts of California, *California Fish and Game*. Vol. 26: No. 2 pp. 96-138. figs. 1-58.

ENEMIES OF TROUT

Fishermen often ask why there are not more trout in our streams and lakes in spite of the fact that thousands of fingerlings are planted each year and thousands are naturally reproduced. This is not a simple inquiry to answer because many decimating factors keep the trout population from becoming too great.

One of the most important factors in Yosemite waters is the low water level in the fall of the year. During this period only a small per cent of the trout can occupy the section of stream which was deep and wide during the early summer. Also, as the waters recede many small fish are left stranded in side pools where they are easy prey for predators or where they die when the pool dries up.

The high water of the spring months also does its damage, especially to the spawning redds of the rainbow trout. The extreme fluctuation of Yosemite streams definitely cuts down the carrying capacity of our streams.

Heavy fishing pressure, especially in areas of high concentration of visitors such as Yosemite Valley or Tuolumne meadows, makes it difficult for any number of fish to survive from one season to the next. Increase in transportation has brought great numbers of anglers into areas which formerly were rarely visited except by the most hardy individuals.

Among the enemies of trout are the various fish predators of which man is primary. Water ouzels, kingfishers, ospreys and gulls are a few of the birds which feed upon fish to a certain extent. In the case of the water ouzel, fish constitute a minor item in the diet. Other predators include the giant water bug, dragonfly nymphs, garter snakes, turtles and large trout and other fish. "Water dogs" and suckers will devour exposed trout eggs. Suckers, also, cause certain damaging affects to the spawning redds of trout by disturbing the eggs as they search for food on the bottom of the stream.

In our National Parks all forms, except game fish, are rigidly protected in their natural conditions against the encroachment of civilization. Therefore, these fish predators, which have a definite place in the ecological set-up are also protected.

NATURAL TROUT FOODS

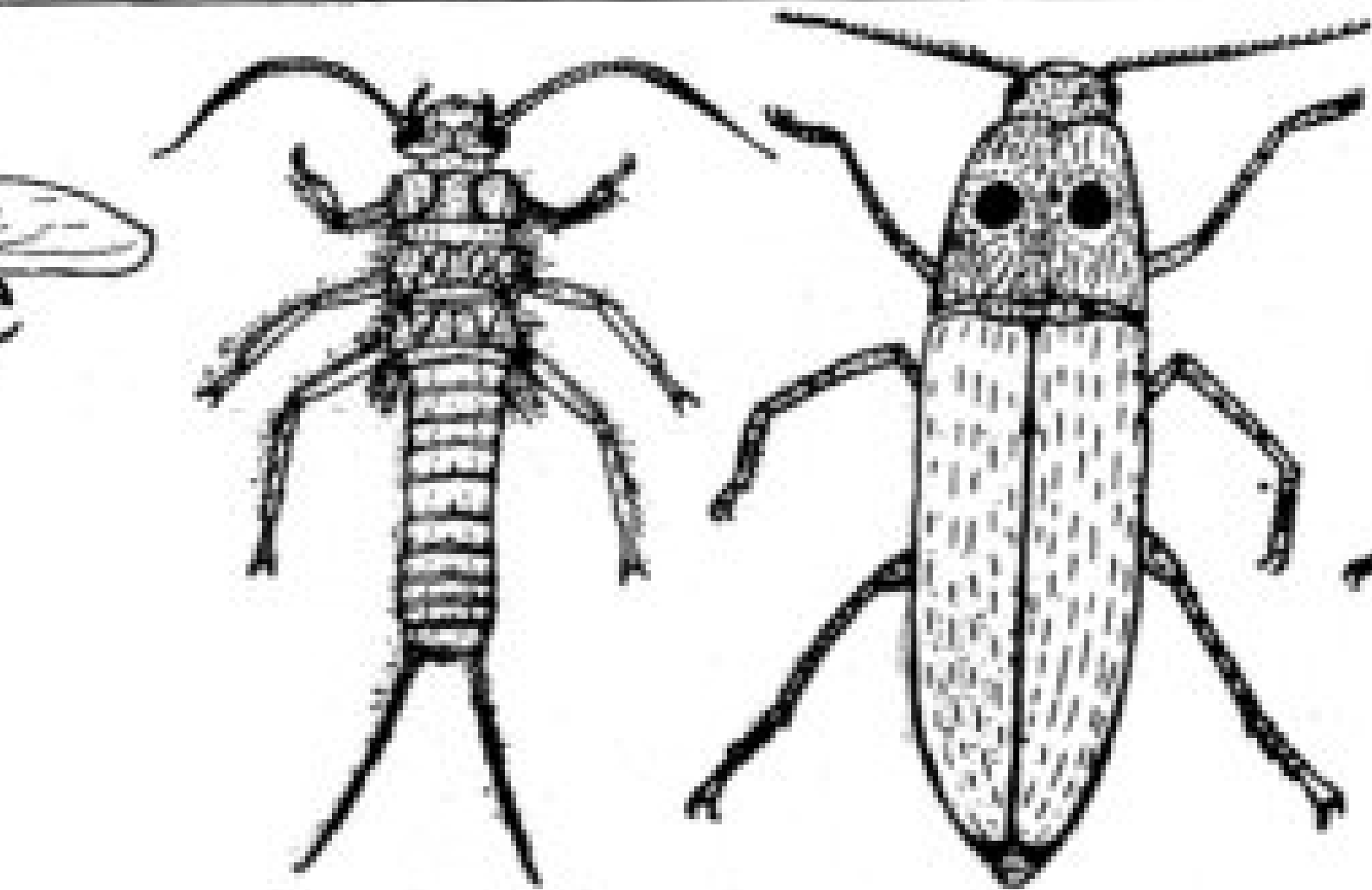
A discussion of the food habits of trout is of special interest to the angler because it often aids him in the selection of artificial lures. The normal diet of a trout may be determined from a study of the stomach contents of a number of fish specimens. Such a study will disclose that the foods of trout come from the land as well as from the water. In Yosemite National Park, even during the summer, the trout depends upon aquatic foods for 82% of the diet as determined by an analysis of 53 stomachs collected in 1948. Studies of 100 stomachs examined by Helen Howe and Avis Meigs in 1926 and 102 stomachs analyzed by H. John Rayner in 1936 bear out this finding.⁹

Insects constitute the most important group from which those foods are drawn. The extent to which trout depend upon the aquatic or terrestrial food source is governed by the weather, the temperature of the air and the water, the season of the year and other factors of the environment. Generally speaking, the trout are dependent upon aquatic forms for nearly all of their food during the winter months.

The contents of stomachs from rainbow, eastern brook, brown, golden and cutthroat trout fail to reveal any great difference in the quantity or kinds of foods eaten by each species at any given size.

Foods of aquatic origin vary with the type of bottom, swiftness of the water, the water temperature and the season of the year. Some of the forms are large while others are minute. The smaller forms often make up for their lack of size by their great numbers. Upon turning over a stone, a person will often find several types of aquatic organisms.

The four main types of aquatic insects are the caddisflies, mayflies, stoneflies and true (two-winged) flies. The larvae of many caddisflies construct small tube shelters or cases of gravel, bark, grass or twigs. These cases are attached to the rocks in



Stone Fly (larva)

*One of the click beetles,
Eyed Elater*

Some Favorite Trout Foods

swift water but in still water they are usually unattached. The larvae are, also, known as caseworms or perrywinkles. Both the larvae and the adults furnish one of the important trout foods.

Many of the two-winged or true flies are of aquatic origin. The young are found as small, worm-like larvae or as transforming pupae, while the adults are winged forms. Some of these flies are very small and are commonly referred to as "gnats."

Mosquitoes are true flies, also. In certain waters, mayflies and stoneflies are of value as trout foods. The nymphs of mayflies or stoneflies may be found crawling around under the rocks in the stream bed. Mayfly nymphs possess three tails or cerci while stone fly nymphs have only two.

Other foods of aquatic origin include: dragonflies, damselflies, fresh water clams, waterboatmen, water striders and aquatic beetles. Trout foods derived from the land include principally flying insects which have fallen into the water where they are consumed by the trout. Beetles found in the stomachs include click beetles, lady bird beetles, and various kinds of bark beetles. During the period when the black ants are in the winged form, these furnish an abundance of food. True bugs, wasps, bees, grasshoppers, crane flies, and spiders are other common foods.

Larger trout will feed upon other fish and other large items. Two trout caught in 1936 contained mice in their stomachs. In June 1934, Ranger Oscar Irwin, stationed at Buck Camp, caught an 18 inch eastern brook trout in Chilnualna Lake which had eaten a full grown water ouzel and a seven inch trout.

If the angler has determined that the trout are feeding upon black ants or black flies, a black gnat fly will usually be successful in catching trout. Use a brown hackle if trout food consists of brown flies or a gray hackle or mosquito if the food is made up of small gray flies

or mosquitoes. In the early spring before the hatch of flies has occurred wet flies or nymph type lures will usually produce the best results. (see page 25.)

9. Howe, Helen Y. and Meigs, Avis F. 1926. Food habits of trout. *Yosemite Nature Notes*. Vol. 5: No. 12 (Dec. 31) pp. 92-94.

Rayner, J. H. 1937. Notes on the food of trout of Yosemite National Park. *California Fish and Game*. Vol. 27: No. 2. pp. 149-156.

NOTES OF FISHING IN YOSEMITE NATIONAL PARK

Where to fish is the question foremost in the mind of an angler when he comes into a new place to try his luck. Here in Yosemite National Park, trout have been planted in 150 lakes and in 490 miles of streams from one end of the park to the other. These waters are kept stocked either by natural or artificial means. Generally speaking, the best fishing is to be found when one takes to the trails and angles in waters far from the centers where visitors congregate. Before planning a fishing trip in the park, the angler will find it to his advantage to secure a topographical map of Yosemite National Park.¹⁰ This map will serve as a trail guide and, also, will show the location of the streams and lakes.

When to fish? The open season in Yosemite is from May 30 to October 15 inclusive. The best fishing in the lakes and streams is to be found when the water has receded after the spring run-off. As the early morning and late afternoon hours appear to be the principle feeding periods for



“Pretty Waters” on the Merced River

—*Photo by Anderson*

the trout, fishing during these times of day usually produces the best results. In some lakes, the shallow water along the edge will rapidly warm up during the middle of the morning. Trout naturally prefer cold water and therefore, they will desert the warm shallows for the cool depths during the middle of the day.

Tackle. Although trout may be caught on a pole and line with a bent pin, most anglers desire more elaborate equipment consisting of a rod, reel, hooks or flies, line and sinkers. Equipment may be secured to fit any angler's pocketbook. Choose your tackle in relation to the fish you are angling for. Using lighter tackle requires greater skill but is rewarding from the extra thrills gained by having to play the trout rather than merely hoisting it in.

For an all-around fly and bait fishing rod, a nine foot split-bamboo rod of about five ounces is recommended. A 4 1/2 to 5 foot bamboo or tubular steel rod is ideal for casting plugs, spoons, spinners and heavy sinkers. To secure maximum advantage from one's equipment, the reel should be selected to match the rod.

For fly fishing, tapered leaders are desirable: a 6 foot leader with a 3 x tippet is satisfactory for both lake and stream fishing while a 7 1/2 foot leader with a 3 x or 4 x tippet is suitable for stream fly fishing.

Artificial lures are encouraged for fishing in the waters of our national parks. They are divided into two main types, spinners and flies or nymphs. Spinners recommended vary from 3/0 to No. 2. The selection of flies depends upon one's own preference but the following flies have proven successful in Yosemite waters: captain, gray hackle with yellow body, mosquito, red ant, plain coachman, California coachman, royal coachman, McGinty, black gnat, and brown hackle peacock. The hooks should be sizes 10 to 12 for smaller fish and 8 or 6 for larger trout. In the section under natural foods of trout (page 24) there are a few hints about the selection of which fly to use based upon the food which the trout are eating.

Nymph flies are fuzzy with little hackle and are intended to simulate the bottom living aquatic forms which crawl around on the rocks. For best results these flies are fished near the bottom of the lake or stream in a jerking fashion. A B-B shot (or two if the water is rapid) fastened to the leader will get the nymph down where it is most effective.

Natural bait used in Yosemite waters include earthworms, and salmon eggs. In the use of salmon eggs and other baits, chumming or the feeding of the fish is prohibited as a method to attract trout. **The use of bait fish either dead or alive is strictly prohibited by the National Park regulations.**

Care of Trout.¹¹ Use a good trout basket, not a sack. Clean fish as soon as is possible, wash and hang up to dry. Do not put any more water on them. Hang outside at night. To keep trout several days before taking them home, lay out over night to drain, then pack well in willow boughs or sod grass, a layer of fish and a layer of grass. Roll them up during the day in a damp gunny sack and lay out each night to air and cool.

Another method suggested is to wrap each fish in oiled paper after cleaning and drying, then roll in a dry sack or piece of newspaper, and wrap again. The extreme outer sack may be wet, then carefully wrung out, and roped around the dry bundle. Keep in a cool place away from the air, inside if possible. Tie the bundle at the ends much the same as a tamale is tied. Do not open until the fish are to be used. Such bundles have been shipped in a box with ice for thousands of miles, providing the fish do not touch the ice.



The theory of saving trout is to keep them cool, clean, dry and away from the air.

If fish are to be shipped in ice, this method is suggested: Put a lot of green grass blades or similar material in the bottom of the container, and after wrapping each fish separately in more green material or newspaper and all are packed in, put a batch of green material on top. Put paper on top of fish letting paper down over sides of box. Then put in ice to the depth of from four to six inches, fold paper back over ice, put more paper on top, nail on cover, and mark box, "Perishable, This Side Up." The paper will exclude the air.

Here is another good way to keep trout. Clean the fish soon after they leave the water. Hang up to dry over night. Don't use water, but wipe insides with damp cloth, being sure that all the blood is removed. In the morning dust both inside and out with dry corn meal. Wrap each fish separately, first in oil paper, then in newspaper and then wrap the entire catch in burlap or a box lined with newspaper. Then they will be ready for shipping.

Message to Yosemite anglers. Fish are planted in the waters of Yosemite National Park to provide sport and recreation to the park visitor while he is enjoying the virgin beauty of the region. In an attempt, to maintain trout in waters which are heavily fished, many anglers find sport in fishing with a barbless hook or by releasing the fish which they do not need. **Today fishing is primarily for recreation rather than for food. Therefore, if the fish is returned to the water it will provide further sport for some other angler.**

As anglers utilize the back country of the High Sierras great care should be taken in their use of fire. Fires created by unattended camp fires or cigarette butts can inflict great damage to the virgin back country and the fishing conditions in the affected areas.

10. Available at the Yosemite Museum for 26 cents, or 30 cents by mail from the Yosemite Natural History Association, Box 545, Yosemite National Park, California.

11. This section is adapted from the California Division of Fish and Game leaflet, "The Care of Deer, Game Birds and Trout."



FISH POLICY OF THE NATIONAL PARK SERVICE

The taking of fish in our national parks has been the one exception in our wildlife policy of complete protection and preservation of all native animal species. Since fish populations are less easily destroyed and can be more readily replaced than any other type of animal, this exception may be justifiable when we consider the high recreational use of our parks which angling brings about. A variety of species may be captured, ranging from deep sea fishing in Acadia to catching golden trout in Sequoia or Yosemite. However, emphasis should be placed upon the perpetuation of native species in their natural environment wherever possible even to the exclusion of exotic species and anglers from certain waters.

In the early days many different kinds of exotic fish were carelessly introduced into our national parks as well as outside areas. Much of this resulted in waste, as many species were not adapted to the type of waters in which they were planted. To safeguard against such introductions and to protect the native species, the Service formulated the following fish policy, which was approved in 1939:

1. No introduction of exotic species of fish or other exotic aquatic life shall be made in national park or monument waters now containing only native species.
2. In waters where native or exotic species now exist, the native species shall be definitely encouraged.

3. In waters where exotic species are best suited to the environment and have proven of higher value for fishing purposes than native species, plantings of exotics may be continued with the approval of the Director and of the Superintendent of the park in which such waters are located.
 4. The wider distribution of exotic species of fish within the national parks and monuments shall be prohibited, and a thorough study of the various park waters shall be encouraged to the end that a more definite policy of fish planting may be reached.
 5. The number of species of native non-game fish should not be reduced even where such reduction may be in the interest of better fishing.
 6. All forms of artificial stream improvement which would change natural conditions should be avoided, but the restoration of streams to their natural condition is permissible where thorough investigation indicates the desirability of such action.
 7. In cases where a lake or stream is of greater value without the presence of fishermen, there should be no stocking of such waters.
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FISHING REGULATIONS IN YOSEMITE NATIONAL PARK

Subject to change: fishermen are requested to check at the Rangers' Office or the Yosemite Museum for any subsequent changes.

The following regulations relative to fishing in Yosemite National Park are derived from, or issued under the authority of, Rules and Regulations made, published, and approved by the Secretary of the Interior.

LICENSE: California State fishing license is required of all persons, of either sex over the age of 16 years desiring to fish in the waters of Yosemite National Park. **FEES:** \$3.00 for any citizen of the United States who is a resident of California. \$5.00 for any citizen of the United States who is not a resident of California. \$3.00 for a special 10 day nonresident license. \$25.00 for noncitizen license. Licenses may be obtained at the stores in Yosemite Valley, Wawona and Tuolumne Meadows.

OPEN SEASON: May 30 to October 15, inclusive.

CLOSED WATERS: The waters of Lake Eleanor, its tributaries for a distance of one mile from the lake are closed to fishing. All other lakes and streams are open to fishing. It is unlawful to take any fish within 150 feet of the lower side of any dam.

CATCH LIMITS: The fish available for the season must be divided fairly among the fishermen and taken slowly enough so that they will last throughout the entire season. Enough fish should be left in the waters to produce trout for years to come.

Daily Limits: Ten (10) fish, but not more than ten (10) pounds and one fish may be taken by any one person in any one day.

Weekly limit: Twenty (20) fish, but not more than twenty (20) pounds and two fish may be taken by any one person in any one week.

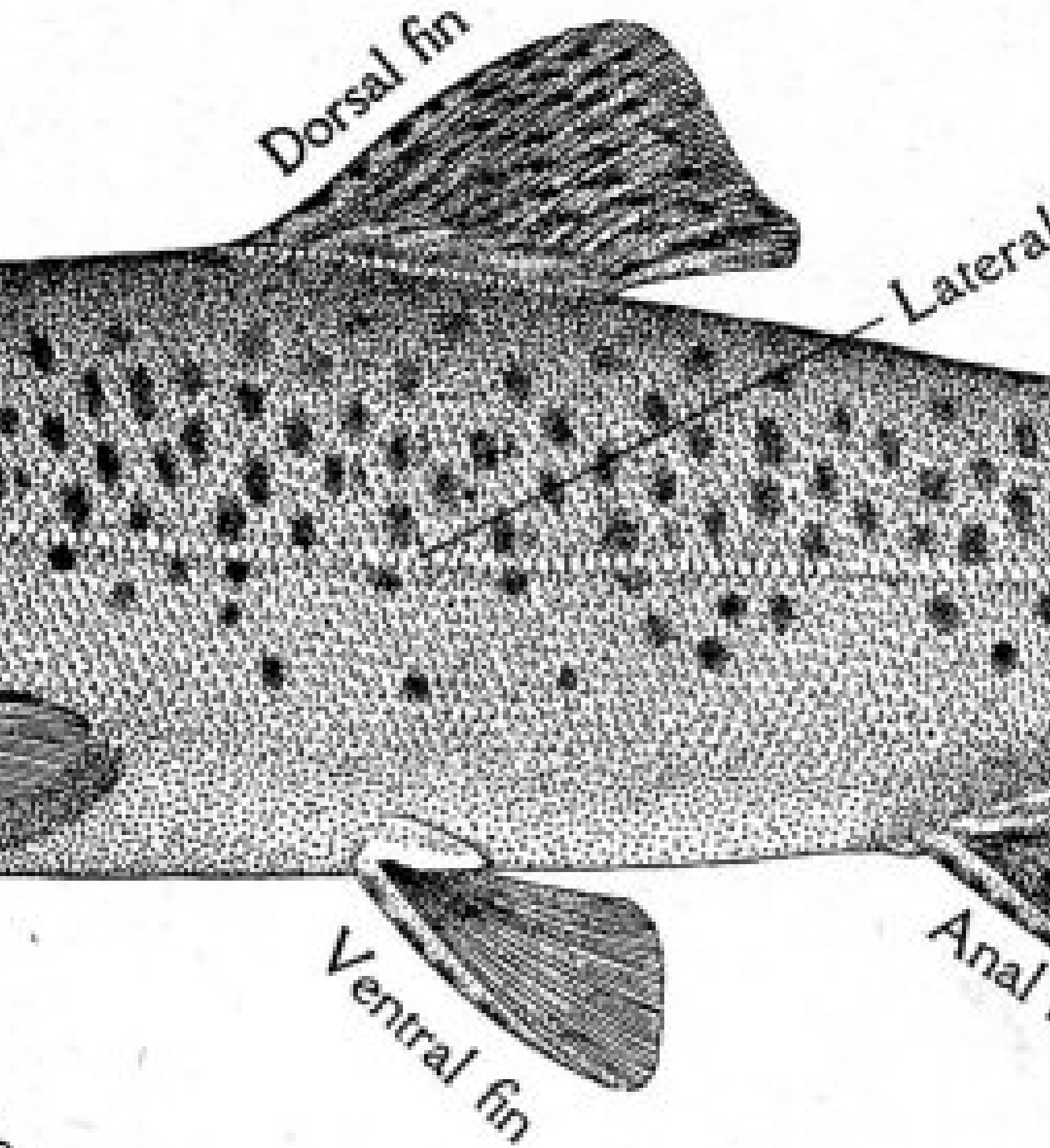
Possession Limit: Any person at any time shall not possess more than one daily limit of fish.

SIZE LIMIT: Fish less than six (6) inches in length must be returned to the water. All fish hooked that are less than six inches in length shall be carefully handled with moist hands and returned to the water. Undersized fish retained because of serious injury shall be counted in the number of fish which may be taken in any one day.

OTHER REGULATIONS:

1. All fishing must be done in conformity with the laws of the State of California, except as otherwise provided in these regulations. (N.B. the State of California prohibits fishing for trout with snag or gaff hooks, set lines, or lines having more than two attractor blades, or more than three hooks. Chumming in inland waters is prohibited.)
 2. State fishing licenses and all fish taken must be exhibited upon demand to any person authorized to enforce the provisions of the fishing regulations.
 3. The regulations prohibit fishing with nets, seines, traps, or by the use of drugs, or explosives, or for merchandise or profit, or in any other way than with hook and line, the rod or line being held in the hand.
 4. The canning or curing of fish for the purpose of transporting them out of the park is prohibited.
 5. The possession of live or dead minnows, chubs, or other bait fish, or the use thereof as bait is prohibited. The digging of worms for bait is prohibited.
 6. The possession of fishing tackle or fish upon or along any waters closed to fishing shall be prima facie evidence that the person or persons having such fishing tackle or fish are guilty of unlawful fishing in such closed waters.
 7. The use of boats, canoes, rafts, or other floating craft is prohibited on all streams and lakes of Yosemite National Park except Tenaya, Merced, May, Benson, Tilden, Kibbie and Twin Lakes.
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A KEY TO THE FISHES OF YOSEMITE NATIONAL PARK



Standard length _____

Total length _____

This key is designed to assist the angler in identifying any fish found in Yosemite waters. It is a key of alternate characters, e.g., if the character opposite 1a is not typical of the specimen, you then proceed to 1b. For example: to identify the brown trout it would be necessary to use the following characters: 1a, 2a, 3b and 6a. Where practicable, **the most usable single recognition character is in bold face type**. The page on which you may find a description of that fish is indicated after each name.

1a. Ventral fins abdominal (attached considerably behind the pectoral fins).

2a. Adipose fin present.

3a. No red or brown spots present. Black spots on a background of lighter color.

4a. Body profusely covered with black spots. Sides not golden.

5a. **Red stripe on sides of body**. No red dash of color below lower jaw on each side.

RAINBOW TROUT, *Salmo gairdnerii irideus* p. 6

5b. No red stripe on sides. Body usually covered with black spots. **Red dash of color in cleft under each side of lower jaw in adults**.

CUTTHROAT TROUT, *Salmo clarki* p. 7.

4b. Black spots relatively few and mainly above midline. **A yellowish-orange band on sides grading into golden-yellow farther down and finally orange on the abdomen**. Body of stream fish with distinct bars or parr marks throughout life. Ventral and anal fins tipped with white.

—**GOLDEN TROUT, *Salmo aqua-bonito*** p. 8

3b. Red or brown spots present. Background either brownish-yellow or strongly mottled with olive and black.

6a. **General color brownish-yellow**. A few red or brown spots present on sides. Back covered with brown spots. Lower fins and abdomen yellow to white.

—**BROWN TROUT, *Salmo trutta fario*** p. 9

6b. Red spots on a background of darker color. **Back unspotted but mottled with olive and black wavy lines**. Lower fins edged with white stripe; bright red or orange behind this.

—**EASTERN BROOK TROUT, *Salvelinus fontinalis*** p. 10

2b. Adipose fin absent.

7a. Mouth directed downward, excessively protractile with sucker-like lips.

—**SACRAMENTO SUCKER, *Catostomus occidentalis*** p. 12

7b. Mouth not especially directed downward. Lips not enlarged and sucker-like.

8a. **Upper lip with frenum** (a small piece of flesh binding the upper lip to the edge of the jaw).

—**HARDHEAD, *Mylopharodon conocephalus*** p. 14

8b. Upper lip without frenum.

9a. Mouth large, maxillary extending to just below anterior edge of the eye. Reaching length of 3 feet. Color plain.

—**SACRAMENTO SQUAWFISH, *Ptychocheilus grandis*** p. 13

9b. Mouth small, maxillary not extending to eye. Not exceeding length of 5 inches. Color somewhat mottled.

—**CHUB-ROACH, *Hesperoleucus symmetricus*** p. 14

1b. Ventral fins thoracic (attached immediately below the pectoral fins). Pectoral fins very large and thick. A small spine on preopercle (on side of head).

—**RIFFLE SCULPIN, *Cottus bairdii gulosus*** p. 15

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FISHERMAN'S LUCK

I fished today 'long a rollicking stream,
I caught no fish but I caught the gleam
Of the sun on the water as it frolicked along,
And I caught overhead the lilting song
Of a bird that sang from a treetop tall,
And I caught the sound of a waterfall.
I caught a glimpse of the cloud-ships high,
As they sailed the seas of the boundless sky;
I caught the sound of the buzzing bees,
And the song of the winds through the tall pine trees.

I caught no fish this summer morn,
But much that I caught I would not scorn;
For I caught the joy of a day well spent
Of hours that brought a sweet content;
A glimpse of God in the woodland plan,
A renewed faith in my fellow man;
And better health and a zest for life,
New strength to meet and conquer strife.
So go out fishing, you city man;

Though you catch no fish you'll find you can
Catch the spirit of a world that is clean,
And the unnamed joys of things unseen.
You'll catch new strength for the tasks ahead,
You'll find new life in hopes you thought dead.

Though you catch no fish from the turbulent streams,
You may recatch youth's wavering dreams;
So go to the woods where the bluebird sings,
And the sun's hues show in the butterfly's wings;
And when you return you'll say with your might,
That God's in His place and the world's all right.

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