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CALIFORNIA STEELHEAD TROUT PROBLEMS

By A. C. TAFT, Assistant Aquatic Biologist, U. S. Bureau of Fisheries

THE SPORTSMEN OF CALIFORNIA are faced with the problem of deciding what steps shall be taken to maintain and augment the steelhead fishing in the coastal streams. The more accessible streams have for some years shown the effects of heavy fishing and as the number of anglers increases and better motor roads are constructed these depleted streams are, to a large extent, abandoned for others which have previously been inaccessible. The streams from the Gualala south to the Big Sur are remembered by many anglers as furnishing excellent fishing in past years, but today are hardly given serious consideration when a fishing trip is planned. It is true that they all still contain fish in considerable numbers and for the first few days after the opening of the spring season their banks are crowded with anglers who make fair catches. The fact still remains that a good deal of dissatisfaction is expressed over fishing conditions in these streams, and it will probably clarify the problem considerably if an analysis is made of the causes for this dissatisfaction and the reasons for its existence.

In order to discuss adequately these problems it will be necessary to refer frequently to the facts which we now know regarding the life habits of the steelhead trout. It will be well to acknowledge at the start that there are a great many things that we do not know that are essential if we are to take advantage of their natural characteristics to increase their number and provide better fishing. These gaps in our knowledge will be referred to in connection with the discussion of the causes of depletion.

At the very start we are handicapped by the fact that we do not know just what a steelhead trout is and how it differs, if at all, from the so-called rainbow trout. This question as to the difference between rainbow and steelhead has been under discussion for a good many years and has not yet been satisfactorily settled. It is now fairly well agreed that the two fishes do not differ sufficiently in form or structure to be separated by the usual characters of this kind that differentiate species. The trout are very variable in most of their bodily characters and coloration and for that reason there is a great tendency to separate different types under different names. Everyone is familiar with

the fact that steelhead and do not greatly res from all differences of in which we are interest migrating from fresh w maturity to spawn. In we have for use in defi In other words, an adul life in the ocean and as the ordinary stream fis fish which have return those in which the great The necessity for this great many steelhead st maturity without ever l more numerous in the p for this may be, the in know whether or not tl It may be that fish hate migratory steelhead jus of this latter type.

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the fact that steelhead fresh from the ocean are bright and silvery and do not greatly resemble the ordinary stream-caught fish. Aside from all differences of appearance, the chief characteristic of steelhead in which we are interested from a practical standpoint is their habit of migrating from fresh water to the ocean when young and returning at maturity to spawn. In fact that is the only clear cut character that we have for use in defining just what we mean by the term steelhead. In other words, an adult steelhead is a trout that has spent part of its life in the ocean and as a consequence has attained a greater size than the ordinary stream fish. Young steelhead are the offspring of these fish which have returned from the ocean and steelhead streams are those in which the great majority of the spawning fish are of this type. The necessity for this broad generalization lies in the fact that in a great many steelhead streams trout have been found that have reached maturity without ever leaving the stream. These fish were apparently more numerous in the past than they are today. Whatever the reasons for this may be, the important point to consider is that we do not know whether or not these fish differ from the ordinary sea-run fish. It may be that fish hatched from the eggs of these resident fish become migratory steelhead just as readily as though their parents had been of this latter type.

The great majority of the fish in our coastal streams are, however, migratory, and their life history is, in brief, as follows: The adult steelhead return to the streams from the ocean during the months from August to May, although the time of the run varies from stream to stream. In the larger rivers such as the Klamath and the Eel, where the mouth is usually open, the run is earlier than in the smaller streams where the mouths are closed except at the time of freshets and the fish must of necessity enter after the heavy rains of December, January, and February. Some of the fish travel to the very headwaters to spawn and are often found above falls and log jams that are a complete barrier to the ascent of silver salmon. By the end of May spawning is completed and by this time the fish from the earlier eggs have come out of the gravel.

Apparently all of the young trout stay in the streams during the first year. During the following months, and particularly during the winter and spring, some of these young fish move downstream into the lagoons and a few of them go on out to the ocean after spending the greater part of their first year in fresh water, but the greater number remain in the stream and by the opening of the season on May 1st many of them are four inches or more in length. As will be shown later these fish furnish the bulk of the catches at the opening of the season.

Most of the young steelhead leave the stream during the following winter and spring, when they are about two years old. There are a number of fish, however, that remain over until their third year, but very few stay in the stream after that time.

During the first year in the ocean the young fish grow very rapidly and some of them, particularly the males, return to spawn after a single summer of sea feeding. The balance of the males and most of the females remain a second year in the ocean before returning to spawn for the first time.

After spawning the fish return to the ocean when possible. Very often they are trapped by the receding water and may remain in the stream all summer. Some of the fish also die from various causes after spawning but those that have escaped the anglers return to the sea where they renew their strength by heavy feeding. Some of the females are known to have spawned as many as five times, but such fish are relatively rare.

Aside from the habits of the steelhead the character of the streams in which they live is the chief factor which must be considered in a study of their abundance. We may assume that originally practically all of the streams from the Oregon line to Monterey were favorable for the propagation of these fish, as they are known to have inhabited them in considerable numbers. It is equally fair to assume that the changes that have been wrought in these streams since the settlement of the State may have had a part in the reduction in their numbers.

If only the principal streams and their larger tributaries are considered it will be found that, exclusive of the Sacramento-San Joaquin system and the streams south of the Big Sur, there are some 5000 miles of stream in the coastal area, and if the creeks down to three miles in length are included the total will be enormously increased; in fact, we shall then find that there is as much as 5000 miles in the Klamath system alone.

All of these streams lie entirely or in part within the coast redwood belt which has been almost entirely logged off. It is difficult to estimate what effects this deforestation may have had on the fish life, but we do know rather definitely that it has made some changes in the streams.

In the first place, the fluctuations in the flow have been greatly accentuated. This means that the floods of the rainy season are more violent and destructive and that subsequently the summer flow is reduced to the point where many of the smaller streams dry up completely. Some of the larger streams are reduced to isolated pools which are fed by the flow of water through intervening gravel beds. The surprising thing is that if not fished out most of these half-dry streams successfully carry young steelhead through the summer. In several instances it has been found that the beds of the streams have also been changed by the washing in of silt and fine gravel which has covered up former spawning beds.

The Klamath, Eel, and the streams to the south of San Francisco have been, in addition to deforestation, seriously affected by the construction of dams and the diversion of water for irrigation and power. This has two effects on the fish. Spawning grounds are cut off or destroyed by the construction of the dams, and secondly, many small fish are destroyed when carried out on to the land with the diverted water. This loss of small fish is to some extent preventable, but only with considerable difficulty.

In spite of these factors, which may have played a part in reducing the number of fish in the streams, the fact remains that angling has probably played a greater part than any other one thing. Few realize the number of fish that have been taken and are still being taken from the steelhead streams.

Even in streams such as the San Lorenzo, which has been fished for years, the number taken is still very great, but the total is lost sight

of due to the fact that consequently the number of fish taken. Unfortunately, we do not know the number of fish taken in these cases we have estimated where the number of fish taken. In the first instance 12 miles of fishing water, is credited with a case it is estimated that over 100,000 fish were taken over 100 miles in length and a to get a fair check on the total will be shown later.

These figures make it apparent that the seining which we have done in the course of cooperative work with the Bureau of Fisheries. On October 1, 1931, above the junction of the streams, 2½ feet deep. taken. On the same day, one mile from the mouth, 12 inches deep; 282 trout were taken. In 1932, two short hauls were taken. In all of these hauls, most of the fish were taken at the time of the flood, concentrated in the pools to enable them to move into neighboring pools.

As has already been pointed out, the streams before they are fished are very small. In order to get a fair check on the number of fish taken by the anglers, cards were distributed in the districts before the operation was taken. One of these cards is shown in the results are shown in the table.

| Length in inches | |
|------------------|-------|
| 3-4 | ----- |
| 4-5 | ----- |
| 5-6 | ----- |
| 6-8 | ----- |
| 8-10 | ----- |
| Over 10 | ----- |
| Total | ----- |

This report includes the results of the investigation in Monterey County to date. The results are made apparent. The number of fish taken which are under five i

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of due to the fact that the number of anglers has greatly increased and consequently the number of fish taken per individual may be small. Unfortunately, we do not have any very satisfactory figures on the number of fish taken, either per angler or per mile of stream. In two cases we have estimates that have been based on close observation, where the number of fishermen could be obtained with fair accuracy. In the first instance a small stream in Santa Cruz County, with about 12 miles of fishing water and a flow of about one second-foot at low water, is credited with a catch of 25,000 fish in 1928. In the second case it is estimated by a deputy that in a Mendocino County stream over 100,000 fish were taken in a single year. This stream is about 20 miles in length and as it is reached by a logging railroad it is possible to get a fair check on the number of fishermen and their creels. As will be shown later these were, for the most part, very small fish.

These figures may appear extravagant but they are borne out by seining which we have done in some of the smaller streams in the course of cooperative trout investigations conducted by the U. S. Bureau of Fisheries and the California Division of Fish and Game. On October 1, 1931, a seine haul was made in the Garcia River just above the junction of the North Fork. The pool was about 70 by 20 feet and 2½ feet deep. In this haul 323 trout and 34 silver salmon were taken. On the same date a haul was made in Alder Creek about one mile from the mouth. This pool was about 100 by 20 feet and 4 to 6 inches deep; 282 trout and no salmon were taken. On September 22, 1932, two short hauls at the Miners Bend in the Gualala River gave 210 trout. In all of these cases it was apparent from the size of the fish that most of them were in their first year. Although the seining was done at the time of low water and the fish were to some extent concentrated in the pools there was in all cases sufficient flow of water to enable them to move up and down stream, and they were as plentiful in neighboring pools as in the ones that were seined.

As has already been stated, most of the trout leave the steelhead streams before they reach three years of age. It naturally follows that most of these immature fish that are caught during the summer season are very small. In order to obtain data on the size of these fish caught by the anglers, cards were sent to all of the deputies in the coastal districts before the opening of the season in 1932. On these cards they were asked to report the number and sizes of the trout and salmon taken. One of these cards was made out for each creel checked and the results are shown in the following table:

| Length in inches | Number of trout | Per cent | Number of salmon | Per cent |
|------------------|-----------------|----------|------------------|----------|
| 3-4 | 41 | 3.8 | 142 | 57.3 |
| 4-5 | 548 | 50.8 | 104 | 41.9 |
| 5-6 | 380 | 35.2 | 2 | .8 |
| 6-8 | 90 | 8.3 | | |
| 8-10 | 14 | 1.3 | | |
| Over 10 | 6 | .6 | | |
| Total | 1079 | | 248 | |

This report includes fish taken from streams all the way from Monterey County to Humboldt County and two things are at once made apparent. The first is that most of the trout taken are fish which are under five inches in length and are probably just starting

their second year. The second is that a considerable number of very small silver salmon are taken as trout. At this size the average angler does not distinguish the trout from the salmon. As far as age is concerned it is probable that the fish from 3 to 5 inches in length are in their second year while those from 5 to 8 inches are in their third year. Practically all of the fish over 10 inches in length were reported as mature spawned out fish which had not yet returned to the ocean.

These small fish are the ones that are caught in the coastal streams in great numbers during the summer months and they are at the same time the stock from which the large mature steelhead are derived. We do not know exactly how many of these young fish must be allowed to migrate to the ocean in order to provide for the return of one adult but judging from experience elsewhere the number probably varies from four to ten. In other words, for every mature steelhead, four to ten young fish must be allowed to grow in the stream until they are ready to migrate. It is certain that if the present drain on these young fish continues, there will not be enough adult fish returning to the streams to make good fishing. At present the season opens in May and continues to November, with a daily limit of 25 trout or 10 pounds and one trout, and no size limit. From November through to February the limit is three trout regardless of weight. This leaves March and April as the only closed months in most of the coastal streams.

In the taking of these small trout during the summer months arises one of the greatest dissatisfactions with angling in the coastal streams. The complaint, common enough among anglers, that the fish are too small, is particularly well justified in this case. The reports of the deputies showed how pitifully small most of the fish are and as a result most of the anglers strive for a limit as being the sole measure of accomplishment.

This taking of immature steelhead in turn gives rise to the second complaint, which is that the catch of mature steelhead has decreased alarmingly in certain streams. Although the curtailment of the number of young fish taken would be an important step towards increasing the number of adult fish returning to the streams, some steps should be taken to increase the protection given the adult fish after they have run the gauntlet of anglers in tidewater and the main stream, and have reached the spawning grounds in the smaller tributaries.

A great many proposals have been made for improving the steelhead fishing and it may be well to review them in the light of the foregoing statements. The most frequent proposal is to plant more hatchery reared fish. There are now six hatcheries supplying the streams in the coastal area. As we have seen this means about 1000 miles of stream for each hatchery to serve if they are all to be stocked, and also means that at present each hatchery is expected to serve a greater area than can be accomplished satisfactorily if the present number of fish is to be maintained. Instead of leaving the hatcheries free to concentrate their output in certain areas where the need is very great due to a concentration of anglers or the construction of dams, they are forced to spread their efforts over such a wide area that the effect is partially lost. Under present conditions the construction of more hatcheries is hardly possible as barely enough money is available to run those now in existence. Up to the present time the hatch-

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eries have concentrated their work to a considerable extent, but as an increasing number of streams become depleted they are expected to extend their work to these new streams that have previously been self-maintaining. This merely means that the same number of fish is spread over a larger area with considerable loss in effectiveness. The hatcheries should be given every possible assistance as their task is a difficult one. Few sportsmen realize the enormous number of fish it takes to make satisfactory angling in the aggregate.

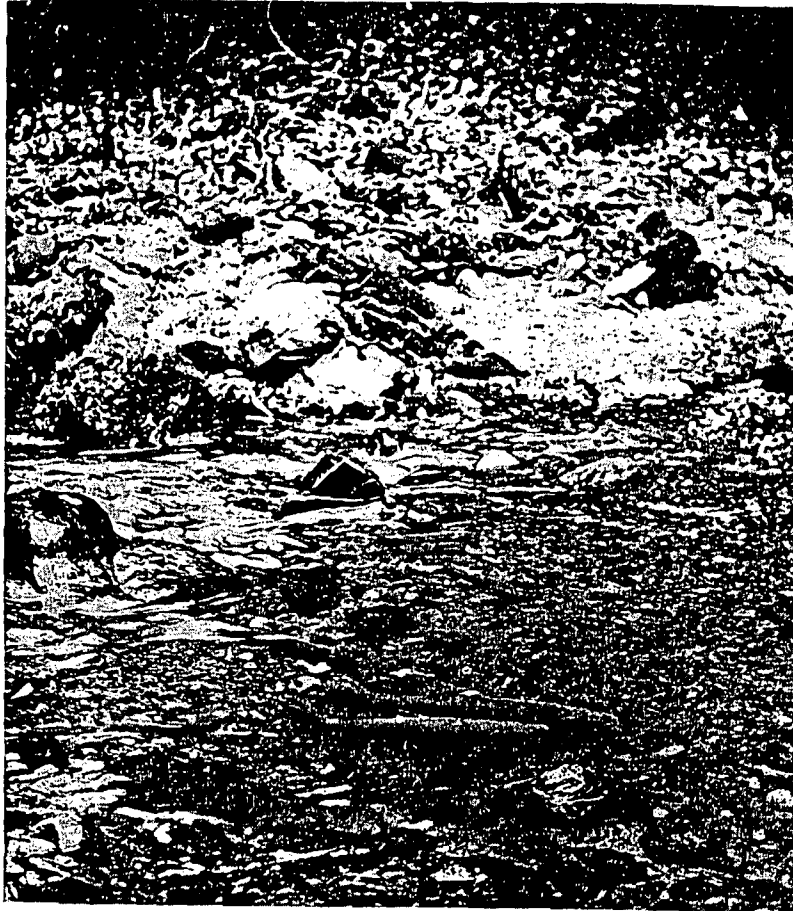


Fig. 63. A pair of steelheads over the spawning nest and three small males nearby. Photograph by Dr. P. R. Needham.

A size limit has at times been suggested as a means of protection. As we have seen that only 10 per cent of the fish examined by the deputies were over six inches in length, it is apparent that the imposition of a size limit would amount to an indirect closure of the streams and would probably give rise to considerable difficulties in enforcement and a loss of small fish that would die after being returned to the stream.

The introduction of other species of trout has been suggested as a means of improving the fishing in the steelhead streams. This suggestion is based on an acknowledgment of the fact that for the most part the young steelhead are too small to furnish satisfactory angling. The intention in introducing these fish would be to have a nonmigratory form that would furnish larger fish in the stream during the months when the adult steelhead were not running. There are two objections to be brought against such a plan. The first is that it is doubtful if a resident species could be maintained along with the young steelhead without endangering the maintenance of the latter. The probable result would be very mediocre fishing for both species. This has been the result in the Russian River where the introduced brown trout have by no means taken the place of the once abundant steelhead. As a matter of fact most of the coastal steelhead streams become so low

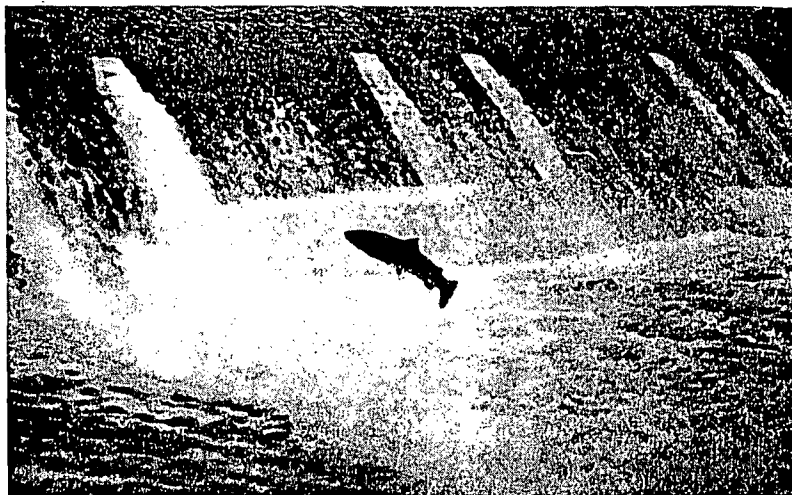


Fig. 64. Steelhead jumping at the Benbow Dam, Eel River. Photograph by A. C. Taft.

and warm during the summer that it is doubtful if large trout of any sort would thrive in them.

One of the great advantages that accrues to California from the steelhead comes from the fact that the fishing for the adults offers sport when the Sierra streams can not be reached. Would it be wise then to take a chance on exchanging one of the best kinds of fishing during the winter months for a duplication of the type of fishing that is now obtainable in thousands of miles of mountain streams? California has sufficient stream mileage so that the State could well afford to abandon entirely summer fishing in the coastal streams and instead use these waters to provide a fine type of trout fishing during the winter months when the Sierra streams are closed.

Shortening the summer season would only be partially effective in protecting the young stream fish for the reason that the number of fish taken is not always dependent upon the length of the season. In a great many cases the shortened season merely means a greater concentration of fishing within the shortened period.

Probably the most complete closure of certain are important nursery protection was initiated of Fish and Game. In during the summer months for young trout as food growth than in the stream the right direction and portions of the stream:

In the case of the different. There, certainly spawning grounds should be closed to fishing; idea of game refuges; expected to remain abundant.

The question might further restriction which shown to be in the favor of one of large fish or species decreasing numbers of to come. They are very other hand if the employment fishing will not only be fish and greater satisfaction.

CONDITION OF

SINCE YELLOWT commercial and sports Division of Fish and Game to determine whether or preliminary survey was number of catches made detailed study of individual catch was delivered in purse seines, but only during the last few years were ideal for a study of by small live bait boats at least four or five months fishery were much more

¹ Contribution No. 130 1933.

has been suggested as a complete closure of certain portions of the streams or of tributaries that are important nursery grounds. During the past year this type of protection was initiated in certain of the coastal streams by the Division of Fish and Game. In these cases the lagoons were closed to all fishing during the summer months. These lagoons are great natural nurseries for young trout as food is very abundant and they make a more rapid growth than in the stream. This closure of the lagoons is a step in the right direction and could profitably be extended to include larger portions of the streams.

The first is that it is along with the young of the latter. The second is that the introduced brown trout and steelhead are abundant in streams where the steelhead become so low.

In the case of the Klamath and Eel rivers, the situation is slightly different. There, certain tributaries that are known to be favorable spawning grounds should be set aside as nursery streams and permanently closed to fishing. Everyone is thoroughly familiar with the idea of game refuges and the necessity for them, but the trout are expected to remain abundant with little or no protection.

The question might reasonably be raised as to the necessity for further restriction when the fish are as abundant as they have been shown to be in the foregoing paragraphs. The alternative is largely one of large fish or small fish. If the present fishing is continued decreasing numbers of these fingerlings will be taken for several years to come. They are very easy to catch and as fishing increases fewer of them will be left to reach maturity and maintain the stock. On the other hand if the emphasis is put on the fishing for the adults the fishing will not only be improved but will result in more pounds of fish and greater satisfaction for the sportsmen of the State.

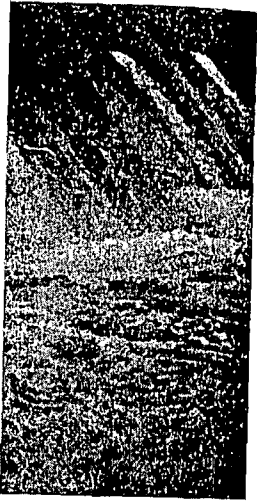
CONDITION OF THE YELLOWTAIL FISHERY¹

By S. S. WHITEHEAD

INTRODUCTION

SINCE YELLOWTAIL (*Seriola dorsalis*) is of interest to both the commercial and sport fishermen, the authorities of the California Division of Fish and Game ordered an investigation of the fishery to determine whether or not the species is in need of protection. A preliminary survey was made of the fishery at San Pedro, and the number of catches made in a season were found to be too scanty for a detailed study of individual boat catches. The small total annual catch was delivered in a few relatively large amounts by boats using purse seines, but only a very few catches are represented in each season during the last few years. On the other hand the data at San Diego were ideal for a study of boat catches because the fishery was exploited by small live bait boats which made daily catches over a period of at least four or five months in a season. Since the data for the San Diego fishery were much more adequate, the study of the yellowtail boat

¹Contribution No. 130 from the California State Fisheries Laboratory, June, 1933.



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