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A SURVEY OF THE COAST CUTTHROAT TROUT, *SALMO CLARKI CLARKI* RICHARDSON, IN CALIFORNIA¹

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INTRODUCTION

Although of restricted distribution and one of the least known trout of California, the Coast Cutthroat Trout, *Salmo clarki clarki* Richardson, occupies an environmental niche that has not yet been filled by any other fish. Probably because of its relative unimportance numerically, no general scientific studies have previously been made of this fish in California. Sumner (1948) has conducted intensive research into the life history of the coast cutthroat in Oregon. Very little has been published concerning it in the State of Washington, but Dymond (1928, 1932), Haig-Brown (1947), and Neave (1949), have contributed considerably to the knowledge of the fish in British Columbia.

With an allegedly declining population of coast cutthroat in California there is a need for definite information on this subspecies. The present paper is based on a study made during 1951 to determine its general distribution and status in the State, as the first step in the search for information on which to base its management.

DISTRIBUTION IN CALIFORNIA

In California the coast cutthroat is restricted mainly to the area bounded by the Eel River, the Oregon state boundary line, the Pacific Ocean, and the summit of the Coast Range (Figure 1). It has also been reported from tributaries of the Rogue River in California's Siskiyou County. Murphy and DeWitt (1951) established what appears to be the first definitive record of the cutthroat in the Eel River system. In that river system cutthroat have been found only in the main river, in tidewater, and in six small tributaries, all within 10 miles of the ocean.

From Eel River northward the distribution extends gradually farther inland. In the Klamath River drainage cutthroat have been taken about 20 miles inland. In the Smith River system they are common even in the headwaters, some 50 to 60 miles from the ocean.

The Smith River system is the most important coast cutthroat area. Virtually all sections of the river and its tributaries are known to contain or are reported to contain cutthroat (see Table 1).

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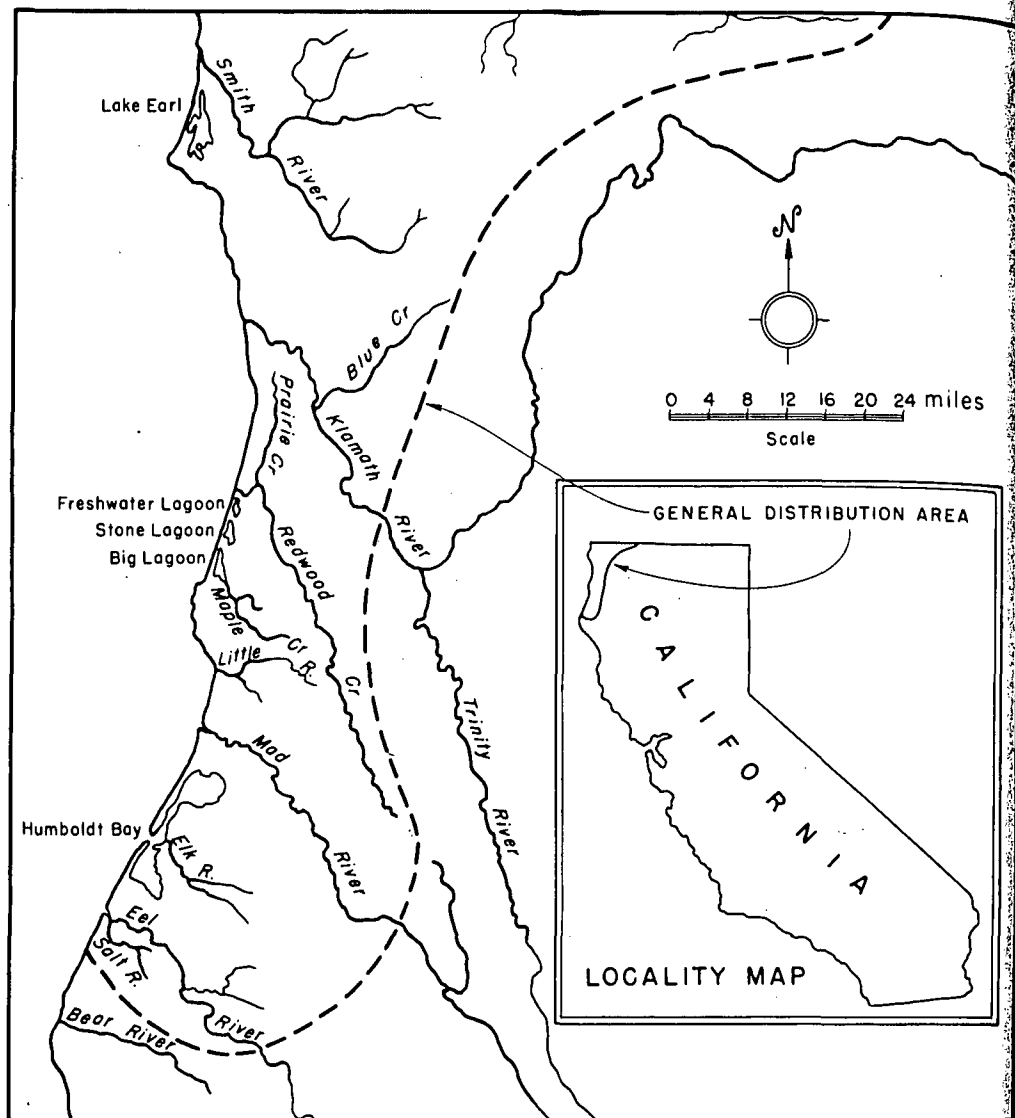


FIGURE 1. Map showing the range of the coast cutthroat trout in California.

DISTINCTIVE FEATURES OF THE COAST CUTTHROAT

The coast cutthroat in California is a slender fish (Figure 2), generally not as deep-bodied nor as large as its cousin, the Steelhead Rainbow Trout (*Salmo gairdneri gairdneri*), in the same waters. Few specimens weighing more than three or four pounds are taken, while the sea-going rainbow frequently exceeds 10 pounds.

The cutthroat may generally be distinguished from steelhead and other trout of the rainbow series by the presence of hyoid teeth and reddish or orange dashes on the throat, as well as by differences in body coloration.

The presence of hyoid teeth is one of the most reliable characters for distinguishing cutthroat from trout of the rainbow series. Rainbows lack these teeth. However, not all cutthroats possess them, as shown

TABLE 1

Waters Containing Coast Cutthroat Trout in California ¹

Eel River—C	Klamath River—C
Salt River	Panther Creek—R
Russ Creek—C	Hunter Creek—C
Reas Creek—C	Turwar Creek—R
Francis Creek—C	Ah Pah Creek—C
Williams Creek—C	Tectah Creek—C
Strongs Creek—C	Wilson Creek—R
Barber Creek—C	Lake Earl—R
Elk River—C	Smith River—C
Mad River—C	Rowdy Creek—R
Mill Creek—C	Little Mill Creek—R
Warren Creek—C	Mill Creek—C
Lindsay Creek—C	South Fork Smith River—C
North Fork Mad River—C	Goose Creek—C
Widow White Creek—R	Hurdygurdy Creek—R
Clam Beach Lagoons—C	Jones Creek—C
Little River—C	Fall Creek—C
Luffenholtz Creek—R	Middle Fork Smith River—R
McNeil Creek—C	Patrick Creek—R
Patrick Creek—R	Jones Creek—C
Big Lagoon—C	Monkey Creek—C
Maple Creek—C	Siskiyou Fork—R
Stone Lagoon—C	North Fork Smith River—R
McDonald Creek—C	Diamond Creek—R
Freshwater Lagoon—C	South Fork Winchuck River—R
Redwood Creek—C	
Prairie Creek—C	
Lost Man Creek—C	

¹C = Cutthroat trout collected during course of study; R = Cutthroat trout reported but not collected during study.

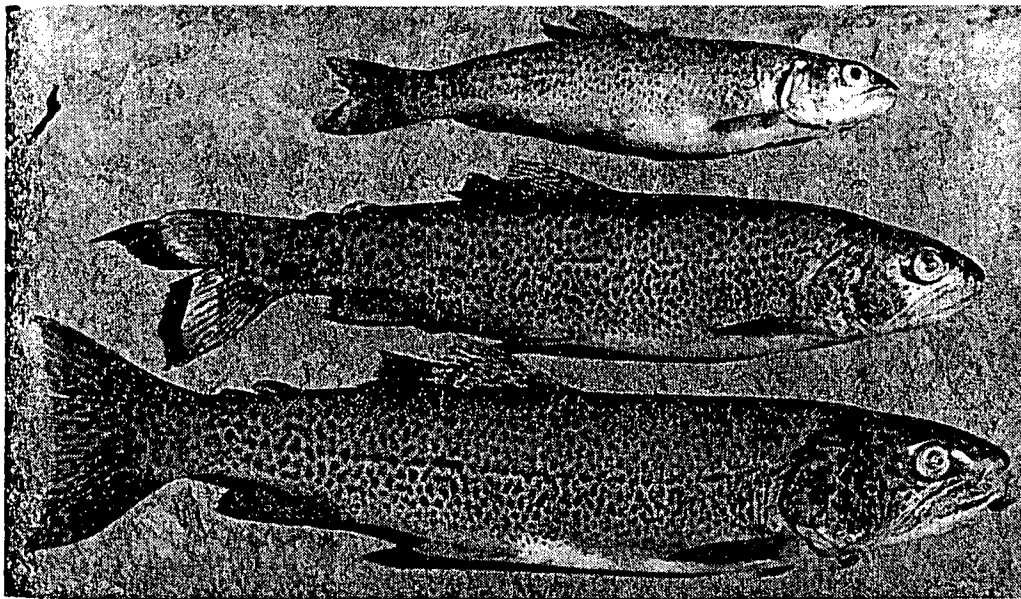


FIGURE 2. Three coast cutthroat trout from Monkey Creek, tributary to the Middle Fork of Smith River, Del Norte County, California. Largest specimen about 12½ inches long, fork length. Photograph by John W. Westgate, August, 1951.

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by Dymond (1928) and others; and, as Miller (1950) points out, all trout having hyoid teeth are not pure cutthroat, for hybrids may have as many as six teeth.

Generally, the hyoid teeth are arranged in two rows meeting at either end, to form a boat-shaped pattern. Frequently, several more are located inside the two outer rows. The teeth are located on the basi-branchial bones approximately between the first and second gill arches. They are deciduous and thus very easily scraped away or broken. The teeth are fang-shaped and usually point toward the back of the throat. In large specimens they may be seen easily with the naked eye or felt with the finger; in small individuals (two to three inches long) they may be readily located with the use of a microscope.

Seventy-nine specimens from nearly all sections of the range were examined. In 73 of these fish the number of hyoid teeth varied from 1 to 34. Most of the counts fell between three and nine, and the average number was 8.8. The counts were made with a binocular microscope under a bright blue light, using a very fine dissecting needle. The usual procedure, which required considerable care, was to count all teeth visible without disturbing the mucus covering over the tooth area. Then, after carefully removing the mucus, a second count was made. Often several teeth would be hidden by the mucus, giving an initial count lower than the actual number present. On occasion, however, during the removal of the mucus one or more teeth were lost, giving a higher initial count.

Nearly all cutthroat observed in this study possessed red, orange, or red-orange throat dashes. Several small specimens under four inches in length and one large tidewater fish did not have the dash. Dymond (1928) and Sumner (1948) also noted that at certain stages cutthroat may not have the red dash. A number of specimens, from Tectah Creek especially, had the general appearance of cutthroat, but instead of the red or orange dash possessed faint yellow or bronze streaks. These fish possessed other somewhat intermediate features and may have been cutthroat-rainbow hybrids.

There was great variation in coloration and an even greater variation in spotting. It was impossible to select any one specimen as a truly "typical" coast cutthroat which would represent all others in its general appearance.

Fish taken in or near tidewater areas were the most uniform in appearance. The most marked diversity occurred among those in small streams and in headwater areas.

The tidewater fish examined were usually more faintly spotted than specimens from other waters. They were often silvery in coloration. Among the upstream fish the spotting varied from profuse to scarce, and the spots ranged from rounded to irregular in shape. Even fish from the same part of a single stream sometimes differed strikingly in the spotting.

General coloration ranged from washed-out brown to brilliant blues and greens. Every specimen examined from the Eel River tributaries was a dirty-white color. In these the jaw dash was a faded orange or red-orange and the spotting on the back was indistinct. A number of Prairie Creek specimens possessed the same general features.

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The most strikingly colored fish were those from several very small, clear creeks flowing directly into the ocean. These, as well as many from other areas, characteristically displayed predominantly red-orange pectoral, ventral, and anal fins. The bases of these fins were ordinarily greyish-white and the free margins milky-white. In other specimens, the pectoral fins were yellow, the ventrals red-orange, and the anals yellow and orange. The characteristic pattern among fish taken from murky waters was grey-white pectoral, ventral, and anal fins.

Diagonal rows of scales were counted along the second row above the lateral line within the standard length (measured from tip of snout to base of the center caudal fin rays) on 78 of the cutthroat examined. The mean count was 151.7. The range of the counts was 122 to 188. Approximately 80 percent of the values fell between 137 and 165. In referring to the coast form, Snyder (1908) stated that the scales in the lateral series of *Salmo clarki* vary generally from 140 to 170. In a later paper (Snyder, 1940), he listed the range as 160 to 200.

Pyloric caecum counts were made on 71 of the specimens examined. The mean number was 40.3. The extreme range of the counts was from 23 to 60; however, the majority were between 30 and 50. These values vary rather widely, thus extending the range given by Miller (1950), who gives the limits as 27 to 45.

LIFE HISTORY NOTES

In the fall and winter fresh sea-run cutthroat are taken in varying numbers from Redwood Creek and the Mad, Klamath, and Smith Rivers. Most of the fish are caught in September or October, usually after the first substantial rain. Only a few are taken from Mad River, with larger numbers from Redwood Creek and tributaries, and the Klamath. Very good catches of apparently sea-run fish are made in tidewater areas of the Smith, especially in the fall, winter, and early spring, but occasionally also in the summer.

Female cutthroat containing ripe or nearly ripe eggs have been taken from September to April. Spawning thus evidently occurs over a relatively long period. Small, newly emerged fry have been seen from March to June. In British Columbia, according to Dymond (1932), spawning occurs from February to May in the small streams. Dimick and Merryfield (1945) say that the migratory phase spawns in January and February in Oregon.

During the summer and early fall the cutthroat populations in coastal California streams consist ordinarily of fish of the year class 1 to and including mature fish that have spawned but have never gone to the ocean, plus a few sea-run individuals landlocked by receding water levels after spawning.

Log jams and natural falls block many streams at different points, preventing, at least in part, the migration of steelhead and salmon into the waters above. Almost pure or predominantly cutthroat populations exist in the sections above these barriers on a number of streams, while almost none are found below the barriers in the summer and early fall. Some of the fish above barriers are sexually mature although relatively small, usually under 10 inches in length.

Fish-of-the-year were taken only in the very smallest tributaries, usually in those with summer flows less than one cubic foot per second. Most of the cutthroat brood streams examined were too small to be named. Large cutthroat occur in many streams throughout the year; life histories of such individuals vary considerably.

In September of 1951 a 779-foot section of Prairie Creek was cut off by diverting the flow into an artificial channel. The cut-off section was seined, treated with rotenone, and reseined. The fish population collected was composed of sculpins (*Cottus* sp.) (72.7 percent), silver salmon (*Oncorhynchus kisutch*) (15.0 percent), steelhead (*Salmo gairdneri gairdneri*) (8.7 percent), stickleback (*Gasterosteus aculeatus*) (2.2 percent), cutthroat trout (*Salmo clarki clarki*) (0.9 percent), and king salmon (*Oncorhynchus tshawytscha*) (0.3 percent). The total number of fish of all kinds taken was 674. Scale readings of the nine cutthroat collected indicated that none had undergone any ocean or tidal growth. The ages of these fish varied from two to six years (Table 2). No cutthroat-of-the-year were found in the cut-off section.

TABLE 2
Length, Age, and Residence of Coast Cutthroat Trout From Prairie Creek Cutoff¹

Fork length in inches	Number of stream annuli ²	Calculated length at each annulus						Ocean or tidal growth
		1	2	3	4	5	6	
15.0-----	6	3.2	4.8	6.1	8.2	11.1 ³	13.4 ³	None
10.1-----	4	3.2	4.9	7.5	8.9	-----	-----	None
8.6-----	3	2.4	4.3	6.0	-----	-----	-----	None
8.1-----	3	2.8	4.6	7.0	-----	-----	-----	None
6.1-----	2	2.0	4.4	-----	-----	-----	-----	None
5.7-----	2	2.8	4.7	-----	-----	-----	-----	None
5.3-----	2	3.1	4.3	-----	-----	-----	-----	None
5.4-----	2	2.0	4.1	-----	-----	-----	-----	None
4.7-----	2	1.7	3.8	-----	-----	-----	-----	None

¹ Determinations by F. H. Sumner of the Oregon Game Commission.
² Not counting edge where annulus is partly formed in some samples.
³ Spawning check.

SUMMARY

In California the Coast Cutthroat Trout (*Salmo clarki clarki*) is restricted mainly to the area bounded by the Eel River, the Oregon state boundary line, and the summit of the Coast Range. The Smith River is the most important cutthroat area.

The cutthroat distinguished from steelhead and other trout of the same residence of hyoid teeth and reddish or orange coloration. All as by differences in body

This form is exclusive of the Columbia. Pyloric caecum counts range from 23 to 122; lateral line vary from 122 to 188; hyoid teeth 101 to 122.

Fresh sea-run cutthroat are taken in varying numbers from the main streams within their California range during the fall and winter.

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There are indications that some coast cutthroat do not migrate to sea and constitute resident, breeding populations.

Fish-of-the-year were found only in the very smallest tributary streams, usually those with summer flows less than one cubic foot per second.

ACKNOWLEDGMENTS

Thanks are extended to Leo Shapovalov of the California Department of Fish and Game and to Dr. Donald E. Wohlschlag of Stanford University for reading the manuscript critically and offering valuable suggestions during the course of study. John W. Westgate assisted the writer in making many trout collections.

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